CURRICULUM FOR THREE YEAR
(SIX SEMESTER)
DIPLOMA COURSE IN

INSTRUMENTATION & CONTROL ENGINEERING

Effective from Session :

Semester System

UNDER DEVELOPMENT

Prepared By

Curriculum Development Cell

INSTITUTE OF RESEARCH DEVELOPMENT
& TRAINING, U.P., KANPUR

APPROVED BY

BOARD OF TECHNICAL EDUCATION
U.P. LUCKNOW
CORRECTED AS SYLLABUS COMMITTEE OF:
B.T.E. MEETING HELD ON 27.05.2015:

Corrected and Approved by B.T.E. On Dated 27.05.2015

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN INSTRUMENTATION & CONTROL ENGINEERING
(Common With Electronics Engineering)
(Effective From)

I SEMESTER

Curriculum							Scheme of Examination								
Periods Per Week						S U B J E C T	Theory				Practical				Grand Total
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Examination Dur.	Examination Marks	Sess. Marks	Total Marks	
5	-	-	3	-	8	1.1 Professional Communication	2.5	50	20	70	3	20	10	30	100
3	1	-	-	-	4	1.2 Applied Mathematics-I(A)	2.5	50	20	70	-	-	-	-	70
3	1	-	-	-	4	1.3 Applied Physics-I	2.5	50	20	70	-	-	-	-	70
6	-	-	-	-	6	1.4 Applied Chemistry	2.5	50	20	70	-	-	-	-	70
4	2		6	-	12	1.5 Electronic Components And Devices.	2.5	50	20	70	3	80	40	120	190
4	-	8	-	-	12	1.6 Technical Drawing.	3.0	50	20	70	-	-	-	-	70
25	4	8	9	-	46	<---------TOTAL---------->	--	250	120	420	--	100	50	150	570
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
														Aggregate	595

II SEMESTER

3	1	-	-	-	4	2.1 Applied Mathematics-I(B)	2.5	50	20	70	-	-	-	-	70
3	1	-	4	-	8	2.2 Applied Physics-II	2.5	50	20	70	3	40	20	60	130
4	1	-	-	-	5	2.3 Engineering Mechanics & Material	2.5	50	20	70	-	-	-	-	70
2	-		5		7	2.4 Introduction To Computer	---	--	--	--	3	60	30	90	90
6	-	-	4	-	10	2.5 Electrical Engineering-I	2.5	50	20	70	3	60	30	90	160
-	-	-	-	12	12	2.6 Elementary Workshop Practice.	--	--	--	--	4	70	30	100	100
18	3	-	13	12	46	<---------TOTAL---------->	--	200	80	280	--	230	110	340	620
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
														Aggregate	645

NOTE:- (1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.

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STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN INSTRUMENTATION & CONTROL ENGINEERING
(Effective From Session)

III SEMESTER

Curriculum							Scheme of Examination								
Periods Per Week						S U B J E C T	Theory				Practical				Grand
							Examination		Sess. Marks	Total Marks	Examination		Sess. Marks	Total Marks	
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Dur.	Marks			Dur.	Marks			Total
5	2		--		7	3.1 Applied Mathematics-II	2.5	50	20	70	--	--	--	--	70
6	-	-	4	-	10	3.2 Electrical Engineering-II	2.5	50	20	70	3	40	20	60	130
6	-	-	4	-	10	3.3 Electronic Devices And Circuits.	2.5	50	20	70	3	40	20	60	130
5	1	-	4	-	10	3.4 Transducers & Application	2.5	50	20	70	3	40	20	60	130
-	-	-	-	6	6	3.5 Electronics Workshop.	--	--	--	--	4	100	40	140	140
22	3	-	12	6	43	<---------TOTAL---------->	--	200	80	280	--	220	100	320	600
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
						Aggregate									625

IV SEMESTER

7	1	-	6	-	14	4.1 Programming In C & C++	2.5	50	20	70	3	60	30	90	160
5	1	-	4	-	10	4.2 Networks,Filters & Transmission Lines.	2.5	50	20	70	3	40	20	60	130
5	1	-	6	-	12	4.3 Process Instrumentation.	2.5	50	20	70	3	40	20	60	130
6	-	-	6	-	12	4.4 Principles of Digital Electronics	2.5	50	20	70	3	40	20	60	130
											:	:	:		
23	3	-	22	--	48	<---------TOTAL---------->	--	200	80	280	--	180	90	260	550
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
						Aggregate									575

NOTE:- (1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) 4 weeks structured and supervised, branch specific, task oriented industrial/field exposure to be organised during summer vacation after IV Sem. examination. Student will submit a report. There will be 60 marks industrial exposure. These marks will be awarded by project examiner in the VI Semester.(Examination marks : 40, Sess. marks : 20).
(6) Field visit and extension lectures are to be organised and managed well in advance at institute level as per need.

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THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN INSTRUMENTATION & CONTROL ENGINEERING
(Effective From Session)

V SEMESTER

Curriculum						S U B J E C T	Scheme of Examination								
Periods Per Week							Theory				Practical				Grand
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Total
6	2		--		8	5.1 Industrial Management and Enterprenurship Development	2.5	50	20	70	--	--	--	--	70
8	2	-	-	-	10	5.2 Signal Transmission Recording and Display.	2.5	50	20	70	--	--	--	--	70
5	1	-	6	-	12	5.3 Electronic Instruments And Measurement.	2.5	50	20	70	3	60	30	90	160
6	-		6	-	12	5.4 Industrial Control	2.5	50	20	70	3	40	20	60	130
						5.5 ELECTIVE (Any One)									
5	1	-	-	-	6	i. Medical Instrumentation	2.5	50	20	70	--	--	--	--	70
5	1	-	-	-	6	ii. Specialised Instruments	2.5	50	20	70	--	--	--	--	70
5	1	-	-	-	6	iii. Advance Microprocessor and Interface	2.5	50	20	70	--	--	--	--	70
5	1	-	-	-	6	iv. Computer Aided Instrumentation	2.5	50	20	70	--	--	--	--	70
30	6	-	12	--	48	<---------TOTAL---------->	--	250	100	350	--	100	50	150	500
						Games/NCC/Social and Culturl Activity + Discipline (15 + 10)									25
														Aggregate	525

VI SEMESTER

4	-	-	-	-	4	6.1 Environmental Education * & Disaster management	2.5	50	--	--	-	--	--	--	--
6	2	-	8	-	16	6.2 Process Control.	2.5	50	20	70	3	60	30	90	160
6	2	-	8	-	16	6.3 Microprocessor And Application.	2.5	50	20	70	3	60	30	90	160
-	-		8	-	8	6.4 Project. i. Problem.	--	--	--	--	VIVA	90	40	130	130
						ii. Industrial/ Field Exposure						50	30	80	80
16	4	--	24	-	44	<---------TOTAL---------->	--	100	40	140	--	260	130	390	530
						Games/NCC/Social and Cultural Activity + Discipline (15 + 10)									25
														Aggregate	555
														30% of I & II Semester	372
														70% of III & IV Semester	840
														100% of V & VI Semester	1080
														Grand Total	2292

NOTE:- (1) Each period will be 50 minutes duration.
(2) Each session will be of 16 weeks.
(3) Effective teaching will be at least 14 weeks.
(4) Remaining periods will be utilised for revision etc.
(5) Field visit and extension lectures at institute level as per need be organised.
(6) (*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks.

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I. MAIN FEATURES OF THE CURRICULUM

1.	Title of the Course	:	Diploma in Instrumentation and Control Engineering
2.	Duration of the Course	:	Three Years(Six Semester)
3.	Type of the Course	:	Full Time Institutional
4.	Pattern of the Course	:	Semester System
5.	Intake	:	60
6.	Entry Qualification	:	Passed High School with 35% Marks
7.	Admission Criteria	:	State Joint Entrance Examination

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II LIST OF EXPERTS

List of experts who contributed in semester system of curriculum for three year (Six Semester) diploma course in Instrumentation & Control Engineering.

1.	Shri Manoj Kumar	HOD(IC)	Govt. Poly., Manpuri
2.	Shri Raj Kumar	HOD(IC)	Govt. Poly., Lucknow
3.	Shri Arun Kumar	Lecturer	Govt. Poly., Kanpur
4.	Shri Lal Ji Patel	TBO	I.R.D.T.,U.P.,Kanpur

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III. NEED ANALYSIS :

Technological advancements have brought revolutionary changes in the world of work. Old conventional methods in machines are in a process of replacement and renewal. Automatic machines and processes have improved the quality of production and minimised the production cost by reducing man power needs in the industry.

An efficient and effective instrumentation & control system is an integral part of an industry to mantain quality of production within specified limits. Electronics plays a role modern control systems. Application of computers in computer aided manufacture for precision work has opened new horizons in the industry therefore the study of electronics and computer requires considerable emphasis in the curriculum.

Keeping in view the technological upgradation the curriculum for three year diploma course in Instrumentation & Control Engineering has been updated. The special features of the revised curriculum are introduction of computer, entrepreneurship development, safety, ecology, environmental pollution and its control at appropriate places.

It is hoped that this curriculum will prove useful for the students to face the challanges of the existing as well as future industrial requirements.

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IV. PROFILE DEVELOPMENT :

A tool in the form of questionnaire for getting information about job potential, job opportunities, man power requirements and job activities of Diploma holder in Instrumentation & Control Engineering was designed and sent to various organisations, industries and higher technological Institutions and Polytechnics. The response was not very much encouraging. So efforts were made to get feed back through mutual interaction with the experts of above organisations, industries, higher technological institutes and polytechnics. The feed back received was discussed and analysed in a workshop and a draft curriculum was prepared adopting the following procedure.

1. Listing job potential and job activities.

2. Analysing activities into knowledge and skill.

3. Determining course objectives.

4. Planning horizontal and vertical organisation of the subjects.

5. Developing study and evaluation scheme.

6. Development of detailed course content and coverage time keeping in view the knowledge and skill requirement.

7. Determination of resource input in the form of human resource, space, equipment etc.

The so prepared curriculum was sent for comments of experts in various higher technological institutions and senior personnels in industries. The suggestions thus recieved and those through personal contacts were incarporated where found suitable. Finally revised curriculum was put before an exspert Committee approved by the "Government of Utter Pradesh" for its final approval. The Committees suggestions though very nominal too were respectfully incarporated to give it its final shape.

It is hoped that revised curriculum of Diploma in Instrumentation & Control Engineering will be useful in producing middle level manpower for world of work.

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V. JOB POTENTIAL/JOB OPPORTUNITIES

These diploma holders are employed in Process Industries; Manufacturing & Assembly Industries of Instrumentation ; Marketing and Servicing organisation; Instrumentation user organisation and self employed. Most of the diploma holders are employed in process Industries and manufacturing and assembly Industries , While few are absorbed in other job opening. The designations specifying various job requirement of diploma holder in instrumentation in various industries are given below :-

1.0 PROCESS INDUSTRIES

1.1 Maitenance and Repair Technician / Supervisor.

1.2 Erection Commissioning and testing technician / supervisor.

1.3 Laboratory technician / incharge in process industries i.e. Textile, Pharmaceutical, Cement, electrical, power generation, fertilizer, petro-chemical, steel, food processing and paper etc.

2.0 MANUFACTURING AND ASSEMBLY INDUSTRIES

2.1 Design and Development assistant.

2.2 Production supervisor / foreman.

2.3 Erection, testing and commission supervisor in measuring instruments and control systems manufacturing and assembly industries.

3.0 MARKETING & SERVICE ORGANISATION

3.1 Marketing Assistant.

3.2 Sales and service Engineer, in marketing organisation.

4.0 INSTRUMENTATION USER ORGANISATION

4.1 Instrument technician / supervisor, in Institutions / reasearch laboratories.

5.0 Can be employed in repair workshop or small manufacturing units.

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VI. JOB ACTIVITIES

A. Activities performed in various jobs :

1. Maintenance and repair Technician / Supervisor :

- Read, interpret and prepare instrumentation drawing and circuits.

- Organise and plan work and communicate effectively with juniors and seniors verbally and in writing.

- Inspect system, diagnose fault and take corrective action.

- Perform routine preventive maintenance of instruments and system.

- Fault finding through tests, repair and calibration of instruments, devices and systems.

- Test instruments and devices on simulated system and actual system.

- prepare estimate of man and material required for simple jobs / installation and maintenance.

2. Erection, commissioning and Testing Technician / Supervisor

-Read, interpret and prepare instrumentation drawing and circuits.

- Do wiring / pneumatic connections of system panel and check the system as per instruction of suppliers.

- Install instruments, control accessories and panels.

- Organise and plan work and communicate effectively with juniors and seniors verbally and in writing.

- Prepare estimate of man and material required for simple jobs / installation and maintenance.

3. Laboratory Technician / Incharge

- Organise and Plan work and communicate effectively with juniors and seniors verbally and in writing.

- Test instruments and devices on actual system and simulated system.

4. Design & Development Assistant

- Read, interpret and prepare instrumentation drawing and circuits.

- Develop control circuits and instrumentation for simple application / modification of existing circuits.

- Select instruments and devices for simple applications.

- Prepare estimate of man material required for simple jobs.

5. Production Supervisor / Foreman

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- Read, interpret and prepare instrumentation drawing and circuits.

- Do wiring / pneumatic connections of system panel and check the system as per instruction of suppliers.

- Install instruments, control accessories and panels.

- Organise and plan work and communicate effectively with juniors and seniors verbally and in writing.

- Inspect system, diagnose fault and take corrective action.

6. Marketing Assistant & Sell & Service Enginner

- Sell and service equipment / instrument and system.

- Select instruments and devices for simple applications.

- Prepare estimate of man material required for simple jobs.

7. Instrument Technician and Supervisor

- Read, interpret and prepare instrumentation drawing and circuits.

- Do wiring / pneumatic connections of system panel and check the system as per instruction of suppliers.

- Install instruments, control accessories and panels.

- Organise and plan work and communicate effectively with juniors and seniors verbally and in writing.

- Inspect system, diagnose fault and take corrective action.

- Perform routine preventive maintenance of instruments and system.

- Fault finding through tests, repair and calibration of instruments, devices and systems.

- Setting up of instrument servicing unit.

8. Self Employed

- Read, interpret and prepare instrumentation drawing and circuits.

- Install instruments, control accessories and panels.

- Inspect system, diagnose fault and take corrective action.

- Fault finding through tests, repair and calibration of instruments, devices and systems.

- Test instruments and devices on simulated system and actual system.

- Sell and service equipment / instrument and system.

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- Setting up of instrument servicing unit.

- Prepare estimate of man material required for simple jobs.

B. Summary of activities of Diploma holder in instrumentation and Control Engineering

1. Organise and plan work and communicate effectively with juniors and seniors verbally and in writing.

2. Read, interpret and prepare instrumentation drawing and circuits.

3. Prepare estimate of man and material required for simple jobs / installation and maintenance.

4. Install instruments, control accessories and panels.

5. Do wiring / pneumatic connections of system panel and check the system as per instruction of suppliers.

6. Inspect system, diagnose fault and take corrective action.

7. Test instruments and devices on simulated system and actual system.

8. Perform routine preventive maintenance of instruments and system.

9. Fault finding through tests, repair and calibration of instruments, devices and systems.

10. Sell and service equipment / instrument and system.

11. Select instruments and devices for simple applications.

12. Develop control circuits and instrumentation for simple application / modification of existing circuits.

13. Setting up of instrument servicing unit.

Note : The activities listed here are derived by listing the activities for various job opportunities and then combining similar activities in one. The serial number of activities indicates its order of importance in determining education and training needs of the course. For example S.No. 1 against activity indicates that / activity i.e. serial number 2 - 13 are in decreasing order of importance.

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VII. ACTIVITY ANALYSIS

(Analysing activities for determining the knowledge and skills required to the various actvities.)

Activity	Theoretical Knowledge required	Practical skills required
1. Organise and plan work and communi-cate effectively with juniors and seniours orally and in writing.	1. Organisational principles 2. Duties towards management, equal and juniors 3. Leadership qualities and humans relations. 4. Job planning; appro-priate tooling material, skill techniques, sequencing and time estimation. 5. Material handling procedures. 6. Procedure for issue of materials of proper quality and quantity. 7. PERT & CPM 8. Speaking and writing proficiency in language. Technical report. 9. Phonetics and pronunciations.	1. Skill in safety measures. 2. Handling of various tools & material handling equipments. 3. Skill in doing exercise on purchase and store routines. 4. Skill in doing planning and report writing exercise. 5. Skill in doing exercise in spoken language by modern gadgets.
2. Read interpret and prepare various drawing and circuits.	1. Fundamental of hydraulic, pneumatic electronic devices, symbols and conventions. 2. ISI code of practice on drawing. 3. Understanding of pneumatic hydraulic, electric and electronic circuits & PCB layout. 4. Fastners, types, specification, symbol	1. Skill in lettering and scaling, dimensioning, using drawing instruments. 2. Skill in making geometric, drawing projection, ortho-graphic & isometric drawing. 3. Skill in making sectional views & expanded views. 4. Skill in making instrumentation

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Activity	Theoretical Knowledge required	Practical skills required
	& use of fastners.	symbol.
	5. Blue print reading of installation, instrument and circuit drawing.	5. Skill in developing line and block diagrams of various circuits & systems.
	6. Panel wiring diagram, line diagrams,instrument layout drawing.	6. Skill in making instrument layout drawing and panel wiring diagram.
	7. Graphic semigraphic panel diagrams.	7. Skill in developing graphic panel diagrams.
	8. Principle of instrument-ation engg. and control system.	8. Skill in developing PCB layout diagram.
1. Prepare estimate of man and material required for simple jobs of installation and maintenance.	1. Introduction of drawings.	1. Skill in doing exercises on purchase procedure
	2. Knowledge of job installation, repair maintenance.	
	3. Specification of supplies.	
	4. Requirement of man-hours for a job.	
	5. Wages and remuneration time and piece rate system.	
	6. Preparing bill of material cost for a given work.	
4. Install instru-ments control accessories and panels.	1. Read and interpret various drawings.	1. Basic workshop skills, fitting, drilling, welding turning, shaping sheet metal work, soldering and brazing.
	2. Electrical, pneumatic and hydraulic connectors, their types, materials and properties.	2. Handling of tools.
	3. Filling and packing	

Activity	Theoretical Knowledge required	Practical skills required
	materials codes and specifications of above materials.	
5. Do wiring pneumatic connections of system/ panel and check the system as per instruction of suppliers.	1. Read and interpret various drawings. 2. Different types of mountings and fastners. 3. Electrical, pneumatic, hydraulic connectors, their types, materials, properties and their pertinent code & specifications. 4. Types, size and specific section of various hand tools and testing instruments. 5. Precautions and procedures of installation of instruments, services and panels. 6. Principle, working and operation of various instruments and devices. 7. Basic knowledge of plant and process & pertinent codes and specification. 8. Working range, quality of auxiliary supplies and fluids for the circuits.	1. Skill in doing wiring tubing and soldering and their exercises. 2. Skill in the proper use of hand tools & test instruments 3. Skill in drilling and tapping. 4. Skill in Tracing of circuits and verification.
6. Inspect system; diagnose fault and take corrective action.	1. Function of various components of system. 2. Normal characterstics & tolerance of various instruments & components in a system. 3. Basics of process and plan layout. 4. type set test instruments and use of various hand tools. 5. Understanding graphic	1. Skill in interpreting code and specification of components. 2. Skill of reading of diagrams of plant layout. 3. Skill in the proper use of hand tools. 4. Skill in the proper use of testing and measuring instruments. 5. Skill in doing

Activity	Theoretical Knowledge required	Practical skills required
	panel or line diagram.	fault diagnosis and corrective exercise on simple systems.
	6. Reading & interpreting, recording of various, process variables.	
	7. Behaviour of process variable with reference to control element.	
7. Test of instruments Devices on simulated systems and actual systems.	1. Specification,Principle and working of instruments and devices.	1. Skill in the use of testing instruments.
	2. Calibration and testing procedures.	2. Skill in rigging of testing and calibration circuits.
	3. Calibration set ups.	3. Skill in doing calibration exercise.
	4. Selection, types and working of test instruments.	4. Skill in doing simple installation exercise.
	5. Safety precautions to be taken while testing instruments.	5. Skill in doing exercise of faulty instruments.
8. Perform routines preventives and breakdown maintenance of instruments and system.	1. Theory of maintenance.	1. Skill in interpreting the maintenance schedule for instrument&devices.
	2. Understanding maintenance schedule for instruments.	2. Skill in prediction of abnormality in the component or instrument by conducting simple test.
	3. Fundamental of Electricals,Electronics, Pneumatic & Hydraulic circuits.	3. Skill in dismantling and assembly of various types of instrument and devices and their calibration.
	4. Process and plant layout working environment and hazards.	4. Skill in doing lubrication procedure exercises.
	5. Properties and uses of lubricants packing and	

Activity	Theoretical Knowledge required	Practical skills required
	insulating materials. 6. Principle of working of various process control instruments. 7. Types and quality of recording pens, inks and charts. 8. Principles of working and use of measuring devices and use of hand tools.	
9. Fault finding through tests, repair and calibration instruments and devices systems.	1. General testing and calibration procedures. 2. General rapair procedures. 3. Different types of faults encountered in various process instruments, their causes and remedies. 4. Units of measurement and conversions. 5. Specification and use of different types of test and calibrating equipment. 6. Fundamentals of electronics, hydraulics, pneumatics & electric circuits. 7. Principles, construction and working of various process control instruments. 8. Types of tools and their uses.	1. Skill in handling of various test instruments and tools. 2. Skill in doing dismantling and repair exercises. 3. Skill in doing testing,adjusting calibration and trouble shooting exercises. 4. Skill in preparation of test report.

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Activity	Theoretical Knowledge required	Practical skills required
10. Sell and service equipment / instruments and systems.	1. Adequate knowledge of instruments to be marked including their specifications utility superiority over the other products. 2. Publicity & display techniques. 3. Marketing investigation regarding new areas of marketing. 4. Cost of trade rebates. 5. Tooling kit and checking instruments and selecting appropriate tools. 6. Common faults and method of rectification. 7. After sales service techniques. 8. Personality Development.	1. Achieve &communcation ability with customers. 2. Attain capability of demonstrating the techniques. 3. Skill in handling of servicing and checking tools. 4. Skill in speaking good language.
11. Select instruments & devices for simple application.	1. Process variables. 2. Range of the variable to be measured. 3. Principle and working of various instruments used for measurement and control of process variables. 4. Instruments characteristic & specifications.	1. Skill in determination of characteristics of instruments. 2. Skill in understanding specifications of instruments. 3. Skill in doing exercise interfacing. 4. Skill in selection of instruments & devices.

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Activity	Theoretical Knowledge required	Practical skills required
12. Develop control circuits and instrumentation for simple application / modification of existing circuits.	1. Basic properties of control loop elements, specifications. 2. Feedback control theory. 3. Process control system. 4. Control objective. 5. Transducers. 6. Basic instrumentation principle. 7. System behaviour for variation of control parameters. 8. Read and interpret drawing.	1. Skill in determining characteristics of components. 2. Skill in doing exercises on feedback control system. 3. Skill in designing of simple system. 4. Skill in the use of testing instruments.
13. Setting up of an instruments servicing unit.	1. Concept of entrepreneurship. 2. Financial assistance Technical assistance available to small scale unit. 3. Selection , location and space requirement of unit. 4. Project report preparation. 5. Use and selection of hand tools,measuring and testing instruments. 6. Principle & working of process instruments & control devices. 7. Common defects &remedies in the instruments, control and devices. 8. Methods of testing setting & calibration. 9. Availability of instruments control devices & their spare parts. 10. Approximate cost of tools, equipment & other overheads. 11. Sales tax, income tax and local taxes. 12. Publicity.	1. Skill in preparation of project report. 2. Skill in doing exercises in filling up form for financial assistance. 3. Skill in praparing bills. 4. Skill in exercises on use of hand tools and Measuring instruments. 5. Skill in doing exercises on various process instruments & control devices to locate fault and rectification. 6. Skill in doing exercises in tracing and calibration. 7. Skill in doing exercises in tracing of ciruits.

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VIII. COURSE OBJECTIVE

At the end of the course students should be able to :

1. Plan and organise men, material and money economically for the execution of projects.

2. Identify the various type of control systems, control devices and instruments.

3. Draw and interpret various types of drawings used in process and control systems.

4. Instal / erect and commission instruments , equipments and pannels.

5. Understand the various stages of process , process variable, and methods adopted for measurement and control and recording, data, acquisition and logging etc in industries.

6. Understand the principle of operation, construction details, error adjustment and process of assembly of instruemnts and devices.

7. Design and layout of control circuit and fabricate small control panels.

8. Select, and use different devices, components, tools and instruments for testing, maintenance and repair.

9. Test and calibrate various components and instruments in industry.

10. Maintain, service and repair instruments including test and instruments in processes.

11. Promote marketing / servicing of the products.

12. Communicate effectively in the profession and develop self learning habits.

13. Set up servicing unit.

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IX. CURRICULUM ANALYSIS TO IDENTIFY SUBJECTS OF STUDY

A. ANALYSIS

Course objective of diploma	Curriculum Areas		
Course in Instrumentation Engg.	Engg. Specifications	Engineering Science	Basic Science, Humanties Management & Basic Skill
1. Plan & organise men, material and money economically for the execution of projects.	- Industrial Management (CPM & PERT), purchasing and storing, Safety measures, Industrial law, Estimating & Costing		Mathematics language Communication Technique.
2. Identify the various control systems, control devices & instruments.	1. Drawing (Components) 2. Drawing (Process) 3. Instrumentation Engg. 4. Process control components. 5. Process control. 6. Transducer. 7. Industrial Instruments. 8. Electrical Instruments. 9. Mechanical Instruments.	Engineering Materials	Engineering Drawing
3. Draw and interpret various types of drawing used in process and control systems.	1. Drawing (Process) 2. Drawing Components) 3. Instrumentation Engg. 4. Automatic control engg. 5. Process control components. 6. Process control. 7. Transducer.	- Basic Electrical Engineering - Basic Electronics	- Engg. Drawing - Mathematics - Physics - Chemistry
4. Instal / erect and commission instruments, equipment and panels.	1. Drawing (Components) 2. Workshop Process 3. Drawing (Process) 4. Industrial Instruments. 5. Instrumentation Engg. 6. Electric & Electronic Measurement & Instruments. 7. Industrial Measurement and Instruments. 8. Mechanical Measurements and Instruments. 9. Process control 10. Transducer. 11. Process control.	Engineering Materials - Basic Electrical Engineering	- Basic Workshop - Engineering Drawing
stages of process, process variables and methods adopted for measurement and control and recording data acquisition and logging etc in industries.	2. Automatic control Engg. 3. Process control components. 4. Process control. 5. Transducers. 6. Industrial instruments. 7. Digital electronics & Microprocessors.	-Basic Electronics -Basic Elect. Engg. - Fluid Mechanics. -Thermodynamics -Applied Mechanics	-Physics -Chemistry
6. Understand principles of operation, construction details,error adjustment,and process of assembly of instruments and devices.	1. Industrial Instruments 2. Process control(components) 3. Transducer 4. Meachanical measurements. and instruments. 5. Electronic Instruments 6. Bio-medical instruments 7. Optical & Scientific instruments. 8. Digital Electronics and Microprocessors 9. Drawing (Component)	-Basic Electronics -Basic Electrical Engg. -Strength of Materials -Fluid Mechanics -Thermodynamics -Engineering Materials -Theory of Machine -Applied Mechanics	-Physics -Chemistry -Mathematics -Basic Drawing
7. Design and layout of control circuit and fabricate small control panels.	1. Drawing (Process) 2. Workshop (Process) 3. Process control components 4. Automatic control Engg. 5. Instrumentation Engg. 6. Meachanical measurement & and instruments. 7. Electrical measurement & instruments 8. Electronics instruments	-Basic Electrical Engg. -Basic Electronics -Engineering Materials	-Mathematics -Basic workshop practice -Engineering drawing

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Course objective of diploma	Curriculum Areas		
Course in Instrumentation Engg.	Engg. Specifications	Engineering Science	Basic Science,Humanties Management & Basic Skill
5. Understand the various	1. Instrumentation Engg.	-Engineering Materials	-Maths
8. Select and use different devices, components, tools maintenance and repair.	1. Process control(Components) 2. Transducers 3. Meachanical measurement & and instruments. 4. Electrical measurement & instruments 5. Industrial instruments 6. Workshop (Process)	-Basic Electrical Engg. -Engineering Materials	-Basic workshop practice
9. Test & Calibrate various components and instruments in industry as per standard procedure including safety aspects.	1. Process control(Components 2. Tranducers 3. Electronic instruments. 4. Electrical measurement & instruments 5. Industrial instruments 6. Scientific instruments	-Basic Electrical Engg. -Basic Electronics Engg.	-Maths -Physics -Chemistry
10. Maintain, service and repair instruments including test instruments in processes.	1. Maintenance and trouble shooting. 2. Electrical and Electronic measurements. 3. Mechanical Measurement and Instruments. 4. Scientific Instruments. 5. Industrial instruments.	-Basic Electrical Engg. -Basic Electronic Engg. -Fluid Mechanics -Thermodynamics -Applied Mechanics	-Basic Workshop practice -Chemistry
11. Promote marketing / servicing of the products.	1. Marketing & Sales Management. 2. Automatic control Engg. 3. Transducers 4. Process control components. 5. Industrial instruments. 6. Workshop (Process)	-Basic Electrical Engg. -Basic Electronics.	-English & communication techniques -Basic Workshop
12. Communicate effectively in the profession and develop self learning habits.	Industrial Management		-English & communication techniques
13. Set up servicing unit.	-Industrial Management -Entrepreneurship -Estimating & Costing -Project work -Industrial Training -Electrical Measurement & Instruments -Workshop Process -Industrial Instruments. -Scientific Instruments. -Instrumentation Engg. -Process control components. -Transducers. -Automatic control Engg.	-Engineering Materials -Basic Electrical Engg. -Basic Electronics. -Fluid Mechanics -Thermodynamics -Theory of Machines. -Applied Mechanics	-Basic Workshop Practice -Chemistry -Physics -Mathematics

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I Semester

1.1 PROFESSIONAL COMMUNICATION

[Common to All Engineering/Non Engineering Courses]

L	T	P
5	-	3

Rationale:

Communication forms an important activity of diploma holder. It is essential that he/she should be in a position to communicate in writing and orally with superiors,equals and subordinates. This subject aims at providing working knowledge of languages like Hindi and English so as to train the students in the art of communication. It is suggested that maximum attention should be given in developing Communication abilities in the students while imparting instructions by giving maximum emphasis on practice.

Sr.No.	Units	Coverage time L	T	P
1.	Introduction to communication methods meaning,channels & media written and verbal.	5	-	-
2.	Development of comprehension of English & Hindi through study of text material& language exercises.	10	-	-
3.	Development of expression through			
	A. Letters(English & Hindi)	10	-	-
	B. Report writing (English) Note making and minutes writing	10	-	-
4.	Paragraph writing, Essey writing, Proposal writing	10	-	-
5.	Composition	10	-	-
6.	Remecial Grammer & Vocabulary Building	15	-	-
		70	-	42

1. PART I : COMMUNICATION IN ENGLISH (40 Marks)

1.1 Concept of communication, importance of effective communication, types of communucation, formal, informal, verbal and nonverbal, spoken and written. Techniques of communication, Listening, reading, writting and speaking, Barriers in communication, Modern tools of communication- Fax, e-mail, Telephone, telegram, etc.

1.2 Technical communication Vs. General Communication : Development of comprehension and knowledge of English through the study of text material and language exercises based on the prescribed text book of English.

1.3 Development of expression through:

1.3.1 Paragraph writing, Essay writing, Proposal writing.

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1.3.2 Business and personal correspondence (Letters) :
Kinds of letters:-
Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters. Application for a job, Resume.

1.3.3 Report writing and Note making and minutes writing.

1.4 Functional Grammer : Study of sentences and parts of speech (word class), Preposition, Verb, Articles, Abbreviations.

1.5 Vocabulary Building : Homophones, One word substitution, Idioms and Phrases.

1.6 Composition on narrative, descriptive, imaginative, argumentative, discussion and factual topics.

2. PART II : COMMUNICATION IN HINDI (10 Marks)

2.1 Development of comprehension and knowledge of Hindi usage through rapid reading and language exercises based on prescribed text material developed by IRDT.

2.2 Development of expression through ;

Letter writing in Hindi:
Kinds of letters:-
Official, demi-offical, unofficial , for reply or in reply, quotation, tender and order giving letters, Application for a job, Press release in Hindi, Report writing.

Note: Paper should be in two parts, part I - English and part II Hindi.

REFERENCE BOOKS

1. Bookshelf worksheet of Professional Communication, New Delhi : Bookshelf 2008

2. Functional Skills in language and literature by R. P. Singh, New Delhi : Oxford University Press.

3. Oxford Engilsh Hindi English Dictionary, New Delhi : Oxford 2008

LANGUAGE LAB PRACTICE

For the practice/exercise the following is suggested :-

1.A. Phonetic transcription
B. Stress and intonation :
(At least 10 word for writting and 10 word for pronunciation)

2. ASSIGNMENT : (Written Communication)

Two assignment of approximately 400 word each decided by the teacher concerned.

THE FOLLOWING MODEL IS PROPOSED :

1. a picture/photograph
2. an opening sentence or phrase

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3. a newspaper/magzine clipping or report
4. factual writting which should be informative or argumentative.

(The students may refer to "Bookshelf worksheet" for technical communication)

3. Oral Conversation:

1. Short speeches/declamation : Bid farewell, Felicitate somebody, Celebrate a public event, Offer condolences
2. Debate on current problems/topics
3. MockInterview : Preparation, Unfolding of personality and Expressing ideas effectively
4. Group discussion on current topics/problems
5. Role Play/ general conversation : Making polite enquiries at Railway Station, Post Office, Banks and other Public places, Replying to such enquiries, enquiring about various goods sold in the market and discussing their prices. Complaining about service at Hotel, restaurant, Offering apologies in reply to such complaints, complain to a company about a defective product you have brought, reply to such complaints.
6. Presentation skill, Use of OHP and LCD.
7. Through drilling of model words involving different phonetic symbols (Vowels, Consonants, Difthongs).

4. Aural :

Listening to conversation/talk/reading of short passage and then writting down the relevant or main points in the specified number of words and answering the given questions

The assignments/project work are to be evaluated by the internal/ external examiner. The distribution of 30 marks e.g.

10 marks for assignment (Given by subject teacher as sessional marks)
10 marks for conversation and viva-voce
10 marks for phonetic transcription

STRUCTURE OF THE PAPER OF PROFESSIONAL COMMUNICATION

Distribution of Marks

Theory Paper : 50 Marks
Sessional : 20 Marks
Pratices : 30 Marks

Q1. Question based on the topics of the prescribed syllabus will be set for testing candidates ability to understand the content, explain words and phrases, making sentence of given words and ability to summarise will be included. All questions will have to be answered.

A.	from English Text Book	10 Marks
B.	from Hindi Text Book	5 Marks

Q2. Candidates will be required to write one letter (English) and one letter in (Hindi) from a choice of two -

A.	English Letters	5 Marks
B.	Hindi Letters	5 Marks

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Q3. Report Writting on given outlines 5 Marks

Q4. There will be a number of short answer questions to test the candidates knowledge of functional grammer, structure and usage of the language. All the items in this question will be compulsory. The grammar questions has four parts -

(Total Part: A For 5 Marks, B For 3 Marks, C For 3 Marks and D For 4 Marks)

A. This part of the question has to do with the transformation of sentences. English uses several patterns of sentence formation and the same meaning can be expresed by several patterns e.g. Active to Passive voice and vice versa, Direct to Indirect and vice versa, Reframing sentences by changing part of speech e.g Noune to Adjective, Interchanging degree of comparison.

Interchanging Moods - Affirmative to Negative, Assertive to Interrogative or to exclamatory

B. The second part usually requires blanks in a sentence to be filled in with a suitable preposition and articles.

C. The third part is usually an exercise on tenses.

D. The fourth part concerns with one word substitution and abbrevation, uses of idioms and Phrases, Homophones.

Q5. COMPOSITION : (About 300 Words) (5 marks)

Candidates will be required to select one composition topic from a choice of five. The choice will normally include narrative descriptive, argumentative, discussion and factual topics. The main ceteria by which the composition will be marked are as follows

A. the quality of the language employed, the range and appropriateness of vocabulary and sentence structure the correctness of grammatical construction, punctuation and spelling.

B. The degrees to which candidate have been successfully in organising both the composition as a whole and the individual paragraphs.

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1.2 APPLIED MATHEMATICS I(A)

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage L	Time T	P
1.	Algebra- I	8	3	-
2.	Algebra- II	8	3	-
3.	Trignometry	6	2	-
4.	Differential Calculus-I	10	3	-
5.	Differential Calculus-II	10	3	-
		42	14	-

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)

1.1 Series : AP and GP; Sum, nth term, Mean

1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. ALGEBRA-II:(10 Marks)

2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.

2.2 Complex number.

Complex numbers, Representation, Modulus and amplitud Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. TRIGONOMETRY :(8 Marks)

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relation ship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I : (12 Marks)

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

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4.2 Methods of finding derivative, - Function of a function, Logaritimic differentiation, Differentiation of implicit functions.

5. DIFFERENTIAL CALCULUS -II :(10 Marks)

5.1 Higher order derivatives, Leibnitz theorem.

5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.

5.3 Application - Finding Tangants, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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1.3 APPLIED PHYSICS-I

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject,teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Units & Dimensions	3	1	-
2.	Errors in Measurement	3	1	-
3.	Circular Motion	4	1	-
4.	Motion of Planets	4	1	-
5.	Dynamics of rigid body (Rotational Motion)	5	1	-
6.	Fluid Mechanics and Friction	4	1	-
7.	Friction	4	1	-
8.	Harmonic Motion	5	2	-
9.	Heat & Thermodynamics	6	4	-
10.	Acoustics	4	1	-
		42	14	-

DETAILED CONTENTS:

1. Units and Dimensions (4 Marks)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogenity of dimensions and applications of homogenity principle to:

i) Checking the correctness of physical equations,

ii) Deriving relations among various physical quantities,

iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measuremnts, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement(Combination of erros in addition, substraction, multipication and powers). Significant figures, and order of accuracy in respect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizental and Vertical cases),angular velocity,angular acceleration and centripetal acceleration.Relationship between linear and angular velocity and acceleration. Centripetal and

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centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES :(5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kapler's Law, Escope and orbital velocity, Time period of satellite, Geo-stationary, Polar satellites (Concept Only)

5. Dynamics of Rigid Body (Rotational Motion) (6 Marks)

Rigid body,Rotational motion, Moment of inertia,Theorems(Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindercal),Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane . Concept of Fly wheel.

6. Fluid Mechanics :(5 Marks)

Surface tension, Capillary action and determination of surface tension from capilary rise method, Equation of continuity (A1V1=A2V2), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction :(4 Marks)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. Harmonic Motion (6 Marks)

Periodic Motion , characterstics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat & Thermodynamics: (6 Marks)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. Acoustics (5 Marks)
Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Accoustics of building defects and remedy.

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1.4 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L	T	P
6	-	-

Rationale:

Engineering Chemistry has profound and deep relationship with the industrial and environmental technology. This curriculum intends to impart technical knowledge alongwith productive practice to the students of the diploma engineering. The teachers are expected to guide the students in the classroom and the laboratories according to the curriculum by demonstrations and by showing relevant materials and equipments to inculcate interests in learning among students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Atomic Structure	4	-	-
2	Chemical Bonding	6	-	-
3.	Classification of Elements	4	-	-
4.	Electro Chemistry-I	7	-	-
5.	Electro Chemistry-II	8	-	-
6.	Chemical Kinetics	4	-	-
7.	Catalysis	4	-	-
8.	Solid State	4	-	-
9.	Fuels	4	-	-
10.	Water Treatment	6	-	-
11.	Colloidal State	4	-	-
12.	Lubricants	4	-	-
13.	Hydrocarbons	7	-	-
14.	Organic Reactions & Mechanism	8	-	-
15	Polymers	4	-	-
16	Synethetic Materials	6	-	-
		84	-	-

DETAILED CONTENTS:

1. ATOMIC STRUCTURE :(3 MARKS)

Basic concept of atomic structure, Matter wave concept, Quantum number, Haisenberg's Uncertainty Principle, Shaples of orbitals.

2. CHEMICAL BONDING :(4 MARKS)

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS :(3 MARKS)

Modern classification of elements (s,p,d and f blcok elements), Periodic properties : Ionisation potential electro negativity, Electron affinity.

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4. ELECTRO CHEMISTRY-I:(3 MARKS)

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II:(3 MARKS)

Redox reactions, Electrode potential(Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its application. Chemical and Electrochemical theory of corrosion, Galvenic Series. Prevention of corrosion by various method.

6. CHEMICAL KINETICS :(3 MARKS)

Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.

7. CATALYSIS :(2 MARKS)

Definition Characteristics of catalytic reactions, Catalytic promotors and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE :(2 MARKS)

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS :(3 MARKS)

Definition, its classification, high & low Calorific value.Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Disel and Petrol), Benzol and Power alchol. Knocking, Anti-knocking agents, Octane number and Cetane number.

Cracking and its type, Gasoling from hydrogenation of coal (Bergius process and Fischer tropsch's process)

Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.

Numerical Problems based on topics

10. WATER TREATMENT :(3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Sods lime, Zeolote and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embritlement, primming and

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foarming in biolers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorinational, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER :(3 MARKS)

Concept of collidal and its types, Different system of colloids, Dispersed phase and dispersion medium.
Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, tyndal effect, Electro phoresis and coagulation. relative stability of hydrophillic and hydrophobie colloids. Protection and protective colloids. Emulsion, Types, preparation,properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS :(3 MARKS)

Definition, classification, Necessasity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compunds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS:(4 MARKS)

A. Classification and IUPAC nomeuclature of organic compounds hamologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. ORGANIC REACTIONS & MECHANISM:(4 MARKS)

1. Fundamental auspects -

   A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
   B. Inductive effect, Mesomeric effect, Electromeric effect.

2.A. Mechanism of addition reaction (Markonicove's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophillic) hydrolysis of alkyle halide, electrophillic substitution halogenation, Sulphonation, Niration and friedel-Craft reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehyrohalogenation of primary alkyl halide.

15. POLYMERS :(3 MARKS)

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)

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2. Thermosetting and Thermoplastic resen -

A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers(Silicon)

16. SYNETHETIC MATERIALS :(4 MARKS)

A. Introduction - Fats and Oils
B. Saponification of fats and oils , Manufacturing of soap.
C. Synthetic detergents, types of detergents and its manufacturing.
3. EXPLOSIVES: TNT, RDX, Dynamite.
4. Paint and Varnish

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1.5 ELECTRONIC COMPONENTS & DEVICES

(Common with Electronics Engineering and Computer Engg.)

L	T	P
4	2	6

RATIONALE

Knowledge of Electronic components & devices is quite essential for a student of electronics engineering diploma programme. With the knowledge of these active and passive components he will work sucessfully in every field of the branch. Therefore a diploma student in electronics engineering must be equipped with the fundamental knowledge about electronic components, voltage and current source, semi conductor diode, tranistors, FET and integrated circuits for successful handling of industrial problems.

TOPIC WISE DISTRIBUTION OF PERIODS

Sr. No.	Units	Coverage Time L	T	P
1.	Introduction To Electronics, Its Component and Decives, Its Application	4	2	-
2.	Passive Components	8	4	-
3.	Voltage & Current Source	4	2	-
4.	Semiconductor Diode	8	4	-
5.	Introduction To Bipolar Transistor	8	4	-
6.	Transistor Biasing & Stabilization	6	3	-
7.	Single Stage Transistor Amplifier	6	3	-
8.	Field Effect Transistor	3	1	-
9.	Metal Oxide Field Effect Transistor	3	2	-
10.	Complementary Metal Oxide Field Effect Transistor	3	1	-
11.	Integrated Electronics	3	2	-
	Total	56	28	84

DETAILED CONTENTS

1. INTRODUCTION TO ELECTRONICS:

1.1. Application of Electronics in different fields.

1.2. Brief introduction to active components and devices.

2. PASSIVE COMPONENTS:

2.1. Resister- Working characteristics/properties, Resistors- Carbon film, metal-film, carbon composition, wire wound and variable type (presets and potentiometers) constructional details, characteristics (size, voltage, tolerance temperature and frequency dependance and noise consideration, specification Testing, mutual comparison and typical applications, Voltage Dependent Resistor (VDR).

2.2. Capacitors- Working characteristics/properties, Capacitors- polyster, Metallized polyster, ceramic paper mica and electrolytic tantalum and solid aluminium types; construction details and testing, specifications, mutual comparison & typical applications.

2.3. Inductors, Transformers and RF coils- Working

characteristics/properties

Methods of manufacture of inductors, RF coils and small power and AF transformer and their testing. Properties of cores.
Needs and type of shielding.

3. VOLTAGE AND CURRENT SOURCES:

3.1. Concept of constant voltage sources, symbol and graphical representation, characteristics of ideal and practical voltage sources.
3.2. Concept of constant current source, symbol and graphical representation, characteristics of ideal and practical current sources.
3.3. Conversion of voltage source into a current source and vice-versa
3.4 Concept of floating and grounded D.C. supplies.

4. SEMICONDUCTOR DIODE:

4.1. P-N junction diode, Mechanism of current flow in P-N junction drift and diffusion currents, depletion layer, potential barrier, P-N junction diode characteristics, zener & avalanche breakdown, concept of junction capacitance in forward & reverse bias conditions.
4.2. Semiconductor diode characteristics, dynamic resistance & their calculation from diode characteristics, dynamic resistance of diode in terms of diode current. Variation of leakage current and forward voltage with temperature(No deveration).
4.3. Diode (P-N junction) as rectifier, Half wave rectifier full wave rectifier including bridge rectifier, relationship between D.C. output voltage and A.C. input voltage rectification efficiency and ripple factor for rectifier circuits, filter circuits shunt capacitor, series inductor, capacitor input filter, bleeder resistance, working of the filters and typical applications of each type.
4.4. Different types of diodes, characteristics and typical application of power diodes, zener diodes, varactor diodes, point contact diodes, tunnel diodes, LED's and photo diodes.
4.5. Important specifications of rectifier diode and zener diode.

5. INTRODUCTION TO BIPOLAR TRANSISTOR:

5.1. Concept to bipolar transistor as a two junction three terminal device having two kinds of charge carriers, PNP and NPN transistors, their symbols and mechanisms of current flow, explanation of fundamental current relations.
Concept of leakage current (ICBO) effect of temperature on leakage current.
Standard notation for current and voltage polarity.

5.2. CB, CE and CC configruations.

(a) Common base configuration (CB): inputs and output characteristics, determination of transistor parameters (input and output) dynamic resistance, current amplification factor.

(b) Common emitter configuration: current relations in CE configration, collector current interms of base current and leakage current (ICEO), relationship between the

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leakage current in CB and CE configuration, input and output characteristics, determination of dynamic input and output resistance and current amplification factor B from the characteristics.

(C) Common collector configuration: Expression for emitter current in terms of base current and leakage current in CC configuration.

5.3 Comparision of CB and CE configuration with regards to dynamic input and output resistance, current gain and leakge current performance of CE configuration for low frequency voltage amplification. Typical application of CB configuration in amplification.

5.4 Transistor as an amplifier in CE configuration.

(a) DC load line, Its equation and drawing it on collector characteristics.

(b) Determination of small signal voltage and current gain of a basic transistor amplifier using CE output characteristic and DC load line, Concept of power gain as a product of voltage gain and current gain.

6 TRANSISTOR BIASING AND STABILIZATION OF OPERATING POINT:

6.1 Different transistor biasing circuits for fixing the operating points, effect of temperature on operating point. Need and method for stabilization of operating point.
Effect of fixing operating point in cut-off or saturation region on performance of amplifier.

6.2 Calculation of operating point for different biasing circuits, use of Thevenin's theorem in analysing potential divider biasing circuit.

6.3 Simple design problems on potential divider biasing circuit.

7 SINGLE STAGE TRANSISTOR AMPLIFIER:

7.1 Analysis of Single Stage CE, CB and CC amplifier.

7.2 Single stage CE amplifier circuits with proper biasing compontents.

7.3 AC load line and its use in :
(a) Calculation of current and voltage gain of a single-stage amplifier circuit.

(b) Explanation of phase reversal of the output valtage with respect to input voltage.

8. FIELD EFFECT TRANSISTOR (FET)

8.1 Construction, operation, characteristics and Biasing of Junction FET.

8.2 Analysis of Single Stage CS, CG and CD amplifiers. (Only Brief Idea)

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9. MOSFET :

9.1 Construction, operation, Characteristics and Biasing of MOSFET in both depletion and enhancement modes.

9.2 Analysis of Single Stage CS, CG and CD amplifiers. (Only Brief Idea)

10. CMOS :

10.1 Construction, operation and Characteristics of CMOS in both depletion and enhancement modes.

10.2 Use of CMOS as Invertor, Different application of CMOS, CMOS IC.

10.3 Comparison of JEET, MOSFET and Bipolar transistor.

11 INTEGRATED ELECTRONICS

11.1 Introduction to IC and its importance in modern electronics, types of IC's, some examples of populer IC's (74 & 40 series i.e. 741, 714, 555, 810, 4046 etc.).

11.2 Fabrication of transistor by planer process. A typical fabrication process for Ics (brief explanation).

11.3 Difference between SSI, MSI, LSI, VLSI.

LIST OF BOOKS

1. Bhargava, Kulshreshtha & Gupta - "Baisc Electronics & Linear Circuits" - Tata Mcgraw-Hill.
2. Malvino, A. P. - "Electrinics Principles" - Tata Mcgraw-Hill.
3. Sedra, Adel S. Smith, Kenneth. C. " Micro Electronics Circuits" - Oxford University Press 5th Edtion
4. Sombir Sing - Electronic Components Devices- Jai Prakesh Nath Publication Meerut

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ELECTRONIC COMPONENTS & DEVICES

LIST OF PRACTICALS

1. Semiconductor diode characteristics :

   (i) Identifications of types of packages, terminals and noting different ratings using data books for various types of semiconductor diodes (Germanium, point contact, silicon low power and high power and switching diode).
   (ii) Plotting of forward V-I characteristics for a point contact and junction P-N diode (Silicon & Germanium diode).

2. Rectifier circuits using semiconductor diode, measurement of input and output voltage and plotting of input and output wave shapes

   (i) Half wave rectifier.
   (ii) Full wave rectifier (centre tapped and bridge rectifier circuits)

3. To Plot forward and reverse V-I characteristics for a zener diode.

4. To Plot wave shapes of a full wave rectifier with shunt capacitor, series inductor and n filter circuit.
5. To Plot the input and output characteristics and calculation of parameters of a transistor in common base configuration.
6. To Plot input and output characteristics and calculation of parameters of a transistor in common emitter configuration
7. Transistor Biasing circuits

   (i). Measurement of operating point (Ic & Vce) for a fixed bias circuit.
   (ii).Potential divider biasing circuits.
   (Measurement can be made by changing the transistor in the circuits by another of a same type number.
8. Plot the FET characteristics and determination of its parameters from these characteristics.
9. Measurement of voltage gain and plotting of the frequency response curve of a JFET amplifier circuits.
10. Measurement of voltage gain and plotting of the frequency response curve of a MOSFET amplifier circuits.

11. Single stage Common Emitter Amplifier Circuits
    (i). Measurement of voltage gain at 1 KHZ for different load resistance.
    (ii) Plotting of frequency response of a single stage amplifier circuit.
    (iii) Measurement of input and output impedance of the amplifier circuit.
12. Familarization with lan instrument(Multimeter/CRO), etc.

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1.6 TECHNICAL DRAWING:

(Common with Instrumentation & Control Engineering)

L	T	P
4	-	8

ENGINEERING DRAWING SCOPE OF THE SUBJECT :

A diploma holder in electronics is likely to be employed in industries where fabrication manufacturing, marking and servicing of electronics products & instruments are carried out. In such a job situation, he/she will come across various types of drawing of components, circuits & system. A knowledge of enginnering drawing will be useful to interpret those drawing. In case he/she gets employment in documentation service in an electronics industry, he himself may have to prepare such drawing & for this work and understanding of the basis of concepts & principles involved in engineering drawing will be useful and have the necessity of this subject.

INSTRUCTIONAL OBJECTIVES :

At the end of the instruction in the subject, the learner should be able to :-

1. Draw free hand sketches of the schematic diagrams of electronic circuits, using standard symbols.

2. Prepare drawing from the rough sketches provied and/or enlarge/reduce the given drawing to the desired scale.

3. Draw exploded views of components & assemblies in preparation of service drawing.

4. Draw wiring diagram & make parts list;

5. Draw various views of the object using orthographic projection.

6. Identify the object when plan, elevation & views of the same are given .

7. Re arrange block reprsentation of the given circuits.

Prat-1 (Mechanical Drawing)

DETALLED CONTENTS.

1. Free hand sketching :

1.1 Introduction of Engineering drawing & its significance in the field of engineering.

1.2 Need of standard practices in engineering drawing.

1.3 Standard practice as per IS-696-1972.

1.4 Free hand sketching; different types of lines, free hand lettering of different types

2. Care, handling & proper use of drawing instruments & materials:

2.1 Drawing instruments.

2.2 Materials used in drawing work.

2.3 Sheet size, layout & planning of drawing sheet (familarity sheet size, layout & planning of drawing sheet (familarity with standared paper sizes, e.g A4, A3 & A2 and their mutual relationship).

3. Lettering techniques and practice

3.1 Free hand drawing of letters & numerals in 3, 5, 8 & 12 mm seriws, vertical upright and inclined at 75o.

3.2 Instrumental single stroke lettering in 12 mm.

4. Dimensioning Techniques :

4.1 Necessity of dimensioning, appropriate methods of dimensioning, their merits and demerits, selection of proper dimension technique.

4.2 Requirements of view for complete dimensioning.

5. Projection :

5.1 Principle of Projection-I

(a) Recognition of objects from the given pictorial view.

(b) Identification of surfaces from different objects & pictorial views.

(c) Exercise on missing surfaces (views).

(d) Sketching practice of pictorial views objects given.

5.2 Principle of Projection-II.

(a) Principle of orthographic projections.

(b) Three views of given object.

(c) Six views of given object.

(d) From shapes of inclined surfaces.

(e) Invisible lines, centre lines, extension & dimensioning lines.

(f) Location & drawing of missing lines.

6. Sections :

6.1 Importance of sectioning.

6.2 Method of representing the section.

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6.3 Conventional sections of different materials.

6.4 Types of sections ;types of breaks, aligned sections.

6.5 Sectioning of simple objects like brackets, pulleys etc.

7. Details & Assembly drawing :

7.1 Symbols used to show joints in chasis & frames.

7.2 Principles of detail & assembly drawing ;part cataloguing.

7.3 Practical exercises of drawing exploded views of machine components & making assembly drawing.

NOTE :

1. Whenever possible drawing work should involve exemples ralevant to electronics discipline.

2. Examples from electronics parts catalogue, views of machine electronic equipment, chasis, consoles, PCB (Printed Circuit Board) Hi Fi cabnets etc. may be used.

PART-II (ELECTRONICS DRAWING)

1. Draw the standard symbols of the following :
(Different pages of ISI standard IS; 2032 may be referred):

1.1 (a) Resistors Capacitors: Fixed, preset, varible, electrolytric and ganged tpes.

(b) Inductors : Fixed, tapped and varible types, RF & AF chokes, Air cored, Solid cored & laminated cored.

(c) Transformers : Step-up, step-down. AF & RF types, Auto-transformer, IF transformer.

Antenna, Chassis, Earth, Loudspeaker, Microphone, Fuse Indicating lamp, Coaxial cable, Switches-double pole single throw (DPST), Double pole throw (DPT) and Rotary types, terminals and connection of conductors.

1.2. Active Devices:

(a). Semiconductor : Rectifier diode, Zener diode, Varacter diode, Tunnel diode, Photo, Light emitting diode (LED), Bipolar transsitor, junction field effect transistor (JFET), Mosfet, Photo transistor, Uni junction transistor (UTJ), Silicon control rectifier (SCR), Diac, Triacs outlines (with their types numbers e.g TO3, TO5, TO18, TO39, TO65 etc) of the different types of semiconductor diodes, Transistors Scrs, Diacs, Triacs and ICs (along with indicators for pin identification etc.)

1.3. Telephone components :

(a). Telephone Instrument/Components : Transmitter, Receiver, Filters & Hybrid transformer.

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1.4. Draw standard symbols of NOT, AND, NAND, OR, NOR XOR, Expandable & Tristate gates, Op, Amp, Ic, Flip-flops (Combination of 2,3,4 input gates should be drawn).

2. Draw the following : (With the help of rough sketch/clues given).

2.1 Circuit diagram of a Wein's bridge oscillator.

2.2 Circuit diagram of a Battery eliminator.

2.3 Block diagram of a typical Radio receiver.

2.4 Block diagram of an Electronic multimeter.

2.5 Circuit of Emergency light.

2.6 Circuit diagram of Voltage stabilizers.

2.7 Circuit diagram of Fan regulator.

3. Connection wiring diagrams.

3.1 Point to point pictorial.

3.2 Highway or trunk line.

3.3 Base line or air line.

Exercise on reading & interpreting of wiring diagrams.

4. Graphical Representation of Data : General concept, selection of varibles & curve fitting, curve indentification zero point location. Use of various graph paper and perparation of diagram from given data. Bar charts, pie graph, pictorial graph.

5. Given the block diagram of a radio receiver on A-4 size, enlarge the same to A-2 size.

6. Given the block diagram of a TV receiver in A-1/A-2 size, reduce it to A-3 size.

7. Convert a rough block diagram sketch on A-4 size to a finished block diagram on A-2 size.

8. P.C.B layout of a single electronic circuit on a graph sheet. Keeping in view the actual size of the components.

PART-III (INSTRUMENTATION & CONTROL DRAWING)

Drawing of common symbols use in instrumentation and signal flow graph in control systems. (Only For Instrumentaion & Control Engineering)

INSTRUMENTATION SYMBOLS :

Locally mounted instruments, Instruments at control centre, Instrument with two services, Transmitter, Pneumatic control valve, Hydraulic control valve, Solenoid volve, Safety valve, Self operated controller, Process line On-Fire sensor, Point of measurement, Fluid Pressure Line, Electric

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line, Pneumatic line, Capillary line, Special type of valves, Method to differentiate various process line using current, Identification table for instrumentation diagram.

Instrumentation diagram of process unit (At least two diagram should be drawn on one sheet)

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II Semester

2.1 APPLIED MATHEMATICS I (B)

[Common to All Engineering Courses]

L	T	P
3	2/2	-

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time L	T	P
1.	Integral Calculus-I	12	4	-
2.	Integral Calculus-II	12	4	-
3.	Coordinate Geometry (2 Dimensional)	10	3	-
4.	Coordinate Geometry (3 Dimensional)	8	3	-
		42	14	-

DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I : (14 Marks)

Methods of Indefinite Integration :-

1.1 Integration by substitution.

1.2 Integration by rational function.

1.3 Integration by partial fraction.

1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :(14 Marks)

2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.

2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.

2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):(14 Marks)

3.1 CIRCLE :

Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

3.2 Standard form and simple properties

Parabola x2=4ay, y2=4ax,

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Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):(8 Marks)

4.1 Straight lines and planes in space -

Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),

4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz = d$ (Radius, Centre and General Equation)

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2.2 APPLIED PHYSICS-II

[Common to All Engineering Courses]

L	T	P
3	2/2	4

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject,teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Optics	4	1	-
2.	Introduction To Fiber Optics	4	1	-
3.	Laser & its Application	4	1	-
4.	Electrostatics	4	1	-
5.	D.C. Circuits	4	1	-
6.	Magnetic Materials & Their Properties	4	1	-
7.	Semi Conductor Physics	4	1	-
8.	Introduction Diode & Transistors	4	2	-
9.	Introduction To Digital Electronics	4	2	-
10.	Non-conventional energy sources	6	3	-
		42	14	56

1. Optics (4 Marks)

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Deotructive), Diffraction and Polarization (Concept Only), Law of Mallus and Polaroids.

2. Introduction To Fibre Optics :(5 Marks)

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications (4 Marks)

Absorbtion and Emission of energy by atom, Spontaneous and Stimulated Emission, Poluation inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :(4 Marks)

Coutomb's Law, Electric field, Electric potential, Potential energy, Capacator, Energy of a charged capacitor, Effect of dielectric on capacators.

5. D.C. Circuits (5 Marks)

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Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties: (5 Marks)

Dia, Para and Ferro-magnetism, Ferrites, Magnatic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

Concept of Energy bands in soldis, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semi conductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transister : (6 Marks)

Majority and Minority charge carriers,P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics : (6 Marks)

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources: (7 Marks)

(a) Wind energy : Introduction, scope and significance, measurement of wind velocty by anemometer, general principle of wind mill.

(b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

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PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.

2. Determination of 'g' by plotting a graph T2 verses l and using the formula g=4n2/Slope of the graph line

3. Determine the force connstant of combinationof springs incase of 1. Series 2. Parallel.

4. To verify the series and parallel combination of Resistances with the help of meter bridge.

5. To determine the velocity of sound with the help of resonance tube.

6. Determination of viscosity coefficient of a lubricant by Stoke's law.

7. Determination of E1/E2 of cells by potentio meter.

8. Determination of specific resistance by Carry Foster bridge.

9. Determination of resitivity by P.O.Box.

10. Verification of Kirchoff's Law.

11. To draw Characteristics of p-n Junction diode.

12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

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2.3 ENGINEERING MECHANICS AND MATERIALS
(Common To Electronics Engineering)

L	T	P
4	1	-

RATIONALE

TOPIC WISE DISTRIBUTION OF PERIODS

SL.No.	Topic	L	T	P
1.	Introduction	6	2	
2.	Force Analysis	10	3	
3.	General condition of equilibrium	10	3	
4.	Stress & Strain	10	2	
5.	Beam & Trusses	10	2	
6.	Materials & Concepts Use In Electronics	10	2	
	Total	56	14	-

DETAILED CONTENTS

1. Introduction:

Mechanics and its utility. Concept of scaler and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

2. Forces Analysis:

Concept of coplaner and non-coplaner forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a praticle,conditions of equilibrium of coplaner concurrent force system.

3. General Condition of Equilibrium:

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

4. Stresses and strains:

Concept of stress and strain. Concept of various types of stresses and strains . Definitions of tension, compression shear, bending, torsion. Concept of volumetric and lateral strains, Poisson's ratio. Mechanical properties of MS, SS, CI Al and etc.

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5. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, calculation of reaction at the support of cantilever and simply supported beams and trusses. (simple problems only)

6.A. MATERIALS & CONCEPT USED IN ELECTRONICS :

Soldering materials - Type, chemical composition and properties, Soldering alloys - Tin lead, Tin antimony, Tin silver, Lead silver, Tin zinc, Different types of flux and their properties, Properties of plastics materials, Epoxy materials for PCB (Single and multi layer board), Emulsion parameters, Film emulsion, Type of laminates (Phenolic, Epoxy, Polyster, Silicon, Melamine, Polymide), Properties of copper clad laminates, Material (Filler, Resin, Copper Foil) Photo printing basic for double side PCB, Photo resin materials coating process materials, Screen printing and its materials Etching agent, Film processing and used materials.

(B) Soldering & Brazing:

For black Galvanised and Tincoated Iron sheet, brass and copper sheets only.

(1) Its concept, comparison with welding as joining method and classification, electric soldering and forge soldering.

(2) Soldering operation- edge preparation of joints, Pickling and degreasing, Fluxing, Tinning and Soldering. Wave soldering, solder mask, Dip soldering, Drag soldering,

(3) Materials Used-Common fluxes, soft and hard solder, solder wire (Plain and Resin core) and sticks, spelters and their specifications and discription (For Identification Only), forge soldering bits.

(4) Electric soldering iron, other soldering tools.

(5) Common defects likely to occurs during and after soldering.

(6) Safety of Personnel, Equipment & Tools to be observed.

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2.4 INTRODUCTION TO COMPUTER

INTRODUCTION TO COMPUTER

[Common with Civil Engg., Civil (Spl. With Rural), Mechanical Engg.,(Specialisation in Production, Automobile, Refrigeration and Air conditioning), Electronics Engg.,Instumentation and Control Engg., Dairy Engg., Leather Technology, Footwear and Leather Goods Tech., Cermics, Chemical Engg.(Four year Sandwitch), Chemical Tech. (Rubber & Plastic), Chemical Tech. (Fertilizer)]

L	T	P
2	-	5

Rationale:

Computers are being used for design and information processing in all branches of engineering. An exposure to fundamentals of computer programming is very essential for all diploma holders. this subject has been included to introduce students in the use and application of computers in engineering.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction to Computer	4	-	-
2.	Introduction To Operating System (MS DOS/Windows)	3	-	-
3.	Word Processing	4	-	-
4.	Worksheet	4	-	-
5.	Presentation	4	-	-
6.	Data Base Operation	3	-	-
7.	Introduction to Internet	2	-	-
8.	Introduction to advance tools	4	-	-
		28	-	70

DETAILED CONTENTS

1. Introduction to Computer:

   A. Block Diagram of Computer.
   B. Types Of Computer
   C. Types of Input and Output devices
   D. Memories Devices (Its Types and Basic).

2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:)

   What is operating system, its significance, Commands of DOS, Features/Application of window.

3. WORD PROCESSING:

   File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup
   Edit : Cut, Copy,Paste, Office Clipboard, Select All, Find, replace, Goto, etc.
   View : Normal/Web Layout/Print Layout; Tool Bars;

Header/Footer; Zoom, etc.
Insert: Break, Page Number, Date & Time, Symbol, Comment, Reference, etc.
Format: Font, Paragraph, Bullets & Numbering, Borders & Shading, Column, Change case, Back ground, etc.
Tools : Spelling & Grammer, Language, Word Count, Letters & Mailing, Options, Customize, etc.
Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc.
Mail Merge

4. WORKSHEET:

Introduction, Use of Tools/Icons for preparing simple Mini Project.

5. PRESENTATION :

Introduction, Use of Tools/Icons for preparing simple presentation on Power Point.

6. DATABASE OPERATION :

Create database using MS Access, Create Table and Creating Reports.

7. Introduction to Internet:

What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails.

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.
A. Flow Chart
B. Algroithm
C. Programming

II. Use of advance Tools such as Skype, Teamviewer, Installation of Modem, use of WiFi, Etc.

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INTRODUCTION TO COMPUTER LAB

List Of Practicals

1. Practice on utility commands in DOS.

2. Composing, Correcting, Formatting and Article (Letter/Essay/ Report) on Word Processing tool Word and taking its print out.

3. Creating, editing, modifying tables in Database tool.

4. Creating labels, report, generation of simple forms in Database tool.

5. Creating simple spread sheet, using in built functions in Worksheet tool..

6. Creating simple presentation.

7. Creating mail ID, Checking mail box, sending/replying e-mails.

8. Surfing web sites, using search engines.

Note : In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/ MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/ Demonstration of project through Power Point Presentation.

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2.5 ELECTRICAL ENGINEERING-I

(Common with Electronics Engineering and Computer Engg.)

L	T	P
6	-	4

RATIONALE

Electrical energy is most convinient neat and clean source of energy for industrial applications. The student is supposed to posses basic knowledge of electrical engineering materials such as conducting, non conducting, insulating, magnetic, semi conductor and some special purpose materials. Fundamental knowledge of electrostatics, electromagnetism will be helpful in understanding the performance of D.C. and A.C. circuits. To face the routine problems of world of work chapters on batteries, transients and harmonics have also been added.

TOPIC WISE DISTRIBUTION OF PERIODS

Sr. No.	Units	Coverage Time L	T	P
1.	Classification	4	-	-
2.	Conducting Materials	8	-	-
3.	Insulating Materials	8	-	-
4.	Magnetic Materials	8	-	-
5.	Semi Conductor & Special Purpose Materials	8	-	-
6.	D. C. Circuits	8	-	-
7.	Electrostatics	8	-	-
8.	Electromagnetism	8	-	-
9.	A. C. Theory	8	-	-
10.	Batteries	8	-	-
11.	Transients & Harmonics	8	-	-
	Total	84	-	56

DETAILED CONTENTS

1. CLASSIFICATION:

Classification of materials into Conducting materials, Insulating materials, Semi-conducting materials with reference to their atomic structure.

2. Conducting Materials:

A. Resistivity and factors affecting resistivity such as temperature, alloying and mechanical stressing.

B. Classification of conducting materials into low resistivity and high resistivity materials. Some examples of each and their typical applications.

3. Insulating Materials:

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A. Electrical Properties:

Volume resistivity, Sarface resistance, Dielectric loss, Dielectric strength (Break down valtage) and Dieclectric constant.

B. Chemical Properties:

Solubility, Chemical resistance, Weather ability.

C. Physical Properties:

Hygroscopicity, tensile and Compressive strength, Abrassive resistance, Brittleness.

D. Thermal Properties:

Heat resistance, classification according to permissible temperature rise, Effect of electrical overloading on the life of an electrical appliance.

E. Plastic Insulating Materials:

Classification into thermoplastic and thermosetting catagories, examples of each and their typical applications.

4. MAGNETIC MATERIALS:

A. Ferromagnetism, domains, permeability, hysterisis loop-(including coerrecive force and residual magnetism) and magnetic saturation.

B. Soft and Hard magnetic materials, their examples and typical applications.

5. SEMI CONDUCTOR AND SPECIAL PURPOSE MATERIALS:

N-type and P-type materials, application of semi-conductor materials, materials used in transistor and I.C. manufacture.

6. D.C. CIRCUITS:

(i) Ohm's law, resistivity, effect of temperature on resistances, heating effect of electric current, conversion of mechanical units into electircal units.

(ii) Kirchoff's laws, application of Kirchoff's laws to solve, simple d.c. circuits.

(iii) Thevenins theorem, maximum power trasfer theorem, Norton's theorem and super position theorem, simple numerical problems.

7. ELECTROSTATICS:

(i) Capacitance and capacitor, definition, various types.

(ii) Charging and discharging of a capacitor, growth and decay of current in a capacitive circuit.

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(iii) Energy stored in a capacitor.

(iv) Capacitance in terms of dimensions of parallel plate capacitor.

(v) Dielectric constant of material, Break down voltage of a capacitor.

(vi) Series and parallel connection of capacitors.

8. ELECTRO MAGNETISM:

(i) Concept of mmf, flux, reluctance and permeability.

(ii) Energy stored in a magnetic field and an inductor.

(iii) Solution of problems on magnetic circuits.

(iv) Faraday's laws of electromagnetic induction, Lenz's law, Physical explanation of self and mutual inductance.

(v) B-H curve, Hysterisis, Eddy currents elementary ideas and significance.

(vi) Growth and decay of current in an inductive circuit.

(vii) Force between two parallel current carrying conductors and its significance.

(viii) Current carrying conductor in a magnetic field and its significance.

9. A.C. THEORY:

(i) Concept of alternating voltage and current, difference between A.C and D.C..

(ii) Generation of alternating voltage, equation of sinusoidal waveform.

(iii) Definition and concept of cycle, frequency, Time period, amplitude, instantaneous value, average value, RMS value, peak value, form factor, Peak factor.

(iv) Phase and phase difference, representation of alternating quantities by phasor, addition and subtraction of alternating quantities.

10. BATTERIES:

(i) Construction of lead acid and nickel cadmium batteries.

(ii) Charging and maintenance of batteries.

(iii) Rating of batteries.

(iv) Back up batteries (Lithium & Silver Oxide batteries)

(v) Shelf life of batteries.

11. TRANSIENTS & HARMONICS:

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Introduction, Types of trasients, Important differential equations, First and Second order equations, Transients in R-L series circuits (D.C.), Short circuit current, Time constant, Transients in R-L series circuits (A.C.), Transients in R-C series circuits (D.C.), Transients in R-C series circuits (A.C), Double energy transients.

Fundamental wave and harmonics, Different complex waveforms, Gemeral equation of complex wave, R.M.S. value of a complex wave, Power supplied by complex wave, Harmonics in single phase a.c. circuits, Selective resonance due to harmonics, Effect of harmonics on measurement of inductance and capacitance

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ELECTRICAL ENGINEERING-I LAB:

LIST OF PRACTICALS:

1. Ohm's law verification.

2. To verify the laws of series and parallel connections of resistances i.e. to verify:-

   (i) The total resistance in series connections.

   RT=R1+R2+R3.....

   Where RT is the total resistance and R1,R2,R3 etc.are the resistances connected in series.

   (ii) The total resistance in parallel connections.

   1/RT=1/R1 + 1/R2 + 1/R3......

   Where RT is the total resistance and R1,R2,R3 etc. are the resistances connected in parallel. Also to conclude that the total resistance value of a parallel circuit is less than the any individual resistance.

3. To verify Kirchoff's following laws:-

   (i) The algebric sum of the currents at a junction is zero.

   (ii) The algebric sum of the e.m.f. in any closed circuit is equal to the algebric sum of IR products (drops) in that circuit.

4. To measure the resistance of an ammeter and a voltmeter and to conclude that ammeter has very low resistance whereas voltmeter has very high resistance.

5. To verify Thevenin's and maximum power transfer theorems.
6. To find the ratio of inductance values of a coil having air core and iron core respectively and thus see that by the introduction of a magnetic material inside the coil,the inductance value of the coil is substantially increased.
7. To verify the relation:-

   CT=(C1*C2)/(C1+C2)
   and
   CT=C1+C2

   For two capacitors,connected in series and parallel respectively.
8. To test a battery for charged and discharged conditions and to make connections for its charging.
9. To show that the range of an ammeter (d.c. and a.c.) and a voltmeter (d.c. and a.c.) can be extended with the use of shunts and multiplier.
10. To convert the given galvanometer into a voltmeter and an ammeter.

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2.6 ELEMENTARY WORKSHOP PRACTICS

(Common with Instrumentation & Control Engineering)

L	T	P
-	-	12

I- FITTING SHOP

Topic	Knowledge/Skill
1. Types and use of making and measuring tools including micrometer, slide callipers, varnier gauge, feeler gauge, sphero meter.	Select and use correct tools to and measure as needed, Ability to measure wire and Sheet gauge, diameter, Radius dimension.
2. Types and use of vice, Clamps Chisel, Hammer, Punch for metal work.	Select and made correct use of appropriate tool for specified job.
3. Types and use of files for Soft and Hard metal/Alloys, Sheets.	Select and made correct use of files on specified materials.
4. Types and use of Grinding Machine, Grinding polishing Machine on Matals/Laminates.	Select and made correct use of appropriate machines and tools for specified grinding, buffing polishing operations.
5. Types and use of Hacksaw Power saw and Blades on soft and hard metals / Alloys / Laminates/Sheets.	Select and made correct use of appropriate saw and blade for specified job.
6. Types and use of Drilling Machine, Drill Bits, Drill Speeds, Including counter sinking on Metals, Alloys, Sheet Metal.	Select and made correct use of appropriate Drilling machine tools for Drilling and counter on specified job.
7. Types and use of Tapes and Dies for internal and external threading.	Select and made correct use of appropriate tools to cut specified job.
8. Types and use of fastening tools and accessories such as nuts, bolts, washers, self taping, screws drivers, allen key, riveting tools and rivet for metal and sheet metal.	Select and made correct use of appropriate tools and fastening materials to carry out a fastening operation on specified job.
9. Techniques of Binding and Folding Aluminium pipes upto 12 mm. diameter. (Exemple Practice Antenna marking)	Ability to bend aluminium pipes of a given size to a specified job shape.

Jobs to be Made :

1. Hacksawing and Chipping of M.S.
2. Filling Chipped M.S job.
3. Fitting on rectangular or wquare M.S. job.

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4. Making trangular squar or Haxagonal figure inside of M.S. job.
5. Utility article to prepare calliper, screw driver or try square.

II-SHEET METAL SHOP

Topic	Knowledge/Skill
1. Types and use hand tools for sheet metal work cross pein, straight pein, ball pein mallet selection.	Select and make correct use of appropriate materials and tool for specified sheet metal job.
2. Types and use of hand shear quillentiness for sheet cutting.	Select and make correct use of appropriate tools/machine for cutting sheet metal specified dimensions.
3. Techniques of grooving creasing, folding, corner making, bending, circle cutting.	Ability to perform the specified operation on sheet metal to a given tolerance.
4. Types and use of engraving tools and machines or sheet metal.	Ability to engrave simple words on sheet metal.

Jobs to be Made :

1. (a) Cutting shearing & bending.
   (b) Brazing practic on small pieces.
2. Making a soap case with M.S. sheet.
3. Making a funnel with tin sheet & soldering the same.
4. Making a cylinder & soldering the same.
5. Preparation of different types of joints such as Lap joint-single seam, Double seam & Cap joint & Hemp & Wired edge.

III-PAINTING SHOP

Topic	Knowledge/Skill
1. Techniques of sheet metal cleaning and surface treatment for spray painting.	Ability to prepare and treat surface appropriate before spray painting.
2. Types of paints, solvants, thinners, removers, brushes, use and care of brushes, paint preparation.	Ability to select and correctly use of appropriate paint remover, solvant, brush, ability to prepare paint and take care brushes.
3. Technique of spray painting and use of stencils on paint letters and figures on sheet metal.	Ability to spray paint on Sheet metal to a specified finish.

Job to be Made :

1. Preparation of wooden surface for paper basket or paper tray & painting & polishing the same.

2. To prepare a metel surface

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IV-WOOD AND LAMINATE SHOP

Topic	Knowledge/Skill
1. Types important properties comparative costs of wood, playwood various particle board, veneers, formica, Bakelite, perspex and common aminities used for making Cabinets, Frames, consoles in the electronics field.	Identify commonly used materials state important properties, estimate cost. Select correct materials(s) for a given assignment.
2. Types important properties comprative cost use of covering materials such as artifical leather, Felt, Cloth, Frams, various types of Trims such as Aluminium strips channels corners grills.	Identify commonly used state important properties estimate cost, select correct materials (s) for the given assigament.
3. Types and use of planner, big saw, band saw, circular saw, various blades, Gullotine for Laminate and wood cutting, Necessary precautions.	Select and correctly use of appropriate Saw / Machine for wood, Laminate paring, cutting to specified shape and size.
4. Types and uses of hand saw, wood chisel, Wood files, Auger, Drill Counter, Sinking, sanding for woods and Laminates.	Select and correct use of appropriate tools for carrying out specified operation to a finish.
5. Techniques of fastening wood and laminates with nails, screws, adhesives.	Ability to fasten wood and liminates as specified.
6. Techniques of working on perspex-cutting shaping, Drilling, hole cutting joining with chloroform	Ability to cut, Join, Drill shape perspex to a given specification.
7. Techniques of fixing formica, venner, felt, artifical leather, rexin, foam, grills, trims on wood, chip board and laminates using adhesives, nails as required.	Ability to perform given fast--ening operation to given specification.
8. Techniques of engraving simple pattern, letters on bakelite, perspex, formica and similar.	Ability to engrave simple patterns and letters on limin--ates.

Jobs to be Made :

1. Plainning & Sawing Practice.
2. Lap joint.
3. Motric & Tenon joint.
4. Dovetial joing.

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NOTES :

1. Each three period pratical session is to be precebed by one period tutorial session for demonstration/theory lessons.

2. Extensive use of illustrative display showing correct use, limitations precautions, properties (As applicable) of materials, tools, Machines should be used for teaching purpose. Teacher-student activity schedule should be prepared to ensure that the required knowledge / skill transfer takes place.

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III SEMESTER

3.1 APPLIED MATHEMATICS II

[Common to All Engineering Courses]

L	T	P
5	2	-

Rationale :

The study of mathematics is an important requirement for the understanding and development of concepts of Engg.The purpose of teaching mathematics to the Diploma Engg. students is to give them basic foundation and understanding of mathematics so that they can use the same for the understanding of engineering subjects and their advancements.

Sl.No.	Units	Coverage L	T	Time P
1.	Matrices	16	6	-
2.	Differential Calculus	15	6	-
2.	Differential Equations	15	6	-
4.	Integral Calculus	12	5	-
5.	Probability & Statistics	12	5	-
		70	28	-

DETAILED CONTENTS

1. MATRICES :(12 Marks)

1.1 Algebra of Matrices, Inverse :

Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermition, Orthagonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix.

Definition and Computation of inverse of a matrix.

1.2 Elementry Row/Column Transformation :

Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix :

Linear dependence/independence of vectors, Definition and computation of a rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors,Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem :

Definition and evaluation of eign values and eign vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof) and its verification, Use in finding inverse and powers of a matrix.

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2. DIFFERENTIAL CALCULUS :(10 Marks)

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation :

Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Eulens theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus :

Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION :(10 Marks)

3.1 Formation, Order, Degree, Types, Solution :

Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, Nonlinear equation.

3.2 First Order Equations :

Variable seperable, equations reducible to seperable forms, Homogeneous equtions, equtions reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation :

Property of solution, Linear differential equation with constant coefficients (PI for X=eax, Sin ax, Cos ax, Xn, eaxV, XV.

3.4 Simple Applications :

LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. INTEGRAL CALCULUS - II: (12 Marks)

4.1 Beta and Gamma Functions :

Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series :

Fourier series of f(x),-n<x<n, Odd and even function,Half range series.

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4.3 Laplace Transform :

Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations.

5. PROBABILITY AND STATISTICS :(6 Marks)

5.1 Probability :

Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution :

Discrete and continuous distribution, Bionimal Distribution, Poisson Distribution, Normal Distribution..

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3.2 ELECTRICAL ENGINEERING-II

(Common with Electronics Engineering)

L	T	P
6	-	4

Rationale :

Electricity is said to be the life of industries. We can not think of an industry without using electricity. The electrical appliances commonly used for industrial application are Transformers, D.C. and A.C. motors and generators. therefore basic knowledge of these appliances should be known to the student to fascilitate him in routine working.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	A. C. Theory	15	-	-
2.	Three Phase Supply	12	-	-
3.	Transformers	15	-	-
4.	D. C. Machines	15	-	
5.	Synchronous Machines	15	-	-
6.	Induction Motor	12	-	-
		84	-	56

DETAILED CONTENTS

1.0 A.C.THEORY

1.1 Representation of sinusoidal quantities by phasors.

1.2 Physical explanation of the phase relationship between voltage and current when sinusoidal alternating voltage is applied across:-

(a) Pure resistance,

(b) Pure inductance and

(c) Pure capacitance.

1.3 Explanation of inductive reactance, capacitive reactance and their significance.

1.4 Relationship between voltage and current when alternating voltage is applied to :-

(a) Resistance and inductance in series,

(b) Resistance and capacitance in series.

1.5 Solution and phasor diagrams for simple R-L-C circuits (Series and parallel); Impedance, Impedance triangle, phase angle.

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1.6 Power in pure resistance, inductance and capacitance; power in combination of R-L-C circuits; power factor.

1.7 Active and reactive currents and their significance; practical importance of power factor.

1.8 Series and parallel resonance in R-L-C circuits, Q-factor of coils and capacitance.

2. THREE PHASE SUPPLY:

2.1 Elementary idea about 3-phase supply.

2.2 Star and delta connection. Relationship between phase and line voltage and currents.

2.3 Power and power factor in three phase system and their measurement.

2.4 Comparison between three phase and single phase supply.

3. TRANSFORMERS:

3.1 Principle of operation.

3.2 E.M.F equation, Voltage & Current relations.

3.3 Construction and applications of small transformers used in electronics and communication engg., construction of auto transformers, constant voltage transformer.

3.4 Phasor diagram of a transformer on load; Definition of regulation and efficiency; Elementary idea of losses in transformer, open circuit and short circuit test.

4. D.C. MACHINES:

(a) D. C. Generator:

Working principle, constructional details, e.m.f equation, types of generators and their applications.

(b) D. C. Motor:

Working principle, back e.m.f., types of D. C. motor and elementary idea of their characteristics, torque equation, methods of speed control (Description only).

(c) Starters for D.C. Machines

5. SYNCHRONOUS MACHINES:

(a) Alternators:
Working principle, types of alternators, constructional details. e.m.f. equation, condition for parallel operation.

(b) Synchonous Motors:

Working principle, construction details, vector diagram, effect of excitation on armature current and power factor, synchronous condenser.

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(c) Application of synchonous machines.

6. INDUCTION MOTORS:

(a) Three Phase Induction Motor:

Working principle and constructional details, types of induction motor, slip ring and squirrel eage, slip in induction motors, speed torque characteristics, starting and speed control, application of induction motors in industry.

(b) Single Phase Induction Motor:

Principle of operation and constructional details of single phase FHP induction motors (Split phase, capacitor start capacitor run, shaded pole, reluctance start, A.C. series, universal, hysterisis, servo and stepper motors their applications).

(c) Starters for Induction motors.

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ELECTRICAL ENGINEERING-II LAB

List Of Experiments

1. To verify that in an A.C. circuit, the phasor sum (not the algebraic sum) of currents at any junction is zero.

2. To find the voltage-current relationship in a R-L series circuit and to measure power and power factor of the circuit.

3. To find for a filament lamp :-

   (a) Variation of resistance with temperature.

   (b) Variation of temperature with voltage.

   (c) Variation of resistance with voltage.

   (d) Variation of power with voltage.

4. To measure power and power factor in three phase system by two wattmeter method.

5. To determine the efficiency and regulation of a transformer by performing direct loading.

6. To measure the induced emf of separatly excited D.C. generator as a function of field current.

7. To measure the terminal voltage of a separatly excited D.C. generator as a function of load current.

8. To measure the terminal voltage of a D.C. shunt generator as a function of load current.

9. To measure the speed of a separately excited D.C. motor as a function of load torque at rated armature voltage.

10. To observe the difference in the starting current at switching on single phase capacitor start induction motor with :-

    (a) The capacitor disconnected and

    (b) The capacitor connected.

    Also to determine how to reverse the direction of rotation.

11. To start a Three Phase induction motor and to determine its slip at various loads.

12. To determine V curves of a synchronous motor.

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3.3 ELECTRONIC DEVICES AND CIRCUITS

(Common with Electronics Engineering and Computer Engineering)

L	T	P
6	-	4

Rationale :

Electronics has become so much closely associated with normal life and industries that basic knowledge about the active and passive devices used in electronics instrumentation has become an improtant tool for the middle level technical man power. Routine problems of maintenance and repair can be dealt successfully by a diploma student if he is equipped with the working and circuitry associated with different type of amplifiers, tuned voltage amplifiers, oscillators, multivibrator, tuned based circuits used in CRO, operational amplifier and waveshaping circuits.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Single Stage Amplifiers	3	-	-
2.	Multistage Transistor Amplifier	9	-	-
3.	Transistor Audio Power Amplifiers	9	-	-
4.	Feed Back Amplifiers	9	-	-
5.	Tuned Voltage Amplifiers	4	-	
6.	Sinusoidal Oscillators	6	-	-
7.	Waveshaping Circuits	6	-	-
8.	Multivibrator Circuits	6	-	-
9.	Operational Amplifier	16	-	-
10.	Timer Ic	4	-	-
11.	Regulated Power Supply	6	-	-
12.	Introduction To Micro Electronics	6	-	-
		84	-	56

DETAILED CONTENTS

1. SINGLE STAGE AMPLIFIERS:

1.1 Transistor hybrid low frequency model in CE configuration, 'h' parameter and their physical significance, typical values of 'h' parameters and their determination by transistor characteristics.

1.2 Expressions for voltage gain, current gain, input and output impedance for a single stage CE amplifier circuit in 'h' parameters, appropriate approximations.

2. MULTISTAGE TRANSISTOR AMPLIFIERS:

2.1 Need of multistage amplifier, different coupling schemes and their working, brief mention of application of each of the type of coupling.

2.2 Working of R.C. coupled and transformer coupled multistage amplifier, approximate calculation of voltage gain for a two

stage R-C coupled amplifier.

2.3 Frequency response of R-C coupled and transformer coupled amplifiers and its physical explanation, definition and physical significance of the term as bandwidth, upper and lower cross over frequencies etc.

2.4 Direct coupled amplifier and its limitations differential amplifier typical circuits diagram and its working.

3. TRANSISTOR AUDIO POWER AMPLIFIERS:

3.1 Difference between voltage and power amplifier, importance of inpedance matching in power amplifier, collector efficiency of power amplifier.

3.2 Typical single ended power amplifier and its working, graphical method for calculation of output power, heat dissipation curve and importance of heat, sinks, class A, class B, class C amplifier (without derivation).

3.3 Working principle of push pull amplifier and circuits, its advantages over single ended power amplifier, cross over distortion in class B operation and its reduction, different driver stages for push pull amplifier circuit.

3.4 Working principle of complementary symmetry push pull circuit and its advantages.

3.5 Boot strap technique in amplifiers.

3.6 Transformer less audio power amplifiers and their typical application.

3.7 Mention of at least one polular IC with its block diagram, Pin configuration and it working of each type of power amplifier.

4. FEED BACK AMPLIFIERS:

4.1 Basic principle and types of feed back.

4.2 Derivation of expression for the gain of an amplifier employing feed back.

4.3 Effect of negative feedback on gain, stability, distortion and band width (Only physical explanation)

4.4 Typical feedback circuits :

(a) A.C. coupled amplifiers with emitter by-pass, capacitor removed.

(b) Emitter follower and its application, simple mathematical analysis for voltage gain and input impedance of above circuits.

5. TUNED VOLTAGE AMPLIFIERS:

5.1 Classification of amplifiers on the basis of frequency.

5.2 Review of basis characteristics of tunned circuits, (Series and Parallel)

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5.3 Single and Double tuned amplifier, their working principles and frequency response (no mathematical derivation). Concepts of neutralization.

5.4 Staggered tuned amplifier and typical applications in brief.

5.5 Mention of at least one polular IC with its block diagram, Pin configuration and it working of each type of Tuned amplifier.

6. SINUSOIDAL OSCILLATORS:

6.1 Application of oscillators.

6.2 Use of positive feedback/negative resistance for generation of oscillation, barkhawn's criterion for oscillations.

6.3 Different oscillators circuits, tuned collector, Hartley, colpitts, phase shift, Wien's bridge and crystal oscillator and their working principles (no mathematical derivation).

6.4 Mention of at least one polular IC with its block diagram, Pin configuration and it working of each type of oscillators.

7. WAVESHAPING CIRCUITS:

7.1 General idea about different waveshapes.

7.2 Review of transient phenomena in R-C and R-L circuits.

7.3 R-C and R-L differentiating circuits and integrating citcuits.
Their applications (physical explanation for square/rectangular input waveshapes only).

7.4 Diode clippers series and shunt biased type double clipper circuits.

7.5 Zener diode clipper circuits.

7.6 Use of transistor for clipping.

Diode clamping circuit for clamping to negative peak, positive peak or any other levels for different input waveforms (e.g sine, square, triangular).

8. MULTIVIBRATOR CIRCUITS:

8.1 Ideal transistor switch; explanation using C.E. output characteristics, calculation of component values (collector and base resistors) for a practical transistor switch.

8.2 Transistor switching time. Use of speed up capacitor (Physical explanation).

8.3 Basic concept of working of collector coupled bistable, monostable and stable multivibrator circuits including principle of triggering.

8.4 Operation of Schmitt trigger, calculation of upper trigger potential (UTP) and lower trigger potential (LTP).

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8.5 Mention of applications of multivibrators and Schmit trigger. Its use as waveform generator.

8.6 Transistorised voltage controlled oscillator (basic) principle only.

8.7 Mention of at least one polular IC with its block diagram, Pin configuration and it working of each type of Multivibrator circuits.

9. OPERATIONAL AMPLIFIERS:

9.1 Specifications of ideal operational amplifier and its block diagram.

9.2 Definition of inverting and noninverting inputs, differential voltage gain and input and output off set, voltage input offset current, input bias current, common mode rejection ratio (CMMR), power supply rejection ratio (PSRR) and slew rate.

9.3 Method of offset null adjustments, use of op.amp. as an inverter scale changer, adder, subtractor, differential amplifier, buffer amplifier, differentiator, integrator, comparator, Schmitt Trigger, Generation of Square and Triangular Waveform, log and anti-log amplifiers, PLL and its appliation and IC power amplifier.

9.4 IC OP-AMP Application :

Inverting/Noninverting VCVS integrators, Differentiators CCVS and VCCS instrumentation amplifiers, Active filter (LP, HP and Notch), Oscillators. Log/Antilog modules, Precision rectifier, Peak detector, Sample and Hold Circuit, IC analog multiplier application, Analog multiplexer and demultiplexer.

10. Timer Ic.:

Block diagram of Ic timer (such as NE 555) and its working, use of 555 timer as monostable and astable multivibrator, and waveform generator.

11. Regulated Power Supply

11.1 Concept of regulation.

11.2 Basic regulator circuits (using zener diode).

11.3 Concept of series and shunt regulator circuits.

11.4 Three terminal voltage regulator Ics (positive negative and variable) application. Block diagram, Pin configuration and working of popular regulator IC.

11.5 OP-AMP regulators, IC regulators, Fixed Voltage regulators, (78/79, XX) 723 IC regulators (Current Limiting, Current Fold Back), SMPS.

12. Introduction to Microelectronics-

- Advantages of integration, Tyes of integrated circuits, Monolithic and Hybrid circuits.

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- Different stages of fabrication of ICs- Epitaxial Growthh, Oxidation and film deposition, Diffusion and Ion Inplatation, Lithography & Etching. (Only brief idea of all)

- Masking, Selective doping, Fine-line lithography and isolation for Monolithic circuits.

- Introduction to monolithic device elements such as BJT, MOS, transistor and integration of other circuit elements.

- Very large scale ingegration (V.L.S.I.).

(Only brief idea)

LIST OF BOOKS

1. Bhargava, Kulshreshtha & Gupta - "Baisc Electronics & Linear Circuits" - Tata Mcgraw-Hill.
2. Malvino, A. P. - "Electrinics Principles" - Tata Mcgraw-Hill.
3. Sedra, Adel S. Smith, Kenneth. C. " Micro Electronics Circuits" - Oxford University Press 5th Edtion

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ELECTRONIC DEVICES AND CIRCUITS LAB

List of Experiment

1. To measure the overall gain of two stage R.C. coupled amplifier at 1 Khz and note the effect of loading of second stage on the first stage.

2. To plot the frequency response of R-C soupled amplifier.

3. (a) To plot the load Vs output power characteristics to determine the maximum signal input for undistorted signal output.

   (b) The above experiment is to be performed with single ended power amplifier; Transistorized push; pull amplifier; Compl-ementary Symmetry power Amplifier.

4. To observe the effect of a by-pass capacitor by measuring voltage gain and plotting of frequency response for a single stage amplifier.

5. To measure input and output impedance of a feedback amplifier with and without by-pass capacitor.

6. Measurement of voltage gain input and output impedance and plotting of frequency response of an emitter follower circuit.

7. Measurement of resonant frequency, plotting of the response curve (i.e. graph between input frequency and impedance) and calculation of Q with the help of this curve for series and parallel resonant circuit.

8. To measure the frequency response of a single stage tuned voltage amplifier and calculation of the Q of the tuned circuit load.

9. Observe and plot the output waveshapes of ;

   (a) R-C differentiating circuits.

   (b) R-C integrating circuits for squarewave input (OBserve the effect of R-C time constant of the circuits on the output waveshape for both the circuits).

10. (a) Observe the output waveforms of given biased and unbiased series and shunt clipping circuits, for positive and negative peak clipping circuits, for positive and negative peak clipping of a sine wave using switching diodes and D-C sources and compare it with input wave.

    (b) Observe the output wave shape of given double clipper circuit using diodes and D-C sources.

    (c) Observe the output wave shape of given zener diode and transistor clipper circuits for positive peak, negative peak and double clipping sine (or other) waveshapes.

11. To clamp square wave to their positive and negative peaks

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and to a specified level.

12. To measure Ic and Vce for transistor when Ib is varied from zero to maximum value and measure the valur of Vce and Ic for saturation at a given supply, voltage and load.

13. To test a transistor schmitt trigger circuit, observe and plot the waveshapes at various points.

14. Use of Op-Amp. (for IC-741) as Inverting and non-inverting amplifier, adder, comparator, buffer, scale changer.

15. Simple working circuits using NE555.

16. To determine the range of frequency variation of a RC phase shift oscillator.

17. To test adjustable IC regulator and current regulator.

18. Identificaiton, Pin configuration and basic working of different polular IC's - Exm.- Power amplifier, Oscillator, Tuned amplifier, Multivibrator, Timer.

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3.4 TRANSDUCERS AND APPLICATION

L	T	P
5	1	4

Rationale :

Sensing elements play a vital role in instrumentation. The type of sensing element needed depends upon the nature of instrumentation system used in the industry. Various types of transducers are available. The student is required to be familiar with the construction working principle and mounting procedure of different types of transducers.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	4	1	-
2.	Variable Resistance Transducers	6	1	-
3.	Variable Inductance Transducer	6	1	-
4.	Capacitive Transducer	6	1	-
5.	Optical Transducer	6	1	-
6.	Puizo Electric Transducer	6	1	-
7.	Viscocity Measurement	6	1	-
8.	pH Analyzer	8	2	-
9.	Conductivity Analyzer	8	2	-
10.	Vibration & Noise Measurement	8	2	-
11.	Gas Analyser Sampling	6	1	-
		70	14	56

DETAILED CONTENTS

1. INTRODUCTION:

Definition of transducers.

CLASSIFICATION OF TRANSDUCERS:

1.1 Primary and secondary, mechanical devices as primary detectors.

1.2 Electrical transducer:

Advantages, classification of electrical transducer, active and passive, analog and digital, Electrical phenomena used in transducers.

2. VARIABLE RESISTANCE TRANSDUCERS:

2.1 Principle of variable resistance transducers.

2.2 Potentiometers - Principle of working, construction, Linearity and sensitivity, Types, advantages and disadvantages of potentiometers, its applications.

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2.3 Strain Gauges - Theory of strain gauges, gauge factor, types of strain gauges, material for strain gauges, temperature compensation in strain gauge, applications.

2.4 Thermistors - Construction, characteristics and applications of Thermistors.

3. VARIABLE INDUCTANCE TYPE TRANSDUCERS:

3.1 Principle of variable inductive transducers by variation of self inductance, mutual inductance and eddy current. Different types of transducers, working on above principles.

3.2 L.V.D.T.: Construction, theory, linearity and sensitivity advantages, disadvantages and uses.

4. CAPACITIVE TRANSDUCERS:

Principle of capacitive transducers, Capacitive transducers using change in distance between plates, differential arrangement for improving sensitivity, capacitive transducers constant, application fo capacitive transducers.

5. OPTICAL TRANSDUCERS:

Theory of photo emission, classification of photo electric devices, vacuum photo tube, Gas photo tube, Photo multiplier tube, photo conductive cell, photo diode, photo transistor and their applications. Optical Fibre sensors.

6. PIEZO ELECTRIC TRANSDUCERS:

Theory of piezoelectric effect, mode of operation and properties of piezoelectric crystal, Equivalent circuit of piezoelectric transducer and applications of piezo electric transducers.

7. VISCOSITY MEASUREMENTS:

Definition of viscosity, measurement of viscosity by capillary type and rotational type, cone and plata viscometer, two float viscometer, rheometers.

8. PH ANALYSER:

Definition and importance of PH value, better solution, reference and standard electrodes for PH measurement Hydrogen calomel and Glass electrode PH-meter-direct reading type and indirect reading type.

9. CONDUCTIVITY ANALYSER:

Defintion of conductivity, conductance, Sp-conductance and equivalent conductance-Alternating current conduction. Measurement of conductivity-conductivity cell, cell constant applications.

10. VIBRATION AND NOISE MEASUREMENT

Measurement of Vibration - Using siesmic accelero meter photentiometric type and LVDT type, piezo electric type

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accelerometer.

11. GAS ANALYSIS AND SAMPLING :

Introduction, different types of gas analyser such as Infrared gas analyser, Thermal conductivity, Paramagnetic and Zirconium oxide based gas gnalyser. Applications of gas analysier, Sampling techniques.
Introduction

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TRANSDUCERS AND APPLICATION LAB

1. To draw the input output characteristics of linear variable differential transducers and also study its details.

2. To fabricate a circuit using linear variable differential tranducer for the measurement of non electrical quantity.

3. To draw I/o characteristics of the following photo transducers.
   A. LDR
   B. Photo diode
   C. Photo Transistor
   D. Opto copler

   and fabricate an application circuit using photo transducers as a switch and as a light intensity meter.

4. To fibricate an application circuit using given temperature transducer like thermistors and I. C. sensors.

5. To fabricate an application circuit using capacitive transducers for measurement of level.

6. To draw I/o characteristics of strain gauge and study working of weighing M/c using strain gauge load cell.

7. To measure conducitivity of a given solution using conductivity meter and calibrate it.

8. To measure PH of given acitic and alkaline solution using a PH meter and standarize it, using buffer solutions.

9. To mesure density of given solution using simple hydrometer

10. To measure vibration of motor or compressor system using a vibration meter and piezo-electric sensors.

11. To study the working principle and construction of PH indicator and measure the PH of a given solution.

12. To perform vibration measurement using pizoelectric type acclerometer.

13. To perform noise measurement using condenser microphone.

NOTE:- Experiments associated with study of equipment in the above should in variably be carried out and should not be restricted to the "Study: part only.

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3.5 ELECTRONICS WORKSHOP

(Common with Electronics Engineering and Computer Engineering)

L	T	P
0	0	6

PART-A ELECTRICAL WORKSHOP

GENERAL OBJECTIVES

After the completion this course the learner will be able to

1. Become familiar with domestic and semi-domestic industrial wiring practice.

INSTRUCTIONAL OBJECTIVES

After completing this course the learner will be able to

1. Plan and Wire a small domestic building given the load requirement.

2. Specify the wiring planes of semi-insdustrial installations with three phase supply and a maximum of 5 KVA load.

Exercises To Be Performed	No. of turns reqd.
1. Identification and study of commonly used electrical materials such as wires, cables, switches, fuses, coiling, roses, battens, cleats and allied items.	1
2. Identification and study of various tools used in Electrical Workshop and safety mesaures.	1
3. Making connection of single lamp and three pin plug socket to supply using batten wiring.	1
4. Making Electrical connection for staircase wiring.	1
5. Making Electrical connection for a tube light and door bell.	1
6. Wire a mains outlet pannel consisting of a specified combination of 5 AMP; 15 AMP, Socket, Main switch, Indicating lamp and Fuse links.	1
7. Given the load requirements, prepare the wiring diagram for a small Electronic/ Electrical Laboratory/ Workshop using energy meter, MDB and SDBS and details of sub-circuits, Protective device, cables/wires should be specified. The wiring should assume the availability of 3 phase 4 wire mains supply near the laboratory/workshop.	2
Total turns required	8

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PART-B. ELECTRONICS WORKSHOP

GENERAL OBJECTIVE

After completion of instruction in this subject the student wiil :-

1. Develop skill in selection and use of commonly used tools, equipment, components in a given situation.

2. Develop skill in wiring, soldering and desoldering works.

3. Develop skill in tracing circuits of simple (analouge and digital) electronic assembly.

INSTRUCTIONAL OBJECTIVE

After completion of instruction in the subject the student will be able to :-

1. State the correct name and function of different tools and accessories, such as :-

Tools

Pliers, Wire cutter, Wire stripper, Tweezer, Soldering iron, Desoldering tools, Neon tester and Screw drivers.

Accessories

1. Including Tapes, Solders, Solders tips, Fluxes; De-soldering wick, Solder cleaning fluids, Sleeves, Tags.

2. Demonstrate the correct use of accessories mentioned in (1) above.

3. Selection and use of general purpose Electronic test and measuring equipemnt :-

3.1 Given any of the wavefrom generators specified in equipment type (a) below with its controls set at random, the student should be able to operate/adjust the necessary control to demonstrate/any desired waveform on the appropriate measuring equipment, specified in (b) below.

3.2 Given any measurement equipment specified in (b) below (with its controls set at random) the student should be able to operate adjust the necessary controls to measure/display electrical parameter(s) such as specified on the right side margin.	Parameter for being measures: Amplitude, Frequency phase Time Period, Rise and Fall time of pulse Wavefrom,common transistor parameters,circuit resistance.

3.3 Given different type of power supply mention in (c), the student should be able to find out the operating range and

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regulate the power supplies

Equipment Type.

(a) Test Wavefrom Generator :- Audio oscillator, Function Generator, Signal Generator, Spectrum Analyzer.

(b) Measurement Equipment ; Single beam CRO, Double beam/ Dual trace CRO, electronic and Digital multimeters, Transistor tester/Curve tracer, IC tester etc.

(c) Power Supply - UPS, Invertor, DIfferent types of DC/AC power supplies

4. Students should be able to identify and use the item mention below (a), (b), (c) and (d).

(a) Various types of Single/Multicored, Insulated screened, Power type/ Audio/ Video/ General purpose wires and cables.

(b) Various types of plugs, sockets, connectors suitable general purpose audio, vidio use. Some of such commectors are : Banana plug and Sockets, ENC, DIN, UHF, VHF, Earphone connectors, Telephone jacks and similar male and female connectors and terminal strips.

(c) Various types of switches such as : Normal/miniature Toggle, Slide, Push botton, Piano key rotary, SPST, DPDT, Band selector multiway, Master main switch.

(d) Various types of protective devices such as : Wire fuse, Cartridge fuse, Single/Multiple miniature circuit breakers over and under current relays.

5. Exercises to be performed :

i. Study and testing of different types of Resistor, Capacitor, Inductor, Diode, Transistor (BJT, FET, MOS, CMOS) and ICs (All Popular Faimlies).

ii. Study of different processes by performing in assembling-Soldering, Dsoldering, Cutting, Stripping and connecting.

iii. Study of equipment - their control and operation mentioned in no. 3 part of accessories.

iv. Study of the items mentioned in part 4-a,b,c,d by using them in different types of circuits.

v. Students should design and assemble at least seven working circuits (Full Fabricated Form) selecting at least three from each group A and B given below

Group A

1. Single Stage Amplifier
2. Halfwave and Full Rectifier
3. Filters
4. RC Coupled Amplifier
5. Power Amplifier (Push Pull)
6. Tuned Amplifier

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7. Oscillator
8. Waveshaping Circuits

Group B

1. Clap Switch
2. Door Bell
3. Burglar Alarm
4. Porch Light
5. Water level Indicator
6. Fan regulator
7. .25 Kva Manual Stablizer
8. Single band transistor radio receiver

Note :

1. The above list of Group B suggestive, more items may be added to the list depending upon students choice and materials availablity but the item should belong consumers interest category.

2. Student should be encouraged for self market survey for each material.

PART-C PREPARATION OF PRINTED CIRCUIT BOARDS

Instructional Objective
*

After the completion of instruction in this area of the subject the learner will able to :-

1. Acquire skill in silk screen printing techniques for the purpose of making the printed circuits boards.

2. Acquire knowledge of non dry-method of PCB making using photoprocessing techniques.

3. Acquire skill in preparing, checking, drilling and proper storing PCBs.

Suggested Task/Exercises	No. of turns required.
1. Familiarisation with tools, equipment, materials and processes of a single and double sided PCB making using direct etching method (Artwork to done by students) .	1
2. As above expect using photoprocessing techniques.The initial exposure is to include the following	2
2.1 Dark Room Practice.	
(a) Exposure using UV light/daylight	

(b) Developing (including dye developing)

(c) Fixing

(d) Printing (including contact printing)

(e) Enlarging/Reducing

2.2 Techniques of photo-resist coating.

2.3 Baking and cleaning procedures.

2.4 Etching procedures.

2.5 Procurement and storage of materials and equipment.

2.6 Safety rules for PCB laboratory and darkroom.

3.	Exercises in making simple single and double sided PCB using direct etching method.	2
4.	Exercises in making single and double sided PCB using photoprocessing method.	2
5.	Familiarisation with tools equipments, materials and process of silk screen printing for PCB making.	2
6.	Exercises in PCB making using silk screen printing techniques.	2
7.	Exercises in drilling, assembling and testing of single and double sided PCB; proper storage of PCBs.	1
	Total Turns Required	12

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IV SEMESTER

4.1 PROGRAMMING IN C & C++

(Common to Post Graduate Diploma In Computer Application, Post Diploma In Information Technology, Electronics Engg.)

L	T	P
7	1	6

Rationale :

For solution of different problems, C is a very powerful high level language. It is widely used in research and engineering problems. A software technician must be aware of this language for working in computer environment.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Concept of Programming	8	2	
2.	Programming in C	30	4	-
3.	Classes & Objects	30	4	
3.	Programming in C++	30	4	
		98	14	84

DETAILED CONTENTS

1. CONCEPT OF PROGRAMMING:

Concept of Flowcharing, algorithm,programming, Structured Programming Various techniques of programming, Use of programming.

2. Programming in C:

Data Types, Operators and Expressions;Input & Output printf, scanf, clibrary Control Statement: IF- ELSE, While, For, Do- While, Switch; Functions and modular programming; Scope of variables, parameter passing, recursion, block structure; preprocessor statements; pointers and arrays; structures and unions; File handling.

3. CLASSES & OBJECT:

What is a class,what is an object,constructors,types of object(external,automatic static, Dynamic objects) Metaclass,role of meta class.Scope of classes, array of objects, objects as a function argument.

4. Programming in C++:

What is object-orientation, area of object technology,C++, getting to grips with C++(data types,escape sequence,characters, variables, operator, notation, Arrays,Function conditional statements.call by value,call by reference.Pointer : C++ memory map, dynamic allocation pointers,pointers with arrays.Structure,structure with arrays,passing, structure of function.Enumerated data types, Inherentance, apolymorphism & Overloading.

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PROGRAMMING IN C & C++

List of Experiments

1. Exercises involving output and input format controls in Pascal.
2. Exercises involving control transfer statements in C & C++
3. Exercises with arrays & Pointers in C & C++.
4. Exercises with functions in C & C++.
5. Exercises with files in C & C++.

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4.2 NETWORK, FILTERS AND TRANSMISSION LINES

(Common with Electronics Engineering and Computer Enginering)

L	T	P
5	1	4

Rationale :

The electronic circuits are too much complicated. To understand the working of electronic circuitary a systematic knowledge of the tools of circuit analysis is required. A student having knowledge of the basic tools like network throrems one port/two port network, symmetrical/asymmetrical network, attenuators, filters and transmission lines will be able to share any type of responsibility in the industry atmosphere.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Review of Network Theorms	5	1	-
2.	Networks	12	2	-
3.	Symmetrical & Asymmetrical Network	15	3	-
4.	Attemuators	6	2	-
5.	Filters	12	2	-
6.	Transmission Lines	20	4	-
		70	14	56

DETAILED CONTENTS

1. REVIEW OF NETWORK THEOREMS:

Review of the following, network theorem; superposition, Thevenin's Norton's and maximum power transfer.

2. NETWORKS:

2.1 One Port Network : Series and parallel tuned circuit, expression for their impedance at any freququency and at resonance in terms of Q and component values (L. C. & R). Band width of tuned circuit in terms of resonance frequency and Q.

2.2 Two Port (Four Terminals Networks : Basic concept of the following terms :

(a) Symmetrical and asymmetrical networks.

(b) Balanced and unbalance network,

(c) T-network, Ladder network, Lattice network, L Network, Bridge T-network.

(d) Representation of a two port " Block Box" in terms of Z, Y and H parameters and mention of application to transistor as a two port network.

3. SYMMETRICAL AND ASYMMETRICAL NETWORK :

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3.1 Symmetrical Network :

(a) Concept and significance of characteristics impedance, propagation constant,attenuation constant, phase shift constant and insertion loss.

(b) Exprssion for characteristic impedance, propagation constant, attenuation constant and phase-shift constant in terms of Zo, Zoc and Zsc for the following

(i) T Network.

(ii) n (pi) Network.

3.2 Asymmertrical Network :

(a) Concept and significance of iterative impedance image impedance, image transfer constant and insertion loss.

(b) The half section (L-section) : Splitting of symmetrical T & n(pi) sections into half sections, derivation of iterative impedence, image impedence open and short circuit impedence of half section.

3.3 Star-Delta Transformation : Equivalence of T and n(pi) network.

4. ATTENUATORS:

4.1 Units of attenuation (decible and nepers)

4.2 General characteristics of attenuators.

4.3 Analysis and design of simple attenuator of following types

(a) Symmetrical T and n type.

(b) L type.

5. FILTERS:

5.1 Brief idea of the uses of filters networks in differnt communication system.

5.2 Connecting of low pass, high pass, band pass and band stop filters.

5.3 Theorem connecting attenuation constant a and characteristics impedence (Zo) determination of cut off frequency constant K section.

5.4 Prototype filter section

(a) T and n low pass filter section.

- Reactance frequency characteristics of low pass and its significance.
- Attenuation Vs frequency; phase shift Vs frequency characteristics impedance Vs frequency of T and n.

- Simple design problems of prototype low pass section.

5.5 Active Filter:

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Basic Concept of active filter and comparison with passive.

(a) Op. amp. intergrater circuit, basic low pass active filter, First and Second order low pass Butter worth filter - Frequency response.

(b) Op. amp. differentiator circuit, basic high pass active filter, First and Second order high pass Butter worth filter- Frequency response.

(c) Basic concept of band pass filter, Wide and narrow band pass active filter.

(d) Basic concept of band reject filter, wide and narrow band reject filter.

(e) All pass filter, Frequency response

5.6 Crystal Filter :

(a) Crystal and its equivalent circuit.

(b) Design properties of piezoelectric filters and their use.

5.7 Equalizers :

General Introduction.

6. TRANSMISSION LINE:

6.1 Transmission lines and their application : Shapes of different types of transmission lines; including 300 ohm antenna feeder cable, 75 ohm co-axial cable, optical fibre cable, Also other different types of cables.

6.2 Distributed (or primary) constants of a transmission line equivalent circuit of infinite line;

6.3 Necessity of the concept of an infinite line; Definition of characteristic impedance of line ; concept of short line termination in Zo currents no voltages long an infinite line; graphical representation; propagation constent, attenuation and phase shift constant of the line.

6.4 Relationship of characteristics impedence, propagation canstant, attenuation constant and phase constant in term of distributed constants of the line, smith charts.

6.5 Conditions for minimum distortion and minimum attenuation of signal on the line; necessity and different methods of loading the communication lines.

6.6 Concept of reflection and standing waves on a transmission line; definition of reflection coefficient in terms of characteristics impedance and load impedance; Definition of standing wave ratio (SWR), relation between VSWR and voltage reflection coefficient, maximim impedance on a line in term of characteristics impedance and VWSR.

6.7 Transmission line equation; expression for voltage, current and impedance at a point on the lines for lines with and

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without losses. Expression for the imput impedance of the line. Solving Transmission line problems using Smith Chart.

6.8 Input impedance of an open and short circuited line and its graphical representation.

6.9 Transmission line at high frequency, effect of high frequencies on the losses of a transmission line; Application of transmission line as a reactive components and imdedance transformer (e.g. quarter wave and half wave transformer).

6.10 Principle of impedance matching using single stub; comparison of open and short circuit stubs.

6.11 Expression for characteristic impedance of open wire and coaxial lines (No derivation).

LIST OF BOOKS

1. J. P. Ryder-Network Filters & Transmission Line- PHI
2. A. Chakravorty- An Introduction to Network, Filters & Transmission Line- Dhanpat rai & Co.
3. D. R. Chaudhry- Network Analysis-Dhanpat Rai & Co.
4. V. K. Aatre- Network Theory & Filter Design- New Age International Pub.

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NETWORK, FILTERS AND TRANSMISSION LINES LAB

List Of Experiment

1. Experimental verifications of the Thevenin's and Norton's theorm with an a.c. source.

2. Experimental varifications maximum power transfer theorm.

3. To measure the characteristics impedance of a symetrical T/n (pi) network.

4. To measure the image impedance of a given asymmetrical T/n (pi) networks.

5. To design and measure the attenuation of a symmetrical T/n(pi) type attenuator.

6. For a prototype low pass filter :

   (a) Determine the characteristics impedance experimentally.

   (b) Plot the attenuation characteristics.

7. For a prototype high pass filter :

   (a) Determine the characteristics impedance experimently.

   (b) To plot the attenuation characteristic.

8. (a) To plot the impedance characteristic of a prototype band pass filter.

   (b) To plot the attenuation characteristic of a prototype band pass filter.

9. (a) To plot the impedance characteristic of m-derived low pass filter.

   (b) To plot the attenuation characteristic of a m-derived high pass filter.

10. To design Ist order and IInd order active LPF filter using IC 741 and draw the frequency response curve.

11. To design Ist order and IInd order active HPF filter using IC 741 and draw the frequency response curve.

12. Measurement of characteristics of a short transmission line.

13. Measurement of L & C of lossless transmission line.

14 Measurement of Zo of lossless transmission line.

15. Measurement of Attenuation of lossless transmission line.
16. Measurement of Velocity of Propagation in lossless transmission line.

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4.3 PROCESS INSTRUMENTATION

L	T	P
5	1	6

Rationale :

Precision measurement of process parameters such as pressure, level density, speed, temperature, flow, moisture etc. is very essential for successful running of a process industry. Various telemetric and mannual control circuits are to be handled by technicians employed in these industries. Therefore to equip the diploma student in instrumentation and control engineering with the knowledge and skill of principles and circuitry for measurement of these parameters will be useful in world of work.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	4	1	-
2.	Pressure Instrumentation	8	1	-
3.	Level Instrumentation	8	1	-
4.	Measurement of Speed	8	2	-
5.	Temperature Instrumentation	8	2	-
6.	Flow Measurement	8	2	-
7.	Moisture Measurement	8	2	-
8.	Measurement of Density	10	2	-
9.	Installation	8	1	-
		70	14	84

DETAILED CONTENTS

1. INTRODUCTION:

1.1 Introduction of a process, chemical engineering process and process variable, listing of different process variable and their definitions, Introduction and definition of the term process instrumentation as applicable to the field of engineering.

1.2 Importance of process instrumentation for process industry-discussion taking example of any of the typical processes

1.3 Block diagram of a general instrumentation system, Elements of an instrument. Symbol used in instrumentation system and process flow diagram

2. PRESSURE INSTRUMENTATION:

2.1 Definition.

2.2 Units KCS, Bar, Pascal, MPa, N/M2, PSI, WCL and conversion of one unit into other and conversion of one unit into another.

2.3 Pressure Elements- Diaphragm, Force Balance, Bellows,

Bourden Tube, Pressure Gauges, Differential Pressure Gauges.

2.4 Types of pressure, atmospheric pressure, absolute pressure, gauge pressure, vacuum pressure, Improtance of Pressure measurement, Pressure Transmitters/Differential Pressure Transmitters (4-20 mA output). Advantages of 4-20 mA systems to be explained.

2.5 Dp gauge, Uses of manometers for differential pressure measurement.

2.6 Measurement of pressure of corrosive fluids-diaphragm seal, liquid seal, Table listing corrosion resistance of Mild Steel, Stainless Steel, Monel and Hastalloy ect. to around four inportant corrosive fluids used in industry to be given to all students.

2.7 Measurement of static and dynamic pressure.

2.8 Pressure switch and regulators.

2.9 Electrical Methods :

(a) Resistive Methods - Strain Gauge, Potentiometric

(b) Capacitive Methods - Absolute capacitive & differential capacitive method.

2.10 Calibration of Pressure Gauge/Pressure Transducers/ Pressure transmitters/Different Pressure Transmitters with Dead weight pressure gauge tester, Digital pressure indicator (Differential pressure and vaccum)

3. LEVEL INSTRUMENTATION:

Introduction, head, density and specific gravity their relationship, method of measurement.

(a) Slight glass method.

(b) Bob tape method.

(c) Float method, Material for float, Float and shaft method.

(d) Magnetic float.

(e) Displacer method.

3.2 Indirect Method:

(a) By pressure gauge.

(b) Diaphrgm box method.

(c) Air trap method.

(d) Air pressure balance method or bubbler method.

(e) Pneumatic force balance method.

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(f) Level measurement in a pressuried vessel using differential gauges and differential pressure gauges.

(g) Level measurement of corrosive liquid by use of seal.

(h) Level measurement by weighing.

(i) Level of dry material.

3.3 Electrical Methods:

(a) Electrical Conductivity method.

(b) Capacitance method.

(c) Radio active methods.

(d) Ultrasonic method.

(e) GWR (Guided Waves Radar)

4. MEASUREMENT OF SPEED:

Speed measurement, Tachometer (Contact type and non contact type - optical), stroboscopic counter, vibration reed method.

5. TEMPERATURE INSTRUMENTATION:

5.1 Definition of temperature, temperature scales conversion of one temperature units into another, importance of temperature instrumentation.

5.2 Methods of measurement, industrial liquid thermometer, thermometeric liquids and its property, limitation of glass thermometer.

5.3 Filled thermometers- Liquids filled, gas filled, vapour filled (construction and working principle of filled thermometers).

5.4 (a) Possible sources of errors, ambient temperature effect, compensation of ambient temperature effect along capilary and bourdon.

(b) Comparison between liquid,filled, gas filled and liquid- vapour filled thermometers.

(c) Mounting method and location and selection.

5.5 Bi-metallic thermometer, principle, construction, material combination of bi-metallic strip its use for control application.

5.6 Electrical methods for temperature mesaurement thermocouple, principle of production of thermal e.m.f, seeback effect, peltier effect, Thompson effect, thermo couple material and temperature range, gauge, protecting tube, standard characteristic curve for

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thermo couple, measurement of thermo couple e.m.f. by mill (temp Vs. e. m. f.) voltmeter method and potentio metric method, use of compensating leads. Comparison between millimeter method and potentiometric method-calbiration of M.C. voltmeter by potentiometer. Mounting of thermo couple.

5.7 Possible sources of errors and reference junction compensation.

(a) Resistance Thermometer, principle, bulbs and wells, constructional detail.

(b) Properties of resistance elements.

(c) Measurement of resistance by resistance meter, bridge method and potentiometric method.

5.8 Semiconductor thermometer, Ranges and limitations.

5.9 Radiation pyrometer-Principle of working, working temperature range.

Total radiation pyrometer-construction and working principle.

6. FLOW MEASUREMENTS:

6.1 Definition of flow-Bornolli's theroem.

6.2 Differential pressure flow meters-Expression for flow rate in terms of differential pressure. Types of restriction, orifice, nozzle, ventury tube, construction and material used. Comparison between orifice, nozzle and ventury tube measurement of differential pressure in flow lines.

6.3 Varible area meter (Rotameter) construction, working principle and its advantage over other method.

6.4 Positive displacement meter, Rotating lobe meter, Rotating vane meter, or Nutating disc meter reciprocating piston meter.

6.5 Velocity Flow Meter:

(a) Turbine meter.

(b) Hot wireflow meter.

(c) Electromagnetic flow meter.

(d) Ultrasonic flow meter.

6.6 Mass flow meter solid flow meter by weighting.

6.7 Flow through open channel:- Weirs and V-notch.

6.8 Methods of measurements of Fluid Flow by means of Orifice Plates and Nozzles, (for In-compressible fluids).

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7. MOISTURE MEASUREMENT:

7.1 Definition:

Direct drying and weighing method.

7.2 Electrical Methods:

Conductance method, capacitance method.

7.3 Use of moisture in process industries.

7.4 Humidity measurement difinition, absolute humidity relative humidity, precentage humidity Dew point, dry bulb temperature, wet temperature, Hydrometer.

8. MEASUREMENT OF DENSITY

Definition relationship between density, pressure at the bottom of column of liquid and weight of a given volume.

8.1 Liquid level method.

8.2 Displacement method.

8.3 Hydrometer method.

9. INSTALLATION :

Introduction, important symbols, method of installation of instrumentation system, Instrumentation flow diagram (few typical example).

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PROCESS INSTRUMENTATION LAB

1. To meaure pressure by various methods

A. Pressure Gauage (Burden, Bollow and diaphragm type)
B. Digital Pressure Indicator
C. Vaccum pressure by any available vacuum gauage and compare.

2. To measure and record pressure of line by graphic recorder and electronic pressure recorder.

3. To measure level of a tank by

A. Sight glass tube and flood method.
B. Capacitive level detector
C. resistive level detector.

4. To calibrate a pressure gauge using load weight tester and staudard pressure calibration.
5. To study the construction and operation of level limit siwtch and make an application circuit using level limit switch.
6. To draw the I/o characterstic of elex. pressure transmitter.
7. To measure speed of motor by

A. Mechanical tacometer
B. Optical tachometer
C. Inductive reductance type tachometer

8. To measure temperature of a furnace by various method.

A. thermometer
B. Thermocouple
C. Pyrometer (Total radiation and iptical pyrometer)
D. RTD
E. I.E. temperature sensor (Semiconductor type)

9. To record level/temperature using universal electronic meter.

10. To measure flow in a pipeline using

A. Orifice meter
B. Venturimeter
C. Rotameter
E. Electromagnetic flowmeter

11. To measure flow of air using anemometer.
12. To measure density of solution using electronic density meter and hydrometer
13. To measure moisture using moisturemeter.
14. To study various hardware to install all instrument and made coupling, connections etc using copper taking and complete a simple arrangement of given flow diagram.
15. To study various instrumentation symbols used and sraw all instrumentation flow diagram of a closed loop process control system.

NOTE: Out of 4 study type practical only 2 practicals should be performed and 10 practicals from other remaining 12 practicals should be performed.

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4.4 PRINCIPLE OF DIGITAL ELECTRONICS

(Common with Electronics Engineering and Computer Engineering, Information Technology)

L	T	P
6	-	6

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage L	Time T	P
Part-1				
1.	Introduction	3	-	-
2.	Number System	6	-	-
3.	Codes, Code Conversion & Parity	3	-	-
4.	Logic Gates	9	-	-
5.	Logic simplifications	9	-	-
6.	Logic Families & Digital ICs	9	-	-
Part2-	Combinational Logic Circuits			
7.	Arithemetic operations	6	-	-
8.	Encoder, Decoders & Display Devices Associated Circuits, Multiplexer & Demultiplexer	9	-	-
Part-3	Sequential Logic Circuits			
9.	Flip Flops	4	-	-
10.	Counters	6	-	-
11.	Shift Registers	4	-	-
Part-4				
12.	Memories	6	-	-
13.	A/D and D/A Converters	6	-	-
14.	Arthametic Circuits	4	-	-
		84	-	84

DETAILED CONTENTS

1. INTRODUCTION TO DIGITAL ELECTRONICS:

1.1 Basic difference between analog and digital signal.

1.2 Application and advantages of digital signal processing.

2. NUMBER SYSTEM:

2.1 Binary, Octal and Hexadecimal number system; conversion from decimal octal and hexadecimal to binary and vice-versa.

2.2 Binary addition, substraction, multiplication and division including binary points.

2.3 1's and 2's complements methoof substraction.

3. CODES, CODE CONVERSION AND PARITY:

3.1 The 8421 and excess-3 codes; mention of other populer BCD codes.

3.2 Addition of 8421, BCD coded numbers its limitations and

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excess-3 coded numbers.

3.3 Gray code, Gray to binary conversion and vice-versa.

3.4 Basic concept of parity, single and double parity and error detection.

4. LOGIC GATES:

4.1 Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates.

4.2 Concept of negative and positive logic.

5. LOGIC SIMPLIFICATIONS

5.1 Boolean algebra, Karnaugh-mapping (upto 4 varibles) and simple application in developing combinational logic circuits.

5.2 Implementation of logic equations with gates.

5.3 Use of NAND and NOR gates as universal gates.

6. LOGIC FAMILIES AND DIGITAL ICS:

6.1 Logic family classification :

(a) Definition of SSI, MSI, LSI, VLSI.

(b) Bipolar Logic, Diode Logic, Transistor Logic Intverter,TTL logic, MOS,CMOS logic, logic ECL

(c) Sub-classification of TTL and MOS logic families.

(d) Characteristics of TTL and MOS Digital gates delay, speed of noise margin, logic levels, power dissipation, FAN-IN, FAN-OUT, power supply requirements and comparison between TTL and MOS ICs.

6.2 Logic Circuits :

(a) Open collector and to tempole output circuit operation for a standard TTL, NAND gate.

(b) MOS circuit operation for a standard gate (NOR).

6.3 Tristate Switch : Normally open and normally closed switch.

6.4 Familiarisation with commerical digital IC gates, Their number identification and Pin configuration.

7. ARITHMETIC OPERATIONS:

7.1 Design of Exclusive Or, Half adder and Half subtractor.

7.2 Design of Full adder circuits and its operation.

7.3 Design of Full subtractor circuits and its operation.

7.4 Some examples (circuits) of code convertors.

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8. ENCODER, DECODERS & DISPLAY DEVICES ASSOCIATED CIRCUITS:

8.1 LED, LCD, seven segment display, basic operation of various commonly used types.

8.2 Four Decoder circuits for 7 segment display.

8.3 Basic decimal to BCD encoder circuits.

8.4 Use of decoders/driver ICs with reference to commerical ICs.

8.5 Basic Multiplexer and Demultiplexer

9. FLIP FLOPS:

9.1 Operation using waveforms and truth tables of following flip flops.
RS, T, RST, D, JK, Master/Slave JK Flip Flops mention of commonly used ICs Flip flops.

10. COUNTERS:

10.1 Counters classification.

10.2 Binary and decade counters.

10.3 Divide by N counters.

10.4 Programmable asynchronous counters.

10.5 Down counters up/down counter operations.

10.6 Presettable asynchronous counters.

10.7 Difference between asynchronous and synchronous counters.

10.8 Ring counters with timing diagram.

10.9 Familiarization with commerical TTL/CMOS counter ICs.

11. SHIFT REGISTERS:

11.1 Introduction and Basic concepts including shift left and shift right.

11.2 Serial in serial out.

Serial in parallel out.

Parallel in serial out.

Parallel in parallel out.

11.3 Universal shift register.

11.4 Familiarisation with common TTL/CMOS ICs.

11.5 Buffer register, Tristate Buffer Register.

12. MEMORIES:

12.1 Classification according to the following heads.

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(a) Volatile and non-volatile memories.

(b) Random access memories and sequential access.

(c) Semiconductor and non-semiconductor memories.

(d) Destructive and non-destructive memories.

12.2 Semi-conductor ROMs, PROMs, EPROM, SRAM, DRAM, Basic structure and working of CCD, R/W memory.

13. A/D AND D/A CONVERTERS:

13.1 Use of A/D and D/A converters.

13.2 Binary resister network R-2R network.

13.3 D/A converter using R-2R.

13.4 UP, UP/Down counter type A/D converter.

13.5 Successive approximation.

13.6 Basic concepts of parrallel A/D converter.

13.7 Two bit A/D converter.

14. ARITHMETIC CIRCUITS: Ideas About

14.1 Basic Arithmetic logic units applications.

14.2 Block diagram explanation of binary multiplier circuit.

List of Books

1. Malvino & Leach- Digital Principles & Application- Mcgraw Hill- 5th Edition.
2. Mano, M. Morris- Digital Logic and Computer Design- Prentic Hall (India)

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PRINCIPLE OF DIGITAL ELECTRONICS-LAB

List Of Experiments

1. Do atleast 20 experiments familiarzation with bread-board.

   Familiarzation With TTL And MOS ICs.

2. Identification of Ic-nos, Pin-nos, Ic types.

3. To observe that logic low and logic high do not have same voltage value in input and output of logic gate.

4. To observe the propagation delay of TTL logic gate.

5. Observation of the difference between MOS and TTL gates under the following heads

   (a) Logic levels.

   (b) Operating voltages.

   (c) Propagation delay.

   Display Devices And Associated Circuits.

6. Familiarisation and use different types of LEDs common anode and common cathode seven segment display.

7. Use of 7447 BCD to 7-segment decoder.

   Logic Gates.

8. Verification of truth table for 2 Input NOT, AND, OR, NAND, NOR, XOR Gates.

   Design And Implementation Of Simple Logic Circuits.

9. To construct a 4-bit even/odd parity generator/checker using XOR gates and to verify their truth tables.

10. To construct half adder and half subtractor using XOR and NAND gates verification of their truth tables.

11. To construct a full adder circuit with XOR and NAND gates.

12. (a) Study of 3 bit adder circuit implemented with or and NAND gates.

    (b) To construct 4 bit adder and full subtractor using full adder chip 7480 and NAND gates.

13. (a) To verify the truth table of 4 bit adder IC chip 7483.

    (b) To construct the 4 bit adder/2's complement subtractor using 7483 and NAND gates.

    Flip Flops.

14. To verify the truth table for selected positive edge triggered and negative edge triggered F/F of J-K and D type.

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Counters

15. To construct and verify truth table for asynchronous binary and decade using J-K flip flops.

16. (a) To construct divice by 60 counter using ripple.

    (b) To use counter IC chip 7493 in the divide by eight mode and divide by sixteen mode.

    (c) To construct a divide by 100 counter using CMOS.

17. To construct a divide by 60 counters using synchronous counter IC chips.

    Registers.

18. To construct a 4 bit buffer register using 4 bit register IC chip.

19. To construct a 4 bit universal shift register using flip flops.

20. To use a 4035 B universal shift register.

    Multiplexers And Demultiplexers.

21. To decode a 3 line to 8 line encode from 8 line to 3 line and to observe inputs and outputs.

22. Single plus to 16 line decoder and observation output after a 16 to 4 line encoder.

23. To use ALU chip for selected arithmatic and logic operations.

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V SEMESTER

5.1 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

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6	**2**	**-**

RATIONALE

The knowledge of this subject is required for all engineers/technicians who wish to choose industry/field as their career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about industrial and tax laws.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Principles of Management	8	-	-
2.	Human Resource Development	10	-	-
3.	Wages and Incentives	4	-	-
4.	Human and Industrial Relations	6	-	-
5.	Professional Ethics	2	-	-
6.	Sales and Marketing management	10	-	-
7.	Labour Legislation Act	10	-	-
8.	Material Management	8	-	-
9.	Financial Management	8	-	-
10.	Entrepreneurship Development	8	-	-
11.	Fundamental of Economics	5	-	-
12.	Accidents and Safety	5	-	-
		84	-	-

DETAILED CONTENTS

1. **Principles of Management**
   - 1.1 Management, Different Functions: Planning, Organising, Leading, Controlling.
   - 1.2 Organizational Structure, Types, Functions of different departments.
   - 1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.
   - 1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.
2. **Human Resource Development**
   - 2.1 Introduction, objectives and functions of human resource development (HRD) department.
   - 2.2 Recruitment, methods of selection, training strategies and career development.
   - 2.3 Responsibilities of human resource management – policies and functions, selection – Mode of selection – Procedure – training of workers, Job evaluation and Merit rating.
3. **Wages and Incentives**
   - 3.1 Definition and factors affecting wages, methods of wage payment.
   - 3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives of supervisor.
   - 3.3 Job evaluation and merit rating.
4. **Human and Industrial Relations**
   - 4.1 Industrial relations and disputes.
   - 4.2 Relations with subordinates, peers and superiors.
   - 4.3 Characteristics of group behaviour and trade unionism.
   - 4.4 Mob psychology.
   - 4.5 Grievance, Handling of grievances.

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4.6 Agitations, strikes, Lockouts, Picketing and Gherao.
4.7 Labour welfare schemes.
4.8 Workers' participation in management.

5. **Professional Ethics**
   5.1 Concept of professional ethics.
   5.2 Need for code of professional ethics.
   5.3 Professional bodies and their role.

6. **Sales and Marketing management**
   6.1 Functions and duties of sales department.
   6.2 Sales forecasting, sales promotion, advertisement and after sale services.
   6.3 Concept of marketing.
   6.4 Problems of marketing.
   6.5 Pricing policy, break even analysis.
   6.6 Distribution channels and methods of marketing.

7. **Labour Legislation Act (as amended on date)**
   7.1 Factory Act 1948.
   7.2 Workmen's Compensation Act 1923.
   7.3 Apprentices Act 1961.
   7.4 PF Act, ESI Act.
   7.5 Industrial Dispute Act 1947.
   7.6 Employers State Insurance Act 1948.
   7.7 Payment of Wages Act, 1936.
   7.8 Intellectual Property Rights Act

8. **Material Management**
   8.1 Inventory control models.
   8.2 ABC Analysis, Safety stock, Economic ordering quantity.
   8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.
   8.4 Material handling techniques.

9. **Financial Management**
   9.1 Importance of ledger and cash book.
   9.2 Profit and loss Account, Balance sheet.
   9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.

10. **Entrepreneurship Development**
   10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.
   10.2 Distinction between an entrepreneur and a manager.
   10.3 Project identification and selection.
   10.4 Project formulation.
   10.5 Project appraisal.
   10.6 Facilities and incentives to an entrepreneur.

11. **Fundamental of Economics**
   11.1 Micro economics.
   11.2 Macro economics.

12. **Accidents and Safety**
   12.1 Classification of accidents based on nature of injuries, event and place.
   12.2 Causes and effects of accidents.
   12.3 Accident-prone workers.
   12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.
   12.5 Safety consciousness and publicity.
   12.6 Safety procedures.
   12.7 Safety measures – Do's and Don'ts and god housing keeping.

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5.2 SIGNAL TRANSMISSION RECORDING AND DISPLAY

L	T	P
8	2	-

Rationale :

The type of display device for the quantity to be measured depends on the actual working atmosphere in the industry. The processing of signal depends on the type of data sensining and handling equipment. the suitability for anologue, digital and recording system used by the industry. The objective of this paper is to equip the student with basic knowledge of display devices, display systems, data transmission and telemetry, recorders, instrumentation amplifiers and data acquisition systems which will be useful for the student for handling problems prevailing in the industry atmosphere.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Display Devices	12	4	-
2.	Display Systems	12	4	-
3.	Recorders	12	5	-
4.	Data Transmission & Telemetry	12	5	-
5.	Instrumentaion Amplifiers	16	5	-
6.	Data Acquisition System	20	5	-
		84	28	-

DETAILED CONTENTS

1. DISPLAY DEVICES:

Classification of display devices, working principles and typical use of various display devices-calthode ray tube (Gen. prupose CRTS, storage CRTS flat CRTS) Light Emitting Diodes, Seven segment display, Liquid Crystal displays, Electro luminescent displays, Incandescent displays, Electrophoretic image displays, Touch screen display-Introduction, Types of touch screen display, Resistive and capacitive touch screen display concept and construction, Application of touch screen..

2. DISPLAY SYSTEMS:

Elements of controlling a display system, Use and implementation of Code converter, latches and shift registers, Counters in display systems. Few examples of display systems-using CRT display (General Purpose), LED display, LCD display other displays.

3. RECORDER:

Necessity of recorder, Basic requirements of a recording systems, classification of recorders-Analog (Graphic, Oscillographic and magnetic recorders) and Digital recorder.

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3.1 Graphic Recorders:

Strip chart recorders- (Galvanometer type, Null type recorders) and X-Y recorders.

3.2 Oscillographic Recorders:

3.3 Magnetic Recorders:

3.4 Digital Recorders:

Basic concept of Digital recorder, types of Digital, recorder:

1. Electro magnetic recorder (Digital type recorder).
2. Introduction and uses of Bar Code Reader & Recorder (Optical).
3. Introduction and uses of Quick Response(QR) code reader and recorder (Optical).

DATA TRANSMISSION AND TELEMETRY:

4.1 Methods of Data Transmission - Hydraulic, pneumatic, electrical or electronic.

4.2 Definition of Telemetry, General requirements of Telemetry system.

4.3 Types of Telemetry

1. Voltage Telemetry.
2. Current Telemetry.
3. Position Telemetry.
4. A. C. Telemetry-Concept of modulation and demodulation (A.M., F.M. and Phase modulation).
5. Pluse Telemetry System - Analog pluse telemetry (PAM, PFM, PDM, PPM) and Concept of Digital telemetry- PCM, Delta Modulation (Basic Principle Only)

4.4 Transmission Channels And Medias:

(Concept only) wire line channels, Radio channels, Microwave channels, Power line carrier channel and optical fibre channels.

4.5 Multiplexing In Telemetring System:

Time division multiplexing (TDM) and frequency division multiplexing (FDM), Concept of CDMA (Code Division Multiple Access).

4.6 Introduction to Demultiplexing.

4.7 Smart type transmitter using HART (Highway Addressable Remote Transmitters). techniques.

5. INSTRUMENTATION AMPLIFIER:

Introduction and Characteristics of instrumentation amplifiers in respect of input impedance, output impedance,

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drift, d.c. offset noise, gain, common mode rejection ratio, frequency response, slew rate etc.. Relating the suitability of these characteristics for amplifying signals from various transducers.

6. DATA ACQUISTION SYSTEMS (DAS):

6.1 General concept, Importance of DAS to instrumentation.

Types of DAS components of

1. Analog data acquistion system.
2. Digital data acquisition system.

Use of Data Acquisition system. Use of recorder in digital data acquisition systems.

6.2 Modern trends in DAS - Instroduction of microprocessor in DAS.

6.3 SCADA - An introduction and programming method, advantage.

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5.3 ELECTRONIC INSTRUMENTS AND MEASUREMENTS

(Common with Electronics Engineering and Computer Engineering)

L	T	P
5	1	6

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	2	1	-
2.	Multimeters	6	1	-
3.	Electronic Multimeter	6	1	-
4.	A. C. Millivoltmeter	6	1	
5.	Cathode Ray Oscillograph	12	3	-
6.	Audio Power Meter	6	1	-
7.	Signal Generator	6	1	-
8.	Impedance Bridges & Meters	6	1	-
9.	Regulated Power Supply	9	2	-
10.	Digital Instrument	9	2	-
		70	14	84

DETAILED CONTENTS

1. INTRODUCTION TO THE PROCESS OF MEASUREMENTS:

1.1 Review of the terms, accuracy, precision, sensitivity range and errors, difference between accuracy, precision and resolution.

1.2 Precaution against high frequency noise pick up and remedies, shielding and grounding (two terminal and three terminals).

1.3 Concept of selective wide band measurements.

2. MULTIMETERS:

2.1 Principle of measurement of D.C. voltage and D.C. current, A.C. voltage and A.C. current and resistance in a multimeter.

2.2 Specifications of a multimeter and their significance.

2.3 Limitations with regards to frequency and impedance.

3. ELECTRONIC MULTIMETER:

3.1 Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity, principles of voltage, current and resistance measurements.

3.2 Specification of electronic multimeter and their significance.

4. A. C. MILLIVOLTMETER:

4.1 Types of AC millivoltmeters: Amplifier-rectifier and

rectifier amplifier, block diagram and explanation of the above types of A.C. milli voltmeter.

4.2 Typical specifications and their significance.

5. CATHODE RAY OSCILLOSCOPE:

5.1 Construction of CRT, Electron gun, Electrostatic focussing and acceleration (Explanation only-no mathematical treatment) Deflection sensitivity, Brief mention of screen phospher for CRT. Internal Block Diagram of CRO.

5.2 Explanation of time base operation and need for blanking during flyback, synchronisation.

5.3 Block diagram and explanation of a basic CRO and a triggered sweep oscilloscope, front panel controls.

5.4 Specifications of CRO and their significance.

5.5 Use of CRO for the measurement of voltage (D.C. & A.C.) frequency using Lissagious figure, time period, phase.

5.6 Special features of dual trace, delayed sweep and storage CROs (Brief mention only).

5.7 CRO probes including current probes.

5.8 Working Principle of Spectrum Analyzer.

6. AUDIO POWER METER:

6.1 Block diagram of an audio power meter.

6.2 Principles of working its application and high frequency limitations.

6.3 Scale conversion from power to db.

7. SIGNAL GENERATORS:

7.1 Block diagram explanation of laboratory type low frequency and RF signal generators, pulse generator and function generator.

7.2 Specification for low frequency signal generator, RF generator,pulse generator and function generator. Brief idea of testing specification for the above instrumets.

7.3 Standard signal generator.

8. IMPEDANCE BRIDGES Q METERS:

8.1 D.C. and A.C. Bridges :

D.C. bridges- Wheat stone bridge, Kelvins bridges, Senstivity- Null indicators.

A. C. Bridges - Inductance bridges (Maxwell bridge), Capacitance bridges, Hays bridge, Anderson bridge, Schering bridge, Wein bridge, Twin betwork, Storage factor, Dissipation factor and their measurments.

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8.2 Block diagram explanation and working principle of laboratory types (balancing type) RLC bridge. Specifications of a RLC bridge, Principle of digital RLC bridge.

8.2 Block diagram and working principles of a Q meter.

9. REGULATED POWER SUPPLY:

9.1 Block diagram of regulated power supply, IC based power supply.

9.2 Major specifications of regulated power supply, and their measurement (line and load regulation, output ripple and transients).

9.3 Basic working principles of switched mode power supply.

9.4 Concept of floating and grounded power supplies and their interconnections to obtain multipple output supplies.

9.5 Basic working principle of uninterupted power supply

10. DIGITAL INSTRUMENTS:

10.1 Comparison of Analog and Digital instruments, characteristics of digital meter.

10.2 Working principle of Ramp, Dual slope and integrating type of digital voltmeter.

10.3 Block diagram and working of a digital multimeter.

10.4 Working principle of time interval frequency and period measurement using universal counter, frequency counter, time base stability and accuracy and resolution.

List of Books

1. A. K. Sawhney - A course in Electrical & Electronic Measurement & Instrumentation - Dhanpat Rai & Sons
2. Helfric & Cooper - Modern Electronic Instrumentation and Measurment Techniques- PHI

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ELECTRONIC INSTRUMENTS AND MEASUREMENT LAB

List Of Practicals

1. Loading effect of a multimeter and its limitations to measure high frequency voltages.

2. Measurement of Q of a coil and its dependence on frequency using a Q meter.

3. Measurement of voltage, frequency, time period, phase angle and delay time using CRO : (use of Lissagious Figures).

4. Measurement of time period, frequency, average period using universal counter frequency counter.

5. To test a power supply for ripple, line and load regulation, Tracing of wave form, To findout operating range of power supply.

6. Measurement of rise, fall and delay time using a CRO.

7. Measurement of distortion of a LF signal generator using distortion factor meter.

8. Measurement of R.L. and C using a LRC bridge/universal bridge.

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5.4 INDUSTRIAL CONTROL

L	T	P
6	-	6

Rationale :

Electrical energy is the main source of energy for running nearly all type of industries. The machines are mainly driven by the electrical energy. Therefore the control of electrical power is of utmost importance in these machines. The objective of this paper is to familiarize the student with reponse of simple first order and second order systems, input, output relationships, components and devices used in control systems, thyristors and their application in heating, welding and motor control.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	8	-	-
2.	System Excitation & Response of Simple System	8	-	-
3.	Input Output Relationship of Control System	8	-	-
4.	Components & Devices Used In Control Systems	8	-	-
5.	Thyristors & Their Application	30	-	-
6.	High Frequency Heating & Welding	10	-	-
7.	Solid State Motor Control	12	-	-
		84	-	84

DETAILED CONTENTS

1. INTRODUCTION:

Need of automatic control, classification of control systems:-

(a) Open loop and closed loop system, block diagram of feed back control system and its basic elements.

(b) Definition of other types of control system e.g.

(i) Linear and Nonlinear system.
(ii) Single input - Single output (SISO) system and Multi Input - Multi-output (MIMO) system.
(iii) Static and dynamic systems.
(iv) Constinuous and discrete systems.

2. SYSTEM EXCITATION AND RESPONSE OF SIMPLE SYSTEMS:

2.1 Step, ramp and pulse type of inputs with examples.

2.2 Response of first order and second order systems with

examples.

2.3 Response due to forcing function, response to step and ramp inputs.

2.4 Difinitions of over shoot, under shoot, rise time and damping ratio, damping coefficient, settling time and peak time.

3. INPUT OUTPUT RELATIONSHIP OF CONTROL SYSTEMS:

3.1 Concept of laplace transform & reverse laplace of some useful functions 3.2 Theorems regarding initial and final values.

3.3 Derivation of transfer functions from basic relationship.

3.4 Transfer function of a system in cascade.

3.5 Transfer function of a system with feed back.

3.6 Block diagram representation of control system & simplification technique

4. COMPONENTS AND DEVICES USED IN CONTROL SYSTEMS:

Brief description,working of potentiometer, self balancing potentiometers, Servo motors, Eddy current clutches, Relays and contactors, Timing relays, Saturable core reactor and its use as magnetic amplifier.

5. THYRISTORS AND THEIR APPLICATIONS:

5.1 Name, symbol and typical application of members of Thyristor family.

5.2 SCR, TRIAC AND DIAC:

Basic structure, operation V-I chereacteristics and ratings, gate circutis, ratings Triggering process and ckts, Turn off methods and circuits.

5.3 UJT:

Operation, V-I cherecteristics, use in relaxation oscillator, use of relaxation oscillations for triggering thyristors.

5.4 HALF WAVE FULL WAVE RECTIFIERS:

(Including Bridge) and poly phase rectifiers using SCRS, explanation of 3 phase bridge controlled rectifier and its applications.

5.5 Principle of operation of basic inverter circuits basic series and parallel commutated inverter circuits. Operation of choppers and applications.

6. HIGH FREQUENCY HEATING AND WELDING:

Induction heating, dielectric heating, their application in industry, resistance welding, electronic control of resistance welding and heating processes.

7. SOLID STATE MOTOR CONTROL:

7.1 Application of phase controlled rectifiers and A.C.

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phase control circuit in illumination control and temperature control.

7.2 D. C. motor speed control; phase control, integral cycle control, chopper control.

7.3 A. C. motor speed control.

7.4 Regenerative Braking.

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INDUSTRIAL CONTROL LAB

1. To plot the time response of a first order electrical system.

2. To plot time response of second order electrical system and find out transfer function of a LCR circuit.

3. To draw the characteristic curves of S.C.R., Diac and Triac.

4. To study a power rectifier using SCR and draw input and output wave forms.

5. To study a single phase inverter.

   Circuit using S.C.R. and draw input and output wave forms.

6. To fabricate a S. C. R. chopper circuit, test it and determine duty cycle.

7. To study the effect of variation in firing angle on a C.R.O. and to plot the wave shapes.

8. To study the data transmission with the help of two synchros.

9. To fabricate the traic Diac motor speed control circuit and draw input output (Speed) characteristics.

10. To study construction details of the following components (The components may be dessembled and construction details drawn)- Servo motor, Self balancing potentiometer, Eddy current clutch, Relay, Contactor limit switch.

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5.5 (i)MEDICAL INSTRUMENTATION :ELECTIVE - I

L	T	P
5	1	-

Rationale :

Instrumentation has brought a new revolution in the field of medical science. An insite into human boduy could become possible on account of introduction of various bio instrumentation and cure of various impossible diceases could become possible. An instrumemtation engineer is now a days equally useful for industry as well as medical field.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	HUMAN PHYSIOLOGY	8	2	-
2.	OVERVIEW OF MEDICAL ELECTRONICS EQUIPMENT	6	1	-
3.	ELECTRODES	6	1	-
4.	MEDICAL TRANSDUCERS	6	1	-
5.	BIO-MEDICAL RECORDERS	8	2	-
6.	MEDICAL DISPLAY SYSTEMS	4	1	-
7.	PATIENT MONITORING SYSTEM	6	1	-
8.	ULTRASOUND INSTRUMENTATION	6	1	-
9.	DEFIBRILLATOR AND PACE MAKERS	6	1	-
10.	PHYSIOTHERAPY	8	2	-
11.	LOW VOLTAGE THERAPY INSTRUMENTS	6	1	-
		70	14	-

DETAILED CONTENTS

1. HUMAN PHYSIOLOGY :

1.1 Elementary ideas of cell structure.

1.2 Heart and circulatory system.

1.3 Central Nervous system,

1.4 Muscle action,

1.5 Respiratory system,

1.6 Body temperature

2. OVERVIEW OF MEDICAL ELECTRONICS EQUIPMENT :

Classification, Application of diagnostic, therauptic and clinical laboratory instruments. With example in diagnostic- Blood Pressure Measurement.

3. ELECTRODES :

Bio-electric signals

Bio-electrodes

Electrodes-tissue interface

Contact impedance

Effects of high contact impedance

Types of Electrodes :

a) Electrodes for ECG
b) Electrodes for EEG
c) Electrodes for EMG

4. MEDICAL TRANSDUCERS :

Pressure transducers

Types of pressure transducers -

Flow transducers

Temperature transducers

a) Thermocouples

b) Thermistors

c) Pulse sensors

5. BIO-MEDICAL RECORDERS :

Principle of Physiological pre amplifier and specialised amplifiers. Generalised block diagram of a Bio-medical recorder.

ECG machine
Block diagram of ECG machine
ECG leads
EEG machine, EEG leads
EMG machine

6. MEDICAL DISPLAY SYSTEMS :

Cardioscope

Cardioscope as sub system

Multi-channel display system.

7. PATIENT MONITORING SYSTEM :

Concept, block diagram and working.

Microprocessor application in patient monitoring.

8. ULTRASOUND INSTRUMENTATION :

Basic principles of ultra-sonics

Doppler principle

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Feotal Monitor

Pulse-echotechnique

Pulse-echoinstrument and imaging system, scanners.

9. DEFIBREILLATOR AND PACE MAKERS :

Block diagram and principle of

a) DC defibrillator

b) Synchronised defibrillator

c) Pace makers.

10. PHYSIOTHERAPYS :

Short wave dia-thermy machine

Control of output power

Application techniques

11. LOW VOLTAGE THERAPY INSTRUMENTS :

Diagnostic stimulators

Therapy stimulators

Constant current/constant voltage stimulators.

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5.5 SPECIALISED INSTRUMENTS : ELECTIVE - II

L	T	P
5	1	-

Rationale :

The objective of this paper is to prepare students to work as successful technician in the hi-tech and research organisations. A student having knowledge of X-rays, Ultrasonic, Nuclear instruments, Vibration & Noise measurement, Chromatography and Electrophoresis etc. will prove useful for related field.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	X- rays	6	2	-
2.	Ultra Sonic	8	2	-
3.	Nuclear instruments	8	2	-
4.	Chromatography	12	2	-
5.	Electrophoresis	12	2	-
6.	Spectrometry	12	2	-
7.	Gas Analyzer & Sampling	12	2	-
		70	14	-

DETAILED COURSE CONTENTS

1. X-RAYS:

Generation, application, use of X-ray in non destructive testing with the help of following methods.

(a) Roentgenographic method.
(b) X erograblic method.
(c) Roentgenoscopic method (Fibroxcopic method).

2. ULTRA SONIC:

Generation, application in non destructive testing by following method.

(a) Direct sounding or shadow methods.
(b) Oscillation reflection method.
(c) Ultra sonic pulse method.
(d) Application of Ultrasonic for thickness measurement.

3. NUCLEAR INSTRUMENTS:

Types of nuclear rediation, measurement of radio activity ionisation chamber, proportional counter geiger muller counter and scientillation counter. application of Gama Rays in non destructive testing by radiomatic methods. Application of radio activity in density and thickness measurements.

4. CHROMATOGRAPHY:

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Gas liquid chromatorgraphy, Gas analysis- Using thermal conductivity and Flame ionisation detecter..

5. ELECTROPHORESIS:

The principle of working of electrophoresis and polarography.

6. SPECTROPHOTOMETRY:

I- Principle of filter photometer, direct reading type and double beam spectrophoto meter for visible infrared and ultraviolet regions, advantages of double beam spectrophotometer.

II- Principle of colorimetry, photometry and flame photometry and use of various types of colorimeter photometers and flame photometers.

7. GAS ANALYSER AND SAMPLING TECHNIQUE:

Basic function of analyser, types of analysers- infrared and Zirconium oxide based analyser, Working principle and construction of gas analyser, Precautions to be taken in maintaining accuracy, Need of sampling, technique of sampling.

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5.5 ADVANCE MICROPROCESSOR AND INTERFACE : ELECTIVE-III

(Common to Diploma Electronics Engg. Spl. in Micro-Processor)

L	T	P
5	1	-

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Topic 1	20	4	-
2.	Topic 2	15	3	-
3.	Topic 3	15	3	-
4.	Topic 4	15	3	-
5.	Topic 5	5	1	-
		70	14	-

DETAILED CONTENTS

1. 80286- A MIRCORPOCESSOR WITH MEMORY MANAGEMENT & PROTECTION:

   Sailent features of 80286, Internal architecture of 80286, Signal descriptions of 80286, Real addressing mode, Protected virtual address mode, Privilege, Protection, Special operation, 80286 Bus interface, Basic Bus operation, Fetch cycles of 80286, 80286 Minimum system configuration, Interfacing memory and I/O devices with 80286, Priority of bus use by 80286, Bus Hold and HLDA sequence, Interrupt acknowledge sequence, Instruction set features.

2. 80386, 80486 - THE 32 BIT PROCESSOR :

   Salient feature of 80386, Architecture and signal description of 80386, Register organization of 80386, Addressing modes, Coprocessor 80387.

3. AN INTRODUCTION TO THE PENTIUM MICROPROCESSOR :

   Introduction, real mode and protected mode operation, The software model of the Pentium, A functional description of the Pentium, Pentium processor registers, Pentium data organization, Pentium instruction types, Pentium addressing mode, Interrupts, Pentium instruction, Assembly Language Programming, Interrupt Processing.

4. AN INTRODUCTION TO MICROCINTROLLER 8151 AND 80196 :

   Intel's family of 8-bit microcontroller, Architecture of 8051, Signal description of 8051, Register set, Interrupts.

5. PIPELINING AND CACHE :

   Pipelind implementation, MIPS, MIPSR4300, ABC cache, Cache performance, Reducing cache introduction, Reducing Hit Time, Cache Miss Penalty

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LIST OF BOOKS

1. A. K. Ray & K. M. Bhurchandi- Advanced Microprocessor and Peripherals- Tata Mcgraw Hill.

2. B. P. Singh - Advanced Microprocessor and Microcintrollers- New Age International.

3. Brey, Barry B - Intel Microprocessor

4. D. V. Hall - Mecroprocess Interfacing

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5.5 COMPUTER AIDED INSTRUMENTATION : ELECTIVE-IV

L	T	P
5	1	-

TOPIC WISE DISTRIBUTION OF PERIODS

S1.NO.	UNITS	COVERAGE TIME L	T	P
1.	Computer Aided Instrumentation	12	3	-
2.	BUSES & Standards	12	3	-
3.	Interfacing Using C/VB	12	3	-
4.	I/O Interface Card	12	2	-
5.	Signal Conditioning	10	1	-
6.	Interfacing Technique	12	2	-
		70	14	-

DETAILED CONTENTS

1. COMPUTER AIDED INSTRUMENTATION

Introduction to PC based instrument, General Structure, Advantage and disadvantages of computer control, Comparision with other control system.Introduction to various instrument packages like Labview, Genic, Daisy,lab, etc.

2. BUSES AND STANDARDS :

Introduction, ISA bus, EISA bus, PCI bus, GPIB, RS232 (Brief idea about each type of bus system).

3. INTERFACING USING C/VB :

Introduction of C/VB interfacing language, Small routes for interfacing, Graphic design through C/VB, File generation for data storage, Data aquisition throgh C/VB, Real time interfacing and display, Software compensation techniques.

4. I/O INTERFACE CARD :

Introduction, description and installation of PCL 225 digital, I/O card and Opto I/O card, their features and application areas.

5. SIGNAL CONDITIONING :

OP-amp, Installation Amp., Mux and Demux, ADC and DAC.

6. INTERFACING TECHNIQUE :

Serial interfacing, Parallel interfacing, USB port interfacing and its programming, Instrumentation packages line Lab View, Daisy Lab, Genie- Programming, configuring sensors, measurement and analysis.

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VI SEMESTER

6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

L	T	P
4	-	-

RATIONALE:

A diplima student must have the knowledge of different types of pollution caused due to industrialisation and construction activities, so as he may help in balancing of eco-system and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.

TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Introduction	6		
2.	Pollution	4		
2.1	Water Pollution	8		
2.2	Air Pollution	8		
2.3	Noise Pollution	4		
2.4	Radio Active Pollution	6		
2.5	Solid Waste Management	6		
3.	Legislations	4		
4.	Environmental Impact Assessment	4		
5.	Disaster Management	6		
	TOTAL	56	-	-

DETAILED CONTENTS

1. INTRODUCTION :

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigration, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.

- Lowering of water level , Urbanization.

- Biodegradation and Biodegradibility, composting, bio remediation, Microbes .Use of biopesticidies and biofungicides.

- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain,etc.

2. POLLUTION :

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION :

- Factors contributing water pollution and their effect.

- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.

- Physical, Chemical and Biological Characteristics of waste water.

- Indian Standards for qulity of drinking water.

- Indian Standards for quality of treated waste water.

- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, GO, CO2, NH3, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.

A. Settling chambers
B. Cyclones
C. Scrubbers (Dry and Wet)
D. Multi Clones
E. Electro Static Precipitations
F. Bog Fillers.

- Ambient air qulaity measurement and their standards.

- Process and domestic emission control

- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

2.4 RADISACTIVE POLLUTION :

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made thereunder-

- The Water (Prevention and Control of Pollution) Act - 1974.

- The Air (Prevention and Control of Pollution) Act - 1981.

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- The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.

  # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000

  # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003.

  # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.

  # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.

  # Municipal Solid Wastes (Management and Handling) Rules, 2000.

  # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.

- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT :

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benifit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

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6.2 PROCESS CONTROL

L	T	P
6	2	8

Rationale :

To keep output at predesired value some adjustment in process parameters is required during the plant operation. The control actions to be performed are mainly On-Off, proportional, integral and derivative. These control actions can be performed by pneumatic, electric, electronics, hydraulic or mechanical controllers. The controlled variable is finally fed to the final control elements. The students if familiar with different type of controllers, their installation and maintenance will be more suitable to the process industries.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Introduction	6	1	-
2.	Automatic Control Actions	12	2	-
3.	Pneumatic & Hydraulic Controllers	8	1	-
4.	Electronic Controllers	10	2	-
5.	Direct Digital Control System	10	2	-
6.	Programmable Logic Controller	10	2	-
7.	Distributed Control System	10	1	-
8.	Final Control Elements	10	1	-
9.	Preventaive Maintenance	6	1	-
10.	Virtual Instrumentation	2	1	-
		84	14	112

DETAILED CONTENTS

1. INTRODUCTION:

Basic of Process control, Process and process charcteristics, (Static and Dynamic) resistance and capacitance of a process, analog with electrical system, process time delay, dead time process delay in single capacitor and two capacitor process, response of general control process in following diagram of a general closed loop process control system.

2. AUTOMATIC CONTROL ACTIONS:

Types of control actions, control action, two position control (one/off action) Proportional, proportional plus derivative action, proportional plus integral, proportional plus integral plus derivative action, Control Scheme- Feed Forward.

3. PNEUMATIC AND HYDRAULIC CONTROLLER:

Flapper-Nozzle system as control element, characteristic of flapper-nozzle system, Effect of non linearity of various gain, direct active and reverse acting relay as amplifier in pneumatic system. On/Off, P, PI, PD and PID pneumatic controller, Hydraulic fluids, Jet nozzle as control

component comparision between hydraulic and pneumatic control system. Hydraulic controller (On/Off, P, PI, PD and PID type).

4. ELECTRONIC CONTROLLERS:

Opamp as building block of Elex controller, On/Off, P, PI, PD, PID, Elex. Controller.

5. DIRECT DIGITAL CONTROL SYSTEM :

Introduction, DDC structure, DDC software basics, Advantage and disadvantage of DDC.

6. PROGRAMMABLE LOGIC CONTROLLER (PLC) :

Introduction, Principle of operation, Architecture of programmable controller, Programming the programmable controller, Application of programmable controller.

7. DISTRIBUTED CONTROL SYSTEM (DCS) :

Real time computer control system - A concept, Functional requirements of distributed process control system, System architecture, Distributed control system, Configuration, Some popular DCS.

8. FINAL CONTROL ELEMENT :

Introduction, Pneumatic actuator, Hydraulic actuator, Electric actuators, Motor actuators, Control volves, Use of final control elements. Types of control valves, Globe, Butterfly and Ball valves, Solenoid valves. Uses of final control element.

9. PREVENTIVE MAINTENANCE:

Objectives of preventive maintenance, elements of preventive maintenance,Procedure of preventive maintenance, simple example of preventive programmes and maintenance schedules.

10. VIRTUAL INSTRUMENTATION :

Concept of data flow techniques, basics of data acquisition and use of analysis tools.

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PROCESS CONTROL LAB:

LIST OF EXPERIMENTS

1. To draw characteristic of
   A. Quick opening control valve
   B. Equal percentage control valve
   C. Linear control valve

2. To draw the characteristic of valve
   A. Without positioner
   B. with valve positioner and compare it

3. To study the working of D/P transmitter and plot the I/o characteristic at different range of I/P span.

4. To study the working of ON/OFF level controller and draw I/O characteristics.

5. To study the PLC ladder logic and do various experiment of given PLC.

6. To fabricate an allication circuit using PLC and Various sensors and write a program to operate it in various way.

7. To study PC/PLC based multiprocess control system using training module.

8. To study a distributed control system pannel and do various experiment task on it.

9. To design a simple control diagram on SCADA software and link it to a given PLC and do various experiment on it.

10. Design a control loop of a typical process using LABVIEW and do various task using using virtual instrumentation software.

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6.3 MICROPROCESSORS AND APPLICATIONS

(Common with Electronics Engineering and Computer Engineering)

L	T	P
6	2	8

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time L	T	P
1.	Over View of Microcomputer System	6	1	-
2.	Memory of A Microcomputer	15	3	-
3.	C.P.U. and Control	15	3	-
4.	Introduction To 8085 Microprocessor	15	3	-
5.	Architecture of 8086 Microprocessor	12	3	-
6.	Assembly Language Programming	12	4	-
7.	Basic I/O Interfacing	12	4	-
8.	Memory Interfacing	12	4	-
9.	Advance Microprocessor & Micro Controllers	12	3	-
		84	28	112

DETAILED CONTENTS

1. OVERVIEW OF MICROCOMPUTERS SYSTEM:

1.1 Functional block.

(a) CPU.

(b) Memory.

(c) Input/Out devices (Key board, Floppy drive, Harddisk drive, Tape drive, VDU, Printer, Plotter).

1.2 Concept of programme and data memory.

(a) Registors (general purpose).

(b) external memory for storing data and results.

1.3 Data transfer between registers.

1.4 Concept of tristate bus.

1.5 Control on registers.

2. MEMORY OF A MICROCOMPUTER:

2.1 Concept of byte organised memory.

(a) Address inputs.

(b) Address space.

(c) Data input/output.

2.2 Addressing and Address decoding.

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(a) Memory system organisation.

(b) Partitioning of total memory space into small blocks.

(c) Bus contention and how to avoid it.

2.3 Memory chips.

(a) Types of ROM, RAM, EPROM, PROM.

(b) Read/Write inputs.

(c) Chip enable/select input.

(d) Other control input/output signals.

- Address latching.
- Read output.
- Address strobes.

(f) Power supply inputs.

2.4 Extension of memory.

- In terms of word length and depth.

3. C P U & CONTROL:

3.1 General microprocessor architecture.

3.1 Instruction pointer and instruction register.

3.2 Instruction format.

- Machine and Mnimonics codes.
- Machine and Assembly language.

3.3 Instruction decoder and control action.

3.4 Use of Arthematic Logic Unit.

- Accumulator.
- Temporary Register.
- Flag flip-flop to indicate overflow, underflow, zero result occurance.

3.5 Timing and control circuit.

- Crystal and frequency range for CPU operation.
- Control bus to control peripherals.

4. INTRODUCTION OF 8085 MICROPROCESSOR:

Evolution of Microprocessor, Register Structure, ALU, BUS Organization, Timing and Control.

5. INTRODUCTION OF 8086 MICROPROCESSOR:

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Internal organization of 8086, Bus Interface Unit, Execuation Unit, Unit, register, Organization, Sequential Memory Organization, Bus Cycle.

6. ASSEMBLY LANGUAGE PROGRAMMING :

Addressing Modes, Data Transfer, Instructions, Arithmetic and Logic Instruction, Program Control Instructions (Jumps, Conditional Jumps, Subroutine Call) Loop and String Instructions, Assembler Directives.

7. BASIC I/O INTERFACING :

Programmed I/O, Interrupt Driven I/O, DMA, Parallel I/O (8255-PPI, Centronics Parallel Port), Serial I/O (8251/8250, RS-232 Standard), 8259-Programmable Interrupt Controller, 8237-DMA Controller, 8253/8254-Programmable Timer/Counter, A/D and D/A conversion.

8. MEMORY INTERFACING :

Types of Memory, RAM and ROM Interfacing with Timing Considerations, DRAM Interfacing.

9. ADVANCE MICROPROCESSOR AND MICRO CONTROLLERS :

Brief idea of Microcontroller 8051, Pentium and Power PC

NOTE :

Study of Popular ICs Read/Write Chips-8155/8156, 2114,2148,2164. ROM Chips- 8355,2716,2732,8755. Other support chips - 8279,8257,8275,8205.

LIST OF BOOKS

1. Singh, B. P. - Advanced Microprocessor and Microcontrollers- New Age International.

2. Singh, B. P. - Microprcessor Interfacing and Application - New Age International.

3. Brey, Barry B. - INTEL Microprocessor - Prentic Hall (India)-4th Edition.

4. Liu and Gibson G.A. - Microcomputer System - The 8086/8088 Faimly-Prentice Hall (India) 2nd Edition.

5. Sombir Singh - Microprocessor and Its Application - Jai Prakesh Publication, Meerut

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MICROPROCESSORS AND APPLICATIONS LAB

List Of Practicals

1. Assembly language programming :- Programming of simple problems.

2. Simple programming problems using 8085 and 8086 microprocessor. Trainer kit to gain competence in the use of

   (a) 8085 and 8086 Instruction set.

   (b) Support chips of 8085 and 8086.

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6.4 PROJECT

SUGGESTED LIST OF PROJECT

1. Study of a large plant (Power Station, Cement, Fertilizer etc.) and it control :

   To prepare process flow and piping and instrumentation diagram of a section. Identify their instruments, systems and control parameters, ranges and specifications and makes of each items.

2. Design and rigging up of a simple control loop e.g.

   - Temperature control in an oven.
   - Maintaining constant temperature in hot water tank.
   - Level control in a water tank.
   - Flow control in a pipe line.
   - Control of pressure in a pressurized vessel.
   - Maintaining a constant PH of a solution by injection (acid or alkali).

3. Design and making a simple on/off controller for temperature using ICs, capacitors, resistors on a printed circuit board.

4. Design and alarm annunciation scheme for motor control (trip, supply, failure, overheating) and realizing the same in a control panel using relays, push buttons and lamps.

5. Design and make a regulated DC. power supply.

6. To dismantle and lap a control valve. Assemble and test it hydraulically.

7. Design and fabricate a simple measuring instrument.

8. Design and fabricate a signal transmitter.

9. Design and fabricate a signal convertor.

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SIX SEMESTER DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING
STAFF STRUCTURE

Intake of the Course 60
Pattern of the Course Semester Pattern

Sl. No.	Name of Post	No.	
1.	Principal	1	
2.	H.O.D.	1	
3.	Lecturer Electronics	2	
4.	Lecturer in Instrumentation & Control	2	
5.	Lecturer in Maths	1	Parttime or common with other discipline if the intake is more than 180
6.	Lecturer in Chemistry	1	
7.	Lecturer in Physics	1	
8.	Lecturer in Comm. Tech.	1	
9.	Lecturer in Elect. Engg.	1	
10.	Computer Programmer	1	
11.	Steno Typist	1	
12.	Accountant / Cashier	1	
13.	Student / Library Clerk	1	
14.	Store Keeper	1	
15.	Class IV	6	
16.	Sweeper	Part time as per requirement	
17.	Chaukidar & Mali	as per justification	

Note :

1. Services of other discipline staff of the Institute may be utilized if possible

2. Qualifications of Staff : as per service rule
3. The post of "Computer Programmer" in not needed in the institutions where diploma in "Electronics Engineering" is running.

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SPACE REQUIREMENT

[A] ADMINISTRATIVE BLOCK

Sl. No.	Details of Space	Floor Area Sq. metres
1.	Principal's Room	30
2.	Confidential Room	10
3.	Steno's Room	6
4.(a)	Office including Drawing Office	80
(b)	Record Room	20
5.	Staff Room	
	(a) Head 1	15
	(b) Lecturer 10 sq.m./ Lect. for 8 Lecturers	80
6.	Library and Reading room	150
7.	Store	100
8.	Students Common room	80
9.	Model Room	90

[B] ACADEMIC BLOCK

Sl.No.	Detail of Space	@ Sq.m	Floor Area Sq.m.
1.	Class Room	60	120
2.	Drawing Hall	90	90
3.	Physics Lab		75
4.	Electronics Lab/Shop		120
5.	Electrical Engg. Lab/Shop		120
6.	Digital & Microprocessor Lab		120
7.	Process Control Lab.		75
8.	Process Instrumentation Lab		75
9.	Transducers & Analysers Lab		75
10.	Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling)		60

[C] WORKSHOP

I	Workshop Supdt. Room	12
II	Store	20
III	Shops	
(a)	Wood & Laminate Shop	50
(b)	Fitting Shop	50
(c)	Painting Shop	50
(d)	Sheet Metal ,Soldering & Brazing shop	50

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[D] STUDENT's AMENITIES

1.	Hostel	40	%	of Strength of Students
2.	Cycle Stand	50	%	of Strength of Students
3.	Canteen and Tuck shop	50		
4.	N.C.C. Room	70		
5.	Dispensary	40		
6.	Guest Room(Attached Bath) incuding kitchen & store	45		

[E] STAFF RESIDENCES

1.	Principal	1	100	100
2.	Head od Department	1	100	100
3.	Lecturer	4	80	320
4.	Non teaching & Supporting staff	8	60	480
5.	Class IV	6	30	180

Priority to be given in following order

(1)
 a. Administrative Building
 b. Labs
 c. Workshop
 d. Over head Tank
 e. Boundary Wall
 f. Principal Residence
 g. Forth Class Quarters (2/3)

(2)
 a. Hostel
 b. Students Amenities

(3)
 Residences of employees

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LIST OF EQUIPMENTS

Only those of the equipments given below which are essentially required for the conduction of practicals mentioned in the curriculum are to be procured by the institutions.

"Machine/Equipments/Instruments of old BTE list which are not included below are to be retained in the Lab/Shop for Demonstration purpose but not to be demanded fresh for purchase."

NOTE : Equipment for different shop and lab of latest verson should be purchased.

I. APPLIED PHYSICS LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Brass ball with hook dia 1.8 Cm to 2 Cm diameter	2	50	100
2.	Stop watch least count Least Count 0.1 Sec.(non-megnetic) 0.01 sec to 0.001 sec (Electronic Desirable)	4	750	3000
3.	Wall bracket with clamping arrangement 8" to 10" length	2	50	100
4.	Meter scale Least count 0.1cm,wooden 1meter	5	40	200
5.	Meter scale Least count 0.1cm,wooden 50 Cm	5	40	200
6.	Searl's conductivity apparatus with copper & steel rods 25 cm length 4 cm.diameter with all accessaries	2 set	1500	3000
7.	Constant Level Water Flow Container of one liter capacity vertical stand & rubber tubing	2	250	500
8.	Thermometer 0-110oC(Least count 0.1oC desirable)	4	100	400
9.	Potentiometer - 10 wires (1 meter length of each wire) with jockey, sunmoical top	4	750	3000
10.	Moving coil galvenometer 30-0-30 with moving mounting	5	300	1500
11.	Rheostat 50 ohm.,100 Ohm.,150 Ohm. capacity	16	300	4800
12.	Lead Accumulator 2V,6V (1 No.Each)	2	250	500
13.	Meterbridge 1 meter length, sunmica top copper strips fitted with scale	2	300	600
14.	Resistance Coil (Standard) 1 ohm. to 10 ohm.	10	50	500
15.	Moving coil ammeter 0-1 amp., 0-2 amp., 0-5 amp. with mounting	8	250	2000
16.	Moving coil voltmeter 0-1 V.,0-2V 0-5 V., 0-10 V. with mounting	8	250	2000
17.	Denial cell with complete accessories	2	250	500

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
18.	Leclaunche Cell with complete accessories	2	250	500
19.	Standard Cadmium Cell with complete accessories	2	250	500
20.	Battery Charger with complete accessories	1set	1800	1800
21.	Battery Eliminator Multi range	2set	750	1500
22.	Multimeter(Digital)	1set	800	800
23.	Carey Foster Bridge (With all accessories)	2set	4500	9000
24.	Resistance Box (2 No. Each) 0-1 Ohm, 0-100 Ohm.	4	850	3400
25.	Fractional Resistance Box 0-1 Ohm.	2	1200	2400
26.	Post office box Key type	2	1200	2400
27.	Post office box Dial type	2	1200	2400
28.	Resistance Wire(100 Gm.) (Constanton/Maganin)	1 lacchi	100	100
29.	Connecting Wire Copper(1/2 Kg.) (Cotton Insulated)	1 lacchi	700	700
30.	Screw gauge L.c 1/100 mm	5set	150	750
31.	Vernier Callipers L.c. 1/10 mm	5set	100	500
32.	Appratus for determining character-stics of P-N junction diode complete with all accessaries	2 set	1500	3000
33.	Resonance Column of steel One Meter length and 3-4 Cm diameter fitted with scale & water level arrangement	2	1600	3200
34.	App. for determining coefficient of friction on a horrizontal plane (Complete with all accessories)	2 set	700	1400
35.	Tuning Fork's Sets Set of different frequency (with rubber pad)	3set	350	1050
36.	Physical balance with weight box Complete with Fractional weight	2	800	1600
37.	Anemometer with counter cup type	1	1000	1000
38.	Spring Force Constant Apparatus with graduated mirror & pointer, weight set with hanger	2	1200	2400
39.	Viscosity Apparatus (Stock law) with steel balls and viscous liquid & timer	2set	1600	3200
40.	Thermometer of different range Mercury thermometer 0-50oC to 0-110oC	10set	100	1000
41.	Wall Thermometer Alcohal Filled 0-50oC	2set	20	40
42.	Sprit Level Technical Type	1set	60	60
43.	Drilling Machine Electric with different size bits	1set	800	800
44.	LPG Gas Burner with Cylinder	1set	800	800
45.	Tool Kit with different tools Complete	1set	800	800
46.	Lab stools	30		

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S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
47.	Lab tables	8		
48.	Plug Keys One Way	5	50	250
49.	Plug Keys Two Way	5	100	500
50	Helical Springs - Soft, 10 cm each	6	100	600

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INTRODUCTION TO COMPUTER (Common to all Trades)

COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST (in Rs.)
1.	Core-2 Quad Processor, 4GB RAM 1 GB SATA HDD, 19" TFT Monitor/ Server of Latest Specification OS-Windows 2007/2008/Latest Version	02 Server	1,20,000=00
2.	General Desktop Computer-Intel i5 60 node or Higher(with latest Specification Pre loaded latest Anti Virus with Life time Subscription, Licence Media and Manual with UPS 660 VA with latest window OS Including licence OR Computer of latest Specification With latest window os including licence		36,00,000=00
3.	Software :((Latest Version)		
	i. MS OFFICE 2010/Latest Version	LS	LS
	ii COMPILER 'C', C++, JAVA-7	LS	LS
4.	Hardware		4,50,000.00 LS
	i. Switch-32 Port	02	
	ii. Router	02	
	iii. Hub	04(8 Port)	
	iv. Ext. Modem	02	
	v. Wireless N/W Adaptor	02	
	vi. Series Access Point	02	
	vii.LAN Cable Meter	05	
	viii. LAN Cable Analyzer	05	
	ix. Crimping Tool and all other accessories related to Networking	15	
5.	Scanner- Flat Bed A4/Auto Lighter (Bit depth 48)	02	20,000
6.	132 Column 600 CPS or faster 9 Pin dot matrix printer with 500 million character head life	02	50,000
7.	Laser Jet-A4 All In one 20 page per min (2 Each)	04	50,000
8.	Desk Jet-A4 Photo Smart (2 Each)	04	40,000
9.	5 KVA on line UPS with minimum 30 minute battery backup along with sealed maintenance free batteries. Provision for connecting external batteries with network connectivity.(For 2 Labs)	04	8,00000

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10.	Split Air Conditioner 1.5 tones capacity with ISI mark along with electronic voltage stabilizer with over voltage and time delay circuit	08	35,0000
11.	Room preparation and furniture	LS	
12.	19" rack, 24-port switch. connector RJ-45 Cat-6 cabling for network	LS	10,0000
13.	2 KVA Inverter Cum UPS	02	6,0000
14.	Fire Extinguisher (2 Kg.)	04	15000
15.	Fire Extinguisher (5 Kg.)	04	25000
16.	Vacuum Cleaner	02	25000
17.	LCD Projector 3000 Lumen with all Accessories	02	350000
18.	Pen Drive 16 GB	10	10000
19.	DVD Writer External	02	10000
20.	HDD External 500 GB	02	15000
21.	PAD (Latest Configuration)	02	15000
22.	Broadband For Internet(Speed Min. 8mbps)	04	LS
23.	USB Modem	02	8000
24.	Generator 15 KVA Water Coolant	01	450000

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ELECTRONIC WORKSHOP

PART (A)- ELECTRICAL WORKSHOP

S.No.	Name of Equipment /Board/Kit etc.	Equipment required (Intake 60)	Equipment required (Intake 75)	Rate per Piece @ Rs.	Total cost (Intake 60)	Total cost (Intake 75)
1.	Coil winding Machine.	4	5	5000	20000	50000
2.	Bench Drilling Machine.	2	3	5000	10000	15000
3.	Bench Lathe.	2	3	10000	20000	30000
4.	Portable Drilling Machine.	6	7	1500	9000	10500
5.	Multimeter (indicating typ and assorted)	6	7	1000	6000	7000
6.	Megger (1000 V) and Growler	1 each	1 each	--	7000	7000
7.	Bearing Pullers Pulley Pullers, wire gauges and blow lamps	LS	LS	--	4000	6000
8.	Ceiling fans of different types (one with solid state speed control)	LS	LS	--	10000	15000
9.	Electric appliances (Iron, Hot Plate to Aster, immersion heater and room heater air heater, water cooler	LS	LS	--	20000	25000
10.	Old burnt out ceiling fan motor, grinder motors, D C moter armatures, and three phase induction moters for winding	LS	LS	--	15000	20000

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S.No.	Name of Equipment /Board/Kit etc.	Equipment required Intake 60	Equipment required Intake 75	Rate per Piece @ Rs.	Total cost Intake 60	Total cost Intake 75
11.	Starter (3 Point 40 Point D.O.L. star/delta, auto transformer and automatic star/ delta) for fault creation and rectification	LS	LS	--	15500	20500
12.	Single Phase Variac (15 A)	2	3	2500	5000	7500
13.	Dynamic demonst-ration model of automobile ele-ctrical wiring	LS	LS	--	15000	25000
14.	Spare starting motor dynamo cut out, wiper moter, ignition coil & horn for car moters	LS	LS	--	8000	12000
15.	Different types of lamps with their fittings	2 set	2 set	--	8000	8000
16.	HV support fitt-ing & insulators	LS	LS	--	3000	4500
17.	HV cable secti-ons and jointing materials	LS	LS	--	5000	8000
18.	Damonstrations boards on fuses, switches, condu-ctors and elect-rical engg. mat-erials(one each)	LS	LS	--	5000	8000
19.	Electric Blower	2	3	3500	7000	10500
20.	Low Voltage circuit breakers & conductors	LS	LS	--	8000	10000

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S.No.	Name of Equipment /Board/Kit etc.	Equipment required		Rate per Piece @ Rs.	Total cost	
		Intake			Intake	
		60	75		60	75
21.	Wiring boards (Wodden)	LS	LS	--	10000	15000
22.	Miscellaneous tools (for servicing & cable jointing, soldering irons,neon testers etc.)	LS	LS	--	20000	25000

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ELEMENTARY WORKSHOP PRACTICE

MECHANICAL WORKSHOP

(A) Fitting Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Work Benches with Vices (4 vices on a bench)	30	150000
2.	Marking Tables with Scribers (40cm x 60cm)	12	60000
3.	Surface plates (450cm x 60cm:CIII)	10	30000
4.	Bench Grinder	2	20000
5.	Bench Drilling Machines (12 mm capacity with tapping attachment)	4	50000
6.	Power Hacksaw	2	40000
7.	Tool Kits, Chisels, Hammers, Files, Hacksaw etc.	70 Sets	40000
8.	Taps, Dies & fitters tool kits	10	20000
9.	Accessories like cali-pers, V-Block height gauges, steel rules, scribers etc.	LS	50000

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(B) Sheet Metal Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Metal Sheer (Lever type)	4	3000
2.	Sheet Bending Machine	1	2500
3.	Drilling Machine (Pillar type 12 mm capacity)	1	4000
4.	Doall Machine	1	8000
5.	Pipe Bending Devices	1	2000
6.	Mechanical, Power Oper-ated press (5 ton capacity)	1	15000
7.	Fly Press	1	1000
8.	Pipe threading devices	1	2000
9.	Guillatine Shear	1	5000
10.	Seaming & Swaging equipemnt	LS	5000
11.	Tools & Accessories	LS	5000
12.	Miscellaneous	LS	2000

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(C) Painting Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Scrapers	30	1000
2.	Brushes (Including wire type)	30	2000
3.	Spary Painting Plant (Including air compre-ssor)	1 SET	6000
4.	Other Equipment	LS	4500
5.	Miscellaenous	LS	2000

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(D) Wood & Laminate Shop

S.No.	Name Of the Equipment/ Board/Kits etc.	Equipment Rrequired	Approximate Cost.
1.	Work benches fitted with carpenter vices (1 m x 2 m)	30	70000
2.	Wood turning lathe	8	100000
3.	Wood planer	2	60000
4.	Circular saw grinder	2	15000
5.	Wood cutting band saw	2	30000
6.	Band saw blade brazing unit	2	20000
7.	Bench grinder	2	10000
8.	Tool, Accessories, measuring & marking instruments, pattern makers scales	70 SETS	70000
9.	Drilling Machine	2	16000
10.	Other equipment	LS	30000

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ELECTRICAL ENGINEERING LAB

(i) Electrical Engineering-I (First Year)
(ii) Electrical Engineering-II (Second Year)

Sl. No.	Equipment	Qty.	Price
1.	Ammeter -dynamometer type portable, moving coil, permanent magnet 150 mm uniform scale		
a.	Range 0 - 2.5 - 5 Amp.	4	4000
b.	Range 0 - 50 m A	2	1500
c.	Range 0 - 500 mA	4	6000
2.	Ammeter - moving iron type Portable moving iron permanent magnet, 150 mm uniform scale		
a.	Range 0 - 5 Amp.	4	5000
b.	Range 0 - 10/20 Amp.	4	5000
c.	Range 0 - 500 mA/1000 mA	4	5000
3.	Voltmeter dynamometer type portable moving coil permanent magnet 150 mm uniform scale		
a.	Range 0 - 5/10 V	4	3000
b.	Range 0 - 15/30 V	2	2500
c.	Range 0 - 50 mv/100 mv	2	2500
d.	Range 0 - 125/500 V	2	2500
e.	Range 250/500 V		
4.	Digital multimeter 3.5/4.5 digit - display D.C. voltage 0 - 1000 V in 5 steps A.C. voltage 0 - 750 V in 5 steps Resistance 0 - 20 M ohm in 6 steps D.C. 0 - 10 A in 6 steps A.C. 0 - 10 A in 6 steps Power supply 9 V.	2	7000
5.	Analog multimeter (Portable) D.C. Voltage 0 0 1000 V AC Voltage 0 2/5/10/25/100/250/1100 V. Resistance 0 200 M ohm DC 0 - 50 micro Amp./1 mA/10 mA/100mA/1A/10A AC 0 - 100 mA/1A/25 A/10A	2	3000
6.	Wattmeter single phase (LPF= 0.2) portable dynamometer type, scale 150 mm current range 0 - 5/10 Amps voltage Range 0 - 250/500 V	4	15000
7.	Decade resistance box constantan coils, single dial 10x10, 10x100, 10x1000, 10x10,000 ohms	2	2500
8.	Continuously variable 0 - 1000 micro farad, 250 V	2	4000
9.	Energymeter single phase induction type, industrial grade 5 A or 10 A, 250 V, 50 Hz.	2	6000

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10.	Energymeter(Substandard) single phase, induction type 5 A/10A, 250 V, 50 Hz.	2	10000
11.	Power factor meter dynamometer type, eddy current damping, 50 Hz, scale length 150 mm range upto 20 amp, voltage range 300 V 10 F. range 0.5 log, unity 0.5 load.	1	15000
12.	Frequency meter (Reed type) 230 V, range for having 21 reeds for 40-60 Hz range.	2	2000
13.	Rheostat sliding rheostats wound with evenly oxidised iron free nickel copper on vitreous enamelled round steel tube 150 ohms 2 Amps. 110 ohms 2.5 Amps.	2 2	1500 1500
14.	Variable inductor single phase, 250 V, 2.5 KVAr continuously variable	2	6000
15.	Battery charger 12 V silicon bridge rectifier AC input 230 V, DC output suitable for charging 6 V And 12 V batteries provided with MC voltmeter 0 - 20 V and ammeter 0 - 5 A	2	5000
16.	Capacitors 2.5 microfarod, electrolytic type	8	2000
17.	Q Meter frequency 0 - 30 MHz Q 0 to 500	2	15000
18.	LCR meter (digital) 3.5 digit display capacitance 0 to 20,000 microfarad inductance 0 to 200 Henry resistance 0 to 20 M ohms	2	20000
19.	LCR/Q bridge capable of measuring resistance, inductance and capacitance of range 8 amps, 0.012 to 10 M ohms, 4 to 10,000 H, 0.5 pico farad to 10 F.	2	20000
20.	Kelvin double bridge 10 x 0.1 ohms circular slide wire devided into 200 equal parts	2	15000
21.	Energy meter 3 phase induction type, 4 wire, industrial grade, 50 Hz, 10 A, 440 Volt	2	15000
22.	Energy meter (Sub standard)	2	15000

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	3 phase, 4 wire, 440 V, 10A, 50 Hz induction type.		
23.	Transformer single phase core type, 230/110 V, 1 KVA, 50 Hz.	2	12000
24.	Universal shunt 0 - 75 A	2	5000
25.	Current transformer 10/25/50/5A as per IS 4201/1967 and 2705/1981	2	6000
26.	Potential transformer 10 VA, 415/110 V as per IS 4201/1967 and 2705/1981	2	6000
27.	Strain guage	2	3000
28.	Maxwells bridge	2	4000
29.	Laboratory D.C. power supply (220 V) static converter input from 3 phase 50 Hz, 415 volts A.C., output rating of 200 vatts to 260 watts, 50 amps, continuously varibale.	2	150,000
30.	Diesel generator set 3 phase, 415 volts, 15 kva, 50 Hz, diesel generator set, with suitable control pannel, for a stabilized supply including metering for voltage, current frequency, fuel level storage fuel tank of 200 litre capacity 12/24 volt battery for starting the engine, battery charger mounted on trolley wheels.	1	375000
31.	D.C. motor generator set two identical 220 V, 1 KW 1500 rpm. compound d.c. machines with all terminals of armature, series field, shunt field separately mounted for independent connections. D.C. motor starter, field control rheostat suitable for above machines. brushes, commutator should he vissible for study purposes.	2	50000
32.	D.C. shunt motor 220 V, 3 KW, 1500 rpm dc shunt motor with 3 point starter and ponybrake loading arrangement with loading drum, spring balance with belt.	2	30,000
33.	3 Phase variable inductive loading unit rating 400 V, 50 Hz, 0-10 Amps.	2	25000
34.	3 Phase variable capacitive loading unit: rating 400V, 50 Hz, 0-10 Amps.	2	18000

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35.	3 Phase squirrel cage induction motor rating 415 V, 50 Hz, 1440 rpm 3 KW with star/Delta starter	2	50000
36.	Starters for squirrel cage induction motor suitable for 3KW, 415V, 50 HZ, 1440 rpm		
	a. Star/delta automatic	2	1500
	b. Star/delta manual	2	1000
37.	Starter for squirrel cage induction motor 3KW, 415 V, 50 Hz, 1440 rpm direct on line	2	10000
38.	Static speed control unit for 3 phase induction motor 3 KW, 425, 0-1500 rpm.	2	20000
39.	3 Phase synchronous motor (induction start) rating 3 KW, 3 phase, 1500 rpm, 50 Hz 415 v A.C. supply with d.c. exciter mounted on the shaft of motor with suitable starter.	2	50000
40.	Capacitor start single phase induction motor 230 V, 50 Hz 1440 rpm, 500 watts.	2	8000
41.	Watt meter 3 phase induction type 2 element voltage range 0/300/600 V current range 0/5/10 A	2	10000
42.	Frequency meter - portable (Reed type) 45-55 Hz with 21 reeds Frequency meter digital portable 3.5 digit LED display range 20-99 Hz	2	8000
43.	Phase sequence indicator (Rotary) 3 phase, 415 V, 50 Hz	2	4000
44.	Phase sequence indicator (Indicating type) 3 phase, 400 V, 50 Hz	2	5000
45.	Galvanometer centre zero response time 1.8 sec.	2	4000
46.	VAR meter 1/5 A, 300/600 V	2	6000
47.	Synchroscope - portable 230 V, 50 Hz	2	10000
48.	Loading rheostat single phase	2	10000
	a. 240 V, 2.5 KW, trolly type resistance type		
	b. 240 V, 6 KW insteps of 0.25	2	10000
49.	Lamp load 3 phase 415 V, 6 KW	2	7000
50.	Water load 3 phase	2	7000

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	415 V, 5 KW		
51.	Capacitor bank 415 V, 0-10 A, 50 Hz trolley mounted	2	10000
52.	Wire wound rheostats		
	15 ohms, 10 A	4	4000
	100 ohms, 5 A	4	4000
	250 ohms, 5 A	4	4000
	1000 ohms, 0.5 A	4	4000
	2500 ohms, 0.1 A	4	4000
53.	Stop watch least count 0.01 Sec.	4	6000
54.	Stop watch (digital) LED	4	6000

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PROCESS INSTRUMENTATION LAB

Sl. No.	Name of Experiment	Apparatus	Qty.	Price
1.	Measurement of pressure by Various Method A. Bourdon Tube B. U-tube & inclined tube mano meter (water & Hg filled) C. Wall type mono meter D. Vaccum Measurement	Burden type, dis pheagam type, bellow type pressure guage of different sizes & tanges upto 10 Kg. cm2 (Also calibrated in psi) Complete setup for comparing regarding by different method mentioned above with air pressure regulator & filter for varying pressure along small vaccum pump	1 Each	
2.	Measurement of Vaccum by Vaccum gauge & manometer.	1. Vaccum gauge	1	500
		2. Monometer(Mercury Filled)	1	500
		3. Vacum Pump	1	2000
3.	To record the pressure by pressure recordor (Complete Set)	Bourden sensor 0-10 kg cm circular chart recorder for recording speed 1/2 hr.,1 hr 12 hr, 24 hr with precision air pressure regulator & filter input 10 kg cm2 & output 0-10 Kg cm2	1	50000
4.	To calibrate pressure gauge by dead weight tester.	Dead weight pressure guage tester along with standard dead weight accoracy +0.1% range upto 20 kg cm2 (0-10 kg cm2)	1	50000
5.	Measurement of liquid level by float method and air bubbler method (Complete Set)	Level measurement setup having sight glass tube float & bubbler method with pressure regulator bubble counting unit and dightal pressure indicator	1	5000
6.	To study the construct-ion & operation level limiting switches	1. Level limiting switchs (different type).	1 No.	2000
7.	Measurement speed of moter by hand techometer	Contract type and non-contact type speed measurement setup A. Motor 1/4 HP with speed regulator B. Magnetic Pick Up C. Photo electric method D. Digital hand held tachometer with various coupling E. Stroboscope	1 (setup)	20000

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
8.	Measurement of Temperature dial thermometer,Bimetallic thermometer & resistance thermometer, Thermo couple thermometer & pyrometer	Temerature measurement setup alongwith heat source(variable temp.) and various sensors e.g RTD, Thermocouple(various types and various shapes) Total radiation pyrometer temperature range 0-400oC Furnace muffel (0-1000oC) with temperature controller indicator.	1	30000
9.	Measurement of temperature by different thermocouple such as	1. Hot temperature bath	1 No.	10000
		2. Iron/Constantan Cl/Al, Pt,Kh Thermocouple	1 No.	5000
10.	Calibration of temperature indicator by Poten timeter/Thermocouple Test Set.	1. Potentimeter	1 No.	1000
		2. Thermocouple Test set	1 No.	2000
		3. Temperature Indi	1 No.	1500
11.	Study the construction & operation of electromagnetic flow meter.	1. Electromagnetic flow Meter	1 No.	
		2. Pump Set	1 No.	25000
		3. Tank	1 No.	
12.	Study of temperature recorder & temperature recording by temperature recorder.	1. Temperature recorder	1 No.	
		2. Sensor	1 No.	8000
13.	Measurement of flow by Orifice meter, Venturimeter, Rota Meter Pilot tube & Magnetic flowmeter	Experimental Setup For Measurement of Flow with pump & water circulating system having all methods with flow variation	1	50000

1. Sump Tank :Material :Stainless Steel, 2mm Thick/PP 55mm Thick
   Capacity :30 liter
   Dimension : 1ft(L) X 1ft(W) X 1ft(H)
2. Piping : 1" class B GI with 1" SS valve :10 Nos.
3. Centrifugal Pump " 1/2" HP, 230 V AC supply
4. Rotameter : Range 0-2000 LPH Glass tube type/Acrylic body,
   Bob material : SS 304, Connection :1"
   Mounting " Intel-Bottom, Outlet - Top
5. Orifice : 1" Line size, connectric type, MOC : Polypropylens (PP)/SS
6. Ventury : 1" Line Size.
7. Manometer : U tube manometer, H:400 mm Panel Mounting type
8. Flowmeter : Size 1" type : Wheel flowmeter, Range 0-2000 LPH
   Output :4-20 mA/DPT
9. Flow Indicator : 3.5 digit dispaly, 230 V AC operated
   Cut Out : 92mm X 92mm X 144mm
   Range : 0-2000 LPH, Input :4-20 Ma

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
	10. Electrical Control Pannel :MS Powder coated panel with switches, Indicator, Text Points, Controller on front facial, UK 2.5, thermal connector mounted on/DIN rail channel, Use of 1 sq. mm Multistrand wire proper insulated Lugs, Ferruling and neat wire dressing and clamping wires and power cables are seated through 1"X1" PCV cable tray, Dimension 1ft (L) X 1Ft (W) X 1ft (H).			
14.	To determine relative humidity by Hydrometer	Experimental setup having humidity chamber with fogger digital hand head battery operated device, 20-90% humidity measurement,memory for higher < lowest humidity with digital dispaly	1	1000
15.	To study the construc-tional details and to measure percentage moistures of given sample by commerical moisture meter.	Experimental Setup for moisture measurement	1	20000
16.	To study the construc-tion and operation of level limiting switches	Experimental Setup for study of level limiting switches	1	5000

moistures of given
sample by commerical
moisture meter.

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TRANSDUCERS & APPLICATION LAB

Sl. No.	Name of Experiment	Apparatus	Qty.	Price
1.	To draw the output & input characteristics of linear variable differential transducers.	The Setup of LVDT having Following Details A. LVDT of accuracy + 0.5% resolution of 0.1 mm, 3.5 digital display, TEST points provided to observe wave from on CRO, micrometer provided for mech. displacement with suitable variable powers supply variable tray	1	15000
2.	Fibrication of Ckts using L.V.D.T..	1. L. V. D. T. & Associated	1	5000
3.	To draw a light intensity V/S, O/P characteristics of LDR,Photo diode, Photo Transister Soler Dellconductive	Compplete setup of photo transducers having following specification A. Photo Dicde Circuit B. Photo Transistor Circuit C. LDR Circuit D. Solar Cell Circuit For Characteristics Measurement E. Variable light intensity source with precision regulator F. Lux meter to measure intensity of light source G. Suitable power supply & Output digital device	1	10000
4.	To fabricate an applica- circuit using photo transducer.	1. Photo Transducer 2. Circuits Components	1	5000
5.	To draw the characteristics of given temperature transducer, thermistor and also fabricate an application circuit using thermistor.	Complete setup of temp. sensing device with suitable circuit to draw I/O characteristics having following details A. Temperature source like small furance with temp. controller & indicator B. Output measuring device (Digital) C. All temp. sensor e.g. RTD, Thermister,Thermo couple, Solid State sensor etc.	1	10000
6.A. B.	Study & Construction details of a capacitive transducer. To measure noice using consensee microphone	Setup of capactive Transducer having following details A. Metallic Guage Capacitor with angular displacement B. Circuit for above	1	10000

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
C.	To measure level using capacitive probe	C. Variable Freq. source with output device D. Condenser microphone & related circuit for noice measurement with sound sources and output measuring device E. Circuit for measuring level of liquid using capacitive probe.		
7.	To study the construct-ion of strain gauge and Rossets and use it for measurement at stress or pressure.	Experimental Setup having strainguage mounted on cantilever beam with weight pan & Standard weight with specification A. Display 3.5 digit 7 segment LED display B. Range 0-2 Kg C. Accuracy +0.5% D. Resolvtion 0.01, least count 1 gm Test point to plot weight vs strain guage output.	1	30000
8.	To study the construct-ion of a recorder.	A. Mechanical Recorder i. Circular chart recorder with input sensor and variable speed system with recording system ii. Strip chart recorder (Multi Point) with 3/4 sensor & stylus(colour) having variable chart speed control iii. Electronics multi point recorder with LED display sensors & computer interface	1	30000
9.	To study the Strain gauge, Load Cell and Strain gauge indicator	Setup of load cell & its measuring system along with suitablw power supply A. Range 0-100 kg or more B. Standard weights for calibration C. A Model of Dharma Kanta using load cell and its measuring system (if dharma kanta model is not available than standard weight system along with digital dispaly can be purchased)	1	10000

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
10.	To study the construct-ion conductivity meter and its application.	Conductivity Meter Having Following specification A. Range 0.01 Mu siemens/cm to 199.0Mu siemens/cm in 5 different ranges B. Accuracy +02% C. Standard solution for calibration D. 3.5 digit 7 segment LED display with over range indication E. Two conductivity cells, cell stand & Standard conductivity solutions.	1	10000
11.	To study the working principle and construc-tion of PH meter.	pH meter having following specification A. pH range 0-14 with resolution 0.01 pH B. Accuracy +0.40 pH or +0.20 + 2 mv from measurement C. Temperature compensation 0-100 oC D. Glass electrode, Standard electrode & combined electrode (02 sets) E. Display 3.5 digits 7 segment F. Buffer solution of 4,7 & 9 pH	1	10000
12.	To measure density using hydrometer	Setup having different types of hydrometer with suitable display (digital) for different density solutions/liquid	1	1000
13.	To measure vibration using Piezoelectric type accmulator	Setup having different types of piezo electric pickup with source of vibration & output display	1	52000
14.	To measure noise using condensor microphone	1. Condensor Microphone	1	1000
15.	Transduser & Instrument Kit (Pre-Port)		1	41000
16.	Dead Weight Tester(0-10 Kg./cm.)		1	43000
17.	LI Maker Transducer and Instrumentation Trainer		1	5000

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PROCESS CONTROL LAB

Sl. No.	Name of Experiment	Apparatus	Qty.	Price
1.	To calibrate the control valve.	Control valve training module to draw equal %ne characterisitcs Liner characteristics & Quick opening characteristics of linear valve,non-lenear valve and quick opening valve having following specification 1. Stainless steel sump tank 30 liter 2. Centrifugal pump 1/4 hp 1Q 3. Pneumatic control valve two way globe type linear quick opening equal % valve (at least own should be air to close or air to open) 4. Experimental setup for solenoid valve & electric motor control valve 5. Rotameter to measure flow through valve range 0-2000 LPH glass tube type acrylic body 1/2" mounting 6. Air compressor 1/2 HP (Optional)	1	200000
2.	To draw the chracter-istics of valve posit-oner and actuator.	1. Valve positioner mounted on a control valve (Autom-atic diaphram type) for 1/2 pipe line smallest size cost iron/brass	1 Set	4000
		2. Pressure gauge 0 to 20 PSI	1	800
		3. Filter Regulator	1	600
		4. Misc. Pressure pipe bends etc.		2000
3.	To study the working of DP cell and Plot the input and output characteristics.	Differential Pressure Transmitter calibration setup which gives an idea regulating the calibration procedure of transmitter having following specificatio 1. Input Range : 0-400 cm of water column 2. Output Range : 4-20 mA 3. Power Supply : 24V DC 4. U-tube manometer/digital pressure indicator for input measurement	1	150000

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
		5. Precision pressure regulator for regulating given input pressure range 6. Digital output indicator pressure range 7. Digital output indicator input 4-20 mA, mains operated 8. Air compressor 1/2 HP for pressure input		
4.	To study the working of on/off level contro-ller and plot the line response chart and calculate time constant. (Complete Set)	PLC based ON-OFF water level control system having following specification 1. PLC : Allen Bradly or equivalent, Actual Plant I/O Digital inputs-3 digital output-2 2. Level Tank : Material : Transparent acrylic 3. Sumptank : Material : Stainless Steel capacity 30 Liter 4. Fractional HP Pump : 230 V AC 1 Ohm vertical SS Body 5. Level Switch-Float operated switching action reversible 6. Solenoid valve-230 V, 1Q, 1/2" size vertical mounting	1	100000
5.	To draw the character-istics curve of propor-tional temperature controller. (Complete Setup)	Proportional Temperature controller setup having following specification 1. Temp. Sensor - Type RTD PT-100 2. Process Tank 2-3 liter material SS304 with heater 3. Thyristor for heater control input 4-2mA pannel mounted output 0-230 V AC, 6A max. 4. Pump 1/4" HP 5. PID controller-NC based PID controller 6. Electrical Control Panel 7. Rotameter 0-1000 LPH, Acrylic Body	1	100000
6.	To calibrate the given PI pneumatic controller by varrying proportio-nal percentage & inte-gral time.	1. Pneumatic PID controller 2. Air filter cum pressure 3. Circulator Chart Pressure factor.	1 1 1	15000 600 3000

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
		4. Diaphram Control Valve 1/2" size.	1	3000
		5. Pressure gauge -3	1	600
7.	PLC based multi process control trainer		1	350000

Technical Specification
1. Slump Tank : Material :Stanless Steel, 2mm Thick
Capacity : 30 liter
Dimension : 1.5 ft(L) X 1 ft (W) X 1 ft(H)
2. Centrifugal Pump : 1/2"/1/4 HP, 230 V AC supply surface mounting
3. Level Tank : Material : Acrylic 5 mm Thick
Dimension : 150 mm(o) X 500 mm(H)
4. Temperature Cabnit : 1" thick insulation wall with circulation fan and thermostat
Heater : 1 KW
Dimension : 1.25 ft(L)X1.25ft(W)X2ft (H)
5. Pressure Vessel : Shape cylindrical, Material SS304
Diameter : 150 mm Length 300 mm
Capacity : 15 KG/cm2 with 1/2 BSP connection for pressure gauge, inlet & drain facility
6. Piping : 1/2"/1" Class B GI with 1" SS ball valve 17 No.
7. Flowmeter : 2 No. Size : 1/2"/1" Turbine type/wfm type
Range : 0-1000/0-2000 LPH, Supply : 24 V DC 100 mA, Output : 3-20 mA, Type : 3 wire type
Mounting : Horizontal connection : 1"
8. Level Transmitter : Input : 0-400/0-500 mm
Output : 4-20 mA, Supply 24 V DC 100 mA, Type 2 wire capacitance type, Mounting : Top 2" screwed connection
9. Pressure Transmitter : Input 0-25 Kg/Cm2 /0-4 Kg/Cm2
Output : 4-20 mA, Supply 24: V DC 50 mA, Type 2 wire piezoresistive type, Medium : water pressure, Mounting : Top 1/2" BSP connection
10. Temperature Transmitter : Input : RTD, Output : 4-20 mA type, Range 0-200 oC

8.	PC based multi process control system trainer		1	350000

1. Thyresterized Phase Angle Control Card:
Input : 0-40 mA, Output : 0-230 V AC variable, 10 Max.

9.	Distributed control system trainer		1	550000

1. Computer (Optional) : PC with colour monitor
15" PC Pentium Dual Core with 2 Serial communication Ports, 80 GB HDD, 512 MB RAM, Floppy Drive

Features
- Compact Ergonomic Design
- User Friendly, Self Explanatory System
- Leak Proff Safety Measures, Sturdy Piping

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
	- Enhanced Electrical safety Consideration - Training Manuals, Mimic Charts for operation Ease. - System Frame with caster wheel arrangement for ease in movement - MS power coated cubical plant with standard Instrument Mounting - Inbuilt Safety Measures to avoid improper usage - Computer Interface (Optional) Range of Experiments - Study of PLC - Study of PLC based control of Multiprocess System - Study of data logging system - Study of facebook, cascade, ration adn on-off sprit range, control schemes. - Calibration of various sensors, transmitter like pressure, level, flow, control valve, rotameter, E/P et. - ON-OFF Control : Level, Pressure adn Temperature - Study of SCADA application/Software computerized control of PC-PLC based Multi Process Control System System Diamension 5.5 Ft(L) X 2.5 FT.(W) X 5.5 Ft. (H) Service Requirement - Single Phase Electrical Supply of 230 V 50 Hz. - Water Supply adn Drainage arragement - Clean, Dry, Compressed Air Supply at 2.1 KG/Cm2			
10.	Flow control system trainer		1	100000
11.	Level control system trainer		1	150000
12.	Pressure control system trainer		1	100000
13.	Control valve characteristic trainer		1	50000
14.	Electro pneumatic converter trainer		1	100000
15.	Pressure transducer/transmetter module.		1	50000
16.	PC-PLC based pneumatic trainer		1	150000
17.	Feed back,Cascade, Ratio control Trainer among. with SCADA & PC interface.		1	200000
	Technical Specification 1. Slump Tank : Material :Stanless Steel, 2mm Thick Capacity : 30 liter Dimension : 1.5 ft(L) X 1 ft (W) X 1 ft(H) 2. Level Tank : Material : Acrylic 5 mm Thick Dimension : 150 mm(o) X 500 mm(H) 3. Temperature Cabnit : 1" thick insulation wall with circulation fan and thermostat Heater : 1 KW Dimension : 1.25 ft(L)X1.25ft(W)X2ft (H) 4. Centrifugal Pump : 1/4 HP, 230 V AC supply surface mounting 5. Pressure Vessel : Shape cylindrical, Material SS304 Diameter : 150 mm Length 300 mm Capacity : 15 KG/cm2 with 1/2 BSP connection for pressure gauge, inlet & drain facility			

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price

6. Piping : 1" Class B GI with 1" SS ball valve 17 No.
7. Flowmeter : 2 No. Size : 1" Turbine type/wfm type Range : 0-2000 LPH, Supply : 24 V DC 100 mA, Output : 3-20 mA, Type : 3 wire type Mounting : Horizontal connection : 1/2"
8. Level Transmitter : Input : 0-400/0-500 mm Output : 4-20 mA, Supply 24 V DC 100 mA, Type 2 wire capacitance type, Mounting : Top 2" screwed connection
9. Pressure Transmitter : Input 0-25 Kg/Cm2 /0-4 Kg/Cm2 Output : 4-20 mA, Supply 24: V DC 50 mA, Type 2 wire piezoresistive type, Medium : water pressure, Mounting : Top 1/2" BSP connection
10. Temperature Transmitter : Input : RTD, Output : 4-20 mA
11. Thyresterized Phase Angle Control Card: Input : 0-40 mA, Output : 0-230 V AC variable
12. Pneumatic Control Valve : 2 No. size : 1", Characteristics : Equal Percentage, Type : Two way Globe type with valve, Two Way Globe type with valve Positioner Cv : 9 US GPM, with diaphragam actuator, Flange connection : PCD 80 mm, ID : 26 mm, OD : 110 mm, Positioner Action : 0.2 to 1.0 Kg/Cm2 (with bypass) (Director Action/ Reverse Action) Pneumatic Input Signal: 0.2 to 1.0 KG/Cm2 (with Bypass)
13. Rotameter : 2 No. Range 0-2000 LPH Glass tube type/Acrylic body, Connection :1" Mounting : Intel-Bottom, Outlet - Top
14. E/P Convertor : Input : 4-20 mA, Output : 3-15 psi Connection 1.4", Supply 1.4 Kg/Cm2
15. Air Pressure Regulator : 0-10 Kg/Cm2 with pressure guage, Connection 1.4 NPT/BSP
16. Level Switch : Flot operated, Flot Material SS304 Switch Voltage : 240 V AC/200 V AC, Switching Current : 2A Switch Action : Reversiable, Weight : 315 GMS
17. Current Meters : 3 No Range 0-20 mA, Supply 230 V AC Outout : 44mm X 92 mm X 110 mm
18. Isolator : 2 No single isolator : Input : 4-20 mA, Output : 4-20 mA, Supply : 230 V AC
19. Supply : 24 V DC 1.5 A, Size : 48mmX126mmX68mm
20. Electronic PID Controller : 2 No. Single Input PID and Dual Input PID with serial PC Interface (ASCII Protocol) RS 232 cotout size 92X92X144 mm Input 4-20 mA, Output : 4-20 mA, Digital: Dual For PV and SP, Bargraph display for output and devisation HI-low alarm annuncation
21. Electrical Control Pannel :MS Powder coated panel with switches, Indicator, Text Points, Controller on front facial, UK 2.5, thermal connector mounted on/DIN rail channel, Use of 1 sq. mm Multistrand wire proper insulated Lugs, Ferruling and neat wire dressing and clamping wires and power cables are seated through 1"X1" PCV cable tray, Dimension 1ft (L) X 1Ft (W) X 1ft (H).
22. SCADA Application Software (Optional) : SCADA S/w PID control setting (P, PI, PD & PID mode), Auto/ Manual tuning of PID, Data Storage, Off line analysis, Online data acquisation, Simulation and Printing of data in Graphical and tabular from

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
		Interactive Graphical User Interface (GUI) includes. 23. Air Compressor (Optional): Tank capacity : 30 liters Discharge : 2 CFM Motor : Half HP 230 V AC operated, Working Pressure " 3-4 Kg/Cm2 24. Computer (Optional) : PC with colour monitor 15" PC Pentium Dual Core with 2 Serial communication Ports, 80 GB HDD, 512 MB RAM, Floppy Drive		
18.	Flopper-Nozzle assembly trainer		1	50000
19.	PID Control trainer.		1	100000
20.	Multi Process Control Trainer		1	50000
21.	Temperature Control System Trainer.		1	50000
22.	PLC/Computer Based hydraulic Trainer.		1	200000

NOTE:-

Process control equipments may be purchased in the form of complete set and may be installed and commissioned in the supervision of firm supplying the equipment.

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INDUSTRIAL CONTROL LAB

Sl. No.	Name of Experiment	Apparatus	Qty.	Price
1.	To draw the time resopnse of Ist order electrical system	Resistive setup of Ist order system along with a power supply & display system & measurement points for CRO Display	1	15000
2.	To draw time response of IInd order LCR circuit and find out its transfer function	LCR system having different value of variable L,C,R with series & Paralles Combination for IInd order control system - Display for O/P - Suitable power supply with variable freq. - Measurement points for CRO	1	15000
3.	To draw characteristics curves for SCR, Diac & Triac	Setup for drawing I/p characteristics of SCR Traic & Diac having input variable DC/AC supply & suitable O/p display	1	15000
4.	To study a power recti-ficr using SCR and draw input/output wave form	Setup for characteristics of power rectifier using SCR with staitable phase control circuit in full wave and half wave recti-fication & measuring points for CRO display (Single phase & Three Phase rectificer)	1	15000
5.	To study single phase inverter circuit using SCR & draw input & O/p wave forms	Setup for single phase inverter using transistor circuit & SCR & MOSFET circuit and draw characteristic (i) Variable Supply (ii) variable load	1	
6.	To fabricate & SCR chopper circuit, Test it and determine duty cycle.	Setup for chopper circuit using SCR & Vary its duty cycle & draw wave form	1	
7.	To study the effect of variation in firing angle on a C.R.O. & to plot the wave form	Setup for SCRR & TRIAC firing circuit and draw I/o wave form (i) Resistive circuit (ii) Single RC circuit (iii) Double RC circuit (iv) with snubber circuit	1	

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Sl. No.	Name of Experiment	Apparatus	Qty.	Price
8.	To study the data transmission with the help of two synchros	Obsolete Item (Not need to Purchase)		
9.	To fabricate the traic diac motor speed control circuit & draw i/p, o/p (speed) characteristics	Setup for motor speed control circuit for DC & AC motor with phase control using DOAC-TRIAC along with suitable motor & tacho meter	1	

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ELECTRONICS LABORATORY

Electronic Components And Devices Lab. (First Year)
Networks Filters & Transmission Lines Lab. (Second Year)
Electronic Devices & Circuits Lab. (Second Year)

S.No.	Name of the Equipment/ Board/Kit Etc.	Elex. Components & Devices Lab.		Networks Filters & Transmis-sion Lab.		Elex. Devices & Ckts.Lab.		Total		Total No. Recommen-ded		Rate per Piece	Total Cost	
		Intake		Intake		Intake		Intake		Intake		In Rs.	Intake	
		60	75	60	75	60	75	60	75	60	75		60	75
1.	Audio Oscillator (20HZ-50KHZ)	4	5	14	15	12	13	30	34	26	28	3500	91000	98000
2.	Multimeter, 20 K. Ohm per volt Sensitivity, + 1% accuracy d.c. voltage 1000 v. max.	4	5	8	10	-	-	12	15	10	12	2500	25000	35000
3.	Digital Elex. multimeter. 3.5/4.5/5.5 Digit Led, AC & DC Voltage Current, Frequency, Resistance, Capaciters, DC Voltage Accuracy +0.005 AC Voltage + 0.1	14	16	14	16	16	17	48	54	24	27	4500	108000	121500
4.	Regulated Power Supply 0-30 V, 0.5/1 Amps.	10	12	-	-	16	17	30	34	20	22	4000	80000	88000
5.	Multi output Power Supply 0-30V 1 Amp. 0-+-12 V, 1 Amp., 5 V. 2 Amp.	4	5	-	-	4	5	8	10	6	7	3500	21000	24500
6.	Power Supply 0-300 Volt, 1 Amp.	-	-	-	-	-	-	4	5	4	5	4000	16000	20000
7.	Dual Trace C.R.O. (0-30 MHz) Operating Mode Channel I, Channel II, Channel I & II, Accuracy +3, Hold off-variable control for stable triggering slope +ve or -ve, sensitivity Int, 0.5 div, Ext 0.8v, Trace Rotation- Adjustable on Front Panel, Interface-USB	4	5	-	-	10	11	24	27	16	18	30000	480000	540000
8.	R.F.Signal Generator (AM/FM) 500 KHZ to 1.3 GHZ Standard Mak	-	-	-	-	4	5	4	5	4	5	10000	40000	50000
9.	Function Generator upto 10MHZ, Amplitude 0-20V PP LED Display, Frequency Variation Fine Control Output Protected against short circuit, Input 230V AC +10 50HZ	-	-	-	-	6	7	6	7	6	7	10000	60000	70000
10.	A.C. Millivolt Meter/Micto Meter (Elex.)	-	-	-	-	8	9	8	9	8	9	3500	28000	28500
11.	Out Put Audio Power Meter 4 Ohm.- 20 K & 1 MW - 10 W	-	-	-	-	2	3	2	3	2	3	1500	3000	4500
12.	Digital MultiMeter/Micro Meter Digital Millivoltmeter (Suitable range)	4	9	-	-	-	-	12	14	8	9	600	4800	5400
13.	D.C. Voltmeter /D.C. Milliamme-ter/D.C. Micrometer (suitable range)	30	40	-	-	10	12	40	52	30	35	600	18000	21000
14.	Decade Resistance Box (Different ranges) Min 4/5/6 Dials Max Working Voltag 500V	-	-	6	7	-	-	6	7	6	7	1200	7200	8400
15.	Decade Capacitor Box (Different range) Min 4/5/6 Dial Cont	-	-	8	9	-	-	8	9	8	9	3000	24000	27000
16.	Decade Inductance Box Min 4/5 Dials	-	-	8	9	-	-	8	9	8	9	3500	28000	31500
17.	Different Transducers : pressure type, thermo couple, LVFT, Opto pick electromagnetic pick up; Thermal relay, ultra-sonic pick up and potentiometer etc. including strain gauge, Piezoelectric Transduser, Diff. types of Photo sources & Detec-tor,Optical Fibre sensors	-	-	-	-	-	-	8	8	LS (8 set of experimental kit/ board)	LS	8000	64000	64000

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S.No.	Name of the Equipment/ Board/Kit Etc.	Elex. Components & Devices Lab.		Networks Filters & Transmis-sion Lab.		Elex. Devices & Ckts.Lab.		Total		Total No. Recommen-ded		Rate per Piece	Total Cost	
		Intake		Intake		Intake		Intake		Intake		In Rs.	Intake	
		60	75	60	75	60	75	60	75	60	75		60	75
18.	Experimental Kit/ Teaching Modules/ Training boards/ Learning kits. of relevant subject.	2* + 30	3* + 40	2* + 10	3* + 12	0 + 60	0 + 80	4* + 140	6* + 182	LS	LS	50000	100000	100000
19.	Component Storage rack	4	4	4	4	4	4	16	16	16	16	8000	128000	128000
20.	Consumable Items	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	30000	30000
21.	Miscellaneous	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	50000	50000
22.	Power Operated Drilling Machine	2	3	2	3	2	3	2	3	2	3	3500	7000	10500
23.	Servo Voltage Stablizer 5 KVA	1	2	1	2	1	2	1	2	1	2	75000	75000	150000
24.	Invertor 1 KVA with Battery	1	2	1	2	1	2	1	2	1	2	15000	15000	30000
25.	One Desk Top Core i5/i7 -760 Processor, Genuine Window-7 Professional, 18 inch HD,Flat Panel MOnitor, Optical Mouse Key Board and All related media Or Latest Version	2	3	2	3	2	3	2	3	2	3	40000	80000	120000
26.	Electronics Software For Electronics Lab Virtual Lab/ Circuit Maker etc. of Latest Version	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	300000	300000

NOTE:- * Represents the quantiy of learning kits/teaching module. This item is more costly as compared to training boards/
experimental kits etc.

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DIGITAL ELECTRONICS AND MICROPROCESSOR
Principle of Digital Electronics Lab. (Second Year)
Microprocessors And Applications Lab. (Third Year)

S.No.	Name of the Equipment/ Board/Kit Etc.	Principles of Digital Eltx. Lab.		Micropro-cessors & Applicat-ion Lab.		Total		Total No. Recommen-ded		Rate per Piece	Total Cost	
		Intake		Intake		Intake		Intake		@ Rs.	Intake	
		60	75	60	75	60	75	60	75		60	75
1.	CRO dual trace with delayed time base, 25 MHz or higher band width.	2	2	-	-	2	2	2	2	25000	50000	50000
2.	CRO dual trace 100MHz. Digital storage oscilloscope 4 Kpts of Memory, 2 Channels with additional external trigger input, Large 15 Cm. colour display, 20 automatic measurement & 4 math function advance triggering selectable video, mask test,USB inter face for PC Connectivity	2	3	-	-	2	3	2	3	30000	60000	90000
3.	CRO dual trace 30 MHz. Accuracy +3%, Variable Cont. For Stable triggering, Slope Positive or Negative Trace Rotation adjustable on front panel, CRT 140 mm Z Modulation	4	4	2	3	6	7	6	7	15000	90000	105000
4.	Multimeter, 20 K Ohm/volt sensitivity, 1% accuracy in D.C. voltage range, Max. D.C. voltage range 2500 V, A.C Curr-ent.	4	6	-	-	4	6	4	6	3500	14000	21000
5.	Multimeter,Digital hand held 3.5/4.5digit, 0.3% accuracy	4	6	2	4	8	10	8	10	3500	28000	35000
6.	1000 V D.C. and 20 m ohm res-istance range protected against transients. Logic Probe	30	35	10	15	40	50	40	50	500	20000	25000
7.	Logic board/trainer including +5 Volt, 1Amp + 15 V, 0.3 Amp. power supply and bread board and flexible leads.	20	28	-	-	20	28	20	28	5000	100000	140000
8.	Microprocessor trainer kits with 8085 system (EC 85 or similar).	-	-	16	20	16	20	16	20	12000	192000	240000
9.	Component rack 144 tray (small) & 24 large tray.	4	4	2	2	6	6	6	6	8000	48000	48000
10.	Consumable material such as components ICs, resistors transistors etc.	LS	LS	LS	LS	LS	LS	LS	LS	--	80000	
11.	Miscellaneous	LS	LS	LS	LS	LS	LS	LS	LS	--	100000	
12.	Micro Controller Kits/PLC	LS	LS	LS	LS	LS	LS	LS	LS	--	50000	
13.	Trainer Kits of Universal Shift Register (SISO,SIPO,PIPO,PISO) Decade Counter, Universal Counter(Up, Down & Updown) & Different Flip Flops	LS	LS	-	-	LS	LS	LS	LS	--	50000	
14.	Microprocessor Training Kit of 8086	-	-	12	15					LS	100000	
15.	Universal Data Book	1	1	1	1	1	1	1	1	5000	5000	5000
16.	Software	-	-	-	-	-	-	-	-	LS	200000	

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ELECTRONICS WORKSHOP AND PROJECT LABORATORY

Electronics Workshop
Electronics Instruments and Measurements Lab.
Project-(Seperate Lab Should Be Established For Instrumentation & Control Project)

S.No.	Name of the Equipment/ Board/Kit Etc.	Electronics Workshop		Electronics Inst. & Measurements Lab		Project		Total		Total No. Recommended		Rate per Piece	Total Cost	
		Intake		Intake		Intake		Intake		Intake		In Rs.	Intake	
		60	75	60	75	60	75	60	75	60	75		60	75
1.	D C Voltmeter (1K/2K/10K/20K Ohm per Volt)	-	-	8	8	-	-	8	8	8	8	600	4800	4800
2.	Gen.purpose multimeter	4	6	4	6	4	6	12	18	8	10	2500	20000	25000
3.	Digital Multimeter	4	6	6	8	4	6	14	20	10	12	3500	35000	42000
4.	Regulated Power Supply Variable 0-30 V; 1 A	2	2	4	6	8	10	14	18	8	10	3000	24000	30000
5.	Transistor power supply (+,-,Comm)0-30 V / 1 A variable	2	2	2	3	8	10	12	15	8	10	3500	28000	35000
6.	Unregulated power supply 0-30 V; 1 A	2	2	2	2	-	-	4	4	2	2	2500	10000	10000
7.	A.F. signal generator. Output Digital AES 75W on a BN connector,AES/EBU on terminal block connector, S/PDIF on a RCA connector and To link balanced Stereo 600 W on a Terminal block connector with power adaptor	4	6	8	10	4	6	16	22	10	12	10000	100000	120000
8.	RF signal generator Frequency Range 100KHz to 150 Mhz in seven steps, accuracy on sacle +5%, RF output min 100mv (upto 30 Mhz), RMS modulation AM, Audio Frequency Range 150 Hz-1.5 Khz, Audio output 2V RMS, Ext. Audio Input 50 Hz to 20 Khz at less than IV RMS Mains 230 V	4	6	10	12	4	6	18	24	10	12	15000	100000	180000
9.	Function Generator Operating modes sine, square, triangle and DC output Frequency Range 0.1-1Mhz in seven decade steps, Variable control between steps, Frequency Accuracy +0.5% Display LCD controlled by micro controller, Main supply 200V +10%, 50 Hz output voltage max 10V into 50W, attenuation two step variable	2	3	2	3	2	3	6	9	4	6	25000	100000	150000
10.	Std. Signal Generator	4	6	2	2	2	3	8	11	4	6	15000	60000	90000
11.	AC/DC Voltmeter (M.I.type)	-	-	4	6	-	-	4	6	4	6	600	2400	3600
12.	CRO 200 Mhz Digital Storage oscilloscope-upto 1GSa/s Simple Rate Memory 4 Kpts or Higher, 2 Chennel with additional ext. trigger input, Colour Display 15 cm(5.7 inc.) 20 automatic measurement & 4 math function including FFTs, Advance Triggering,Delayed Sweep Mode Mask Test, USB Interface For PC Connectivity	-	-	4	4	8	10	10	14	8	10	35000	280000	350000
13.	Dual Trace CRO 100 MHz Digital Storage oscilloscope-upto 1GSa/s Simple Rate Memory 4 Kpts or Higher, 2 Chennel with additional ext. trigger input, Colour Display 15 cm(5.7 inc.) 20 automatic measurement & 4 math function including FFTs, Advance Triggering,Delayed Sweep Mode Mask Test, USB Interface For PC Connectivity	-	-	4	4	8	10	10	14	8	10	35000	280000	350000

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S.No.	Name of the Equipment/ Board/Kit Etc.	Electronics Work-Shop		Electronics Inst. & Measurements Lab		Project		Total		Total No. Recommended		Rate per Piece	Total Cost	
		Intake		Intake		Intake		Intake		Intake		In Rs.	Intake	
		60	75	60	75	60	75	60	75	60	75		60	75
14.	Q Meter-8 Digit LED 0.8 inch Height, Range Indicator .999 count & Status indicators Via 3 LEDs, Measuring Frequency 250 ms	-	-	2	3	-	-	2	3	2	3	8000	16000	24000
15.	RLC/Universal Bridge AC/DC Bridge	-	-	2	3	2	3	2	4	4	5	8000	32000	40000
16.	Universal Digital Freq. Counter	-	-	2	3	2	3	4	6	2	3	20000	40000	60000
17.	Distortion Factor Meter	-	-	2	2	-	-	2	2	2	2	12000	24000	24000
18.	Decade Resistance Box 4/5/6 Dials	-	-	2	3	2	3	4	6	4	6	1500	6000	9000
19.	Decade Cap. Box 4/5/6 Dials	-	-	1	2	1	2	2	4	2	3	3000	6000	9500
20.	Std. Inductance (Diff. Value)	-	-	4	6	-	-	4	6	4	6	600	2400	3600
21.	Charts, Models, displays for safety/rules etc.	LS	LS	-	-	-	-	LS	LS	LS	LS	--	10000	10000
22.	Digital Multimeter 4.5 Digit Display, AC/DC Voltage, AC/DC Current 20A Resistance, Capacitors Frequency Diode Test, Transistor Test & Continuity Test	2	3	6	6	4	6	12	15	6	8	5000	30000	40000
23.	Single Phase Variac 5 Amp, 15 Amp (Oil/Air cool)	4	10	2	4	8	10	18	22	10	12	5000 av.	50000	60000
24.	Calibrated Dual Trace CRO 100 Mhz Digital Storage oscilloscope-upto 1GSa/s Simple Rate Memory 4 Kpts or Higher, 2 Chennel with additional ext. trigger input, Colour Display 15 cm(5.7 inc.) 20 automatic measurement & 4 math function including FFTs, Advance Triggering,Delayed Sweep Mode Mask Test, USB Interface For PC Connectivity	2	3	-	-	6	6	6	8	4	6	30000	120000	180000
25.	Tools Kit	20 SET	30 SET	-	-	20 SET	30 SET	40 SET	60 SET	30 SET	40 SET	1500	45000	60000
26.	Misc. Active Components	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	15000	
27.	Misc. Accessories as per req.	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000	
28.	Misc. Passive components.	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	15000	
29.	Working Models of analog and digital equipment	LS	LS	-	-	-	-	LS	LS	LS	LS	--	20000	
30.	Dark room with Camera,Enlarger, Developing setup, Fixing & Printing setup etc.	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	80000	
31.	Manual Etching Setup	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000	
32.	Mechanised Etching Setup	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000	
33.	Silk-Screen Printing Setup	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	10000	
34.	Drill Machine Power Operated	2	3	-	-	4	6	4	8	4	6	3500	14000	21000
35.	PCB Drill Machine	2	3	-	-	4	6	6	9	4	6	500	2000	3000
36.	Misc. Items	LS	LS	-	-	LS	LS	LS	LS	LS	LS	--	80000	
37.	Consumable(Not specified above)	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	--	258000	

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XV. LEARNING RESOURCE EQUIPMENT

1.	LCD Projector with Screen	1	--	20000
2.	Handicam	1	--	30000
3.	Cutting, Binding & Stitching equipment.	1	--	30000
4.	Desk Top Computer with Internet Core i5/i7- 760, Processor, Genuine Windiw 7, Professional 18 inch HD, Flat Panel Monitor Optical Mouse, Key Board & all related media or latest version	1	--	40000
5.	Home Theater Support Disc type CD. CDR/CDRW DVDR/DVDRW, VCD Supported with USB Port Support-DIVX/JPEG/MP3	1	--	25000
6.	Commerical P A System 16 W-220W output, AC & 24V DC Operated, 5 Mic. & 2 Auxilary input, Speaker output 4 Ohm, 8 Ohm, 17 V & 100 V	1	--	20000
7.	Interactive Board	1	--	50000

Note :

1. This center will be only one at the institute level irrespective of all branches.

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ANNEXURE I- QUESTIONAIRE

INSTITUTE OF RESEARCH,DEVELOPMENT AND TRAINING U.P.KANPUR -208024

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Instrumentation & Control Engg.

PURPOSE: To design and develop Three Year (Six Semester) diploma curriculum in Instrumentation & Control Engg.

NOTE: 1.Please answer the questions to the points given in the questionnaire.
2.Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1.Name of the organisation:_____
_____

2.Name & Designation of the officer filling the questionnaire _____
_____

3.Name of the department/section/ shop _____
_____

4.Importent functions of the department/section/shop _____
_____

5.Number of diploma holder employees under your charge in the area of Instrumentation & Control Engg. _____

6.Please give names of modern equipments/machines handled by a diploma holder in Instrumentation & Control Engg.

1. 2. 3.

4. 5. 6.

7.What proficiencies are expected from a diploma holder in Instrumentation & Control Engg.

1. 2. 3.

4. 5. 6.

8.Mention the approximate percentage of the following desired in Diploma teaching.

1. Theoretical knowledge ----------%
2. Practical knowledge ----------%
3. Skill Development ----------%

9.Do you think " on the job training" / Industrial training

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should form a part of curriculum. (Yes/ No)
if yes then
(a) Duration of training ----------
(b) Mode of training 1. Spread over different semesters

2. After completion of course

3. Any other mode

10.What mode of recruitment is followed by your organisation.

1. Academic merit
2. Written test
3. Group discussion
4. Interview
5. On the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Instrumentation & Control Engg.

(a) Technical knowledge ----------
(b) Practical skill ----------
(c) Etiquettes and behaviour ----------
(d) Aptitude ----------
(e) Health habit and social background ----------
(f) Institution where trained ----------

12. Does your organisation have any system for the survey of Home articles of different countries/States. Yes/No

13. Does your organisation conduct field survey to know users views regarding. Yes/No

1. Home Articles for different age groups and sex.
2. Effect of climatic conditions
3. Any other

If yes ; Please give brief account of each.

14. Which type of assignment do you suggest for an entrepreneur in Instrumentation & Control Engg.

15. In which types of organisations can a diploma holder in Instrumentation & Control Engg. can work or serve.

1 2 3

4 5 6

16. Job prospects for the diploma holder in Instrumentation & Control Engg. the next ten years in the state / country.

17. In your opinion what should be the subjects to be taught to a diploma student in Instrumentation & Control Engg.

Theory Practical

18. Kindly mention particulars regarding topics/areas which

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should be given more emphasisin the curriculum .

Theory Practical

19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field. Yes/ No
If yes : Please give names of experts in your organisation to whom contact.

20. Kindly give your valuable suggestions for being considered at the time of finilisation of curriculum.

21. What changes in technologies are to be incorporated in the development of curriculum in Instrumentation & Control Engg.

(Signature)

Kindly mail the above questionnaire duly filled to:-

Lal Ji Patel
Text Book Officer
Institute of Research,Development & Training,U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential for the use of curriculum design only)

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ANNEXURE II- SUMMER TRAINING SCHEDULE

4 weeks structured, supervised, branch specific, task oriented industrial/field exposure to be organised during summer vacation after second year annual examination.

The student during the vacational training must undertake training in any one of the following.

1. MANUFACTURE OF CABINATE AND ALLIED FITTINGS

   To study and record drawings, moulds and internal sheet metal fittings of various instruments, records and monitors in a manufacturing unit.

2. To study and record procedure with drawings for testing and repair of under ground cable fault with the list of material.

3. To observe the effect of unsymmetrical loading and variation in symmetrical components with remedy in a power system.

4. To study flow diagram of process parameters. The training should also incorporate maintenance and repair of process instruments. Specifications of process instruments should also be recorded.

5. To study the effect of proportional, integral and derivative control in a flow process. To observe the working of Pneumatic, hydraulic, mechanical and electrical controllers in a system and to practice control techniques.

6. To handle various control components and to look after/repair and maintain these components.

7. To check the accuracy of various gauges and to calibrate gauges with the help of dead weight tester or otherwise.

8. To study the working and maintenance of valves, actuators and final control elements in a process control system.

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The students will work and focus their attention during the training on the following points which will be incorporated by them in their reports.

1. Name & Address of the unit

2. Date of
   i. Joining.
   ii. Leaving.

3. Nature of Industry

   i. Product.
   ii. Services.
   iii. Working Hrs.

4. Sections of the unit visited and activities there in.

5. Details of machines/Tools & instruments used in working in the section of the unit visited.

6. Work procedure in the section visited.

7. Specifications of the product of the section and materials used.

8. Work of repair and maintenance cell.

9. Details of the special sophisticated instruments used in the industry with details of care taken in their handling.

10. Name of checking and Inspecting Instruments and their details. Quality controls measures taken.

11. Details of hadraulics/pneumatic/ thermal units or appliances used if any.

12. Discripton of any breakdown and its restoring.
13. Use of computer - if any.
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygeinic.

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