Book No 14

14/0

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAY

(UNIVERSITY OF TECHNOLOGY OF MADHYA PRADESH)

SECTION :

Instrumentation

SUBJECT :

A/4, OFFICE COMPLEX, GAUTAM NAGAR,BHOPAL-462 023
PHONE : (0755) 2583627, 2583673 FAX : 0755-2583656

1st to 6th Semester (1) 14/1

M. P. Board of Technical Education
Bhopal

I & II Inst Semester of
Instrumentation & Control
Engg. w.e.f. 1995 onwards

THREE YEAR DIPLOMA COURSE
IN
INSTRUMENTATION

(2)

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION,
BHOPAL.

* * *

SECOND YEAR DIPLOMA COURSE IN INSTRUMENTATION.
(III rd & IV th Semesters.)

* * *

3.2. Communication Skill-II	64	-	-	20	-	10	-	1	3 Hrs	100	-	-	-	140
3.3. Basic Electronics	96	64	10	40	30	10	-	1	3 Hrs	100	1	3 Hrs	50	220
3.4. Electrical Engineering	96	64	10	40	30	10	-	1	3 Hrs	100	1	3 Hrs	50	220
3.5. Workshop Practice	-	96	6	-	30	-	-	-	-	-	1	3 Hrs	50	80
6.														
7.														
8.														
9.														
10.														
Total :	356	224	36	80	90	40	-	4	-	400	3	9 Hrs	150	800

NOTE: (1) No.of theory paper: 04
(2) Total theory marks: 400
(3) No.of practicals : 03
(4) Total Pract.Marks.: 150
(5) Implant Training Ms : —
(6) Total mks.of sessional, Prof.Assessment, Pract.& : 400

(7) Ratio of theory marks 400 :: 400 and (sessional +prof.assess.+Practical+Implant Training Marks. (80+90+40+40—50=400) i.e. 1:1

(8) Total Marks : 800

(9) Passing marks for -

(a) Theory -33%
(b) Practicals-40%
(c) sessionals-60%
(d) Implant Training

M.P. BOARD OF TECHNICAL EDUCATION, BHOPAL

4th Semester DIPLOMA PROGRAMMES IN Instrumentation SESSION – JANUARY TO DEC

To be introduced in 1996 - 97 at Korba

S.No.	SUBJECTS	SCHEME OF STUDY: CONTACT HRS PER WEEK (SEMESTER) THEOR.	LAB.	.....	SCHEME OF EXAMINATION: SESS. MKS. TERM WORK.	LAB. WORK.	PRELIM. EXAM. I	II	BOARD EXAMINATION: T.A.	DURATION	PAPER	PRACTICAL	DURATION.	MRKS	REMARKS TOTAL
⊙	4.1. Electrical & Electronics - Measurements and Measuring Instruments	6 (96)	4 (64)	10 (160)	20	50	10	10	1	3Hrs	100	1	3Hrs	50	PRACT+VIVA 240
⊙	4.2. Mechanical Engineering	4 (64)	4 (64)	8 (128)	20	30	10	10	1	3Hrs	100	1	3Hrs	50	PRACT+VIVA 220
	4.3 Instrumentation-1	6 (96)	4 (64)	10 (160)	20	30	10	10	1	3Hrs	100	1	3Hrs	50	PRACT+VIVA 220
	4.4 Engineering Drawing	2 (32)	6 (96)	8 (128)	—	50	10	10	1	4Hrs	100	1	3Hrs	50	PRACT+VIVA 220
6.		( )	( )	( )											
7.		( )	( )	( )											
8.		( )	( )	( )											
9.		( )	( )	( )											
10.		( )	( )	( )											
	Total :	18 (288)	18 (288)	36 (576)	60	160	40	40	4	—	400	4	—	200	900

NOTE; (1) No. of theory paper: 04
(2) Total theory marks: 400
(3) No. of practicals : 04
(4) Total Pract. Marks.: 200
(5) Inplant Training Ms : NIL
(6) Total mks. of sessional, Prog. Assessment, Pract. & ~~Inplant Training~~. : 500
(60+160+40+40+200=500)

(7) Ratio of theory marks 400 :: 500 and (sessional + prog. Assess (+Practical+Inplant Training) i.e. 1:1.25
Marks.
(60+160+40+40+200=500)

(8) Total Marks : 900

(9) Passing marks for –
(a) Theory – 33%
(b) Practicals – 40%
(c) sessionals – 60%
(d) Inplant Training = 50%

TOTAL OF IIIrd & IVth Sem. Marks = 800+900 = 1700

FOURTH SEMESTER ELECT. ENGG.

FIFTH SEMESTER DIPLOMA PROGRAMME IN INSTRUMENTATION — NEW/(REVISED) CURRICULUM

(To be introduced from 199- - 96 — KORBA) SESSION: JULY TO DECEMBER

S.NO.	NAME OF SUBJECT	SCHEME OF STUDY. CONTACT HRS PER WEEK (SEMESTER) THEORY	LAB.	TOTAL	SCHEME OF EXAMINATION. SESS. MRS. TERM WORK.	LAB. WORK	PROG. ASSM. I	II	BOARD EXAMINATION. TH. PAPER	DURATION (HRS)	MKS	PRACTICAL	DURATION. (HRS)	MKS	REMARK TOTAL
X 5.1	DIGITAL ELECTRONICS	6 (96)	4 (64)	10 (160)	25	30	10	10	1	3	100	1	3	50	PRACT + VIVA 225
5.2	CONTROL SYSTEM	6 (96)	4 (64)	10 (160)	25	30	10	10	1	3	100	1	3	50	PRACT + VIVA 225
5.3	MECHANICAL MEASUREMENTS	6 (96)	4 (64)	10 (160)	25	30	10	10	1	3	100	1	3	50	PRACT + VIVA 225
5.4	MICRO PROCESSOR AND MICRO COMPUTER TECHNOLOGY	4 (64)	2 (32)	6 (96)	25	30	10	10	1	3	100	1	3	50	PRACT + VIVA 225
6.		( )	( )	( )											
7.		( )	( )	( )											
8.		( )	( )	( )											
9.		( )	( )	( )											
10.		( )	( )	( )											
	Total :	22 (352)	14 (224)	36 (576)	100	120	40	40	4	—	400	4	—	200	900

NOTE: (1) No. of theory paper: 04
(2) Total theory marks: 400
(3) No. of practicals : 04
(4) Total Pract. Marks.: 200
(5) Inplant Training Mks : NIL
(6) Total mks. of sessional, Prog. Assessment, Pract. & Inplant Training. : 500
(100+120+40+40+200=500)

(7) Ratio of theory marks 400 :: 500 and (sessional + prog. Assess + Practical + Inplant Training i.e. Marks. (100+120+40+40+200=500)) 1 : 1·25

(8) Total Marks : 900

(9) Passing marks for —
(a) Theory — 33%
(b) Practicals — 40%
(c) sessionals — 50%
(d) Inplant Training — 50%

NOTE: EVERY STUDENT HAS TO UNDERGO INDUSTRIAL TRAINING OF FOUR WEEKS IMMEDIATELY AFTER FIFTH SEMESTER EXAMINATION. ITS ASSESSMENT/EVALUATION WILL BE DONE IN SIXTH SEMESTER.

※ Common with subject "Digital Electronics — Components and applications" of Fifth semester

...INSTRUMENTATION — REVISED CURRICULUM

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To be introduced from 1997 - 98 — SESSION : JANUARY - JUNE

S.No.	NAME OF SUBJECT	SCHEME OF STUDY. CONTACT HRS PER WEEK (SEMESTER)			SCHEME OF EXAMINATION. SESS. MRS.		PROG. ASSM.		BOARD EXAMINATION.						REMARK TOTAL
		THEORY	LAB.	TOTAL	TERM WORK.	LAB. WORK	I	II	TH. PAPER	DURATION (HRS)	MRS	PRACTICAL	DURATION (HRS)	MRS	
6.1	INSTRUMENTATION - II	6 (96)	4 (64)	10 (160)	20	30	10	10	1	3	100	1	3	50	PRACT. + VIVA 220
6.2	PROCESS CONTROL	4 (64)	2 (32)	6 (96)	20	30	10	10	1	3	100	1	3	50	PRACT. + VIVA 220
6.3	COMMUNICATION ENGINEERING	4 (64)	4 (64)	8 (128)	20	30	10	10	1	3	100	1	3	50	PRACT. + VIVA 220
6.4	INDUSTRIAL MANAGEMENT	6 (96)	- (-)	6 (96)	20	—	10	10	1	3	100	—	—	—	140
6.5	PROJECT WORK	- (-)	6 (96)	6 (96)	—	50	—	—	—	—	—	1	3	50	VIVA 100
6.6	INDUSTRIAL TRAINING /	- (-)	- (-)	- (-)	50	—	—	—	—	—	—	1	3	50	VIVA 100
7.		( )	( )	( )											
8.		( )	( )	( )											
9.		( )	( )	( )											
10.		( )	( )	( )											
	Total :	28 (320)	16 (256)	36 (576)	80+50 = 130	140	40	40	4	-	400	5	-	200+50+50 = 250	1000

NOTE; (1) No. of theory paper: 04
(2) Total theory marks: 400
(3) No. of practicals : 04
(4) Total Pract. Marks : 200
(5) Inplant Training Mrs : 100
(6) Total mks of sessional, Prog. Assessment, Pract. & Inplant Training. : 600
(80+140+40+40+200+100 = 600)

(7) Ratio of theory marks 400 :: 600 and (sessional + prog. Assess + Practical + Inplant Training) i.e. 1 : 1.5
Marks.
(80+140+40+40+200+100 = 600)

(8) Total Marks : 1000

(9) Passing marks for - TOTAL OF I^th & VI^th Semester marks = 900 + 1000 = 1900

(a) Theory - 55%
(b) Practicals - 40%
(c) sessionals - 60%
(d) Inplant = 50% Training

NOTE: THE TERM WORK MARKS OF INDUSTRIAL TRAINING WILL BE GIVEN AS FOLLOWS :

(A) PLANT LAYOUT = 10 MARKS
(B) PRODUCTION / OPERATION = 10 Marks
(E) SUGGESTION FOR IMPROVING = 05

NOTE:
* Common with 5th Semester Mechanical Engg.
** Common with 6th Sem. Electrical Engg.

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THIRD SEMESTER. (4)

SECOND YEAR DIPLOMA IN INSTRUMENTATION

(3.4) ELECTRICAL ENGINEERING.

CONTENTS

S.No.	Topic	Theory Hours.	Practical Hours.
1.	2.	3.	4.
1.	Elect. Engg. Materials.	8	-
2.	Circuit Analysis.	8	-
3.	Network Theorems	8	-
4.	A.C. Circuits.	10	-
5.	Polyphase circuits.	8	-
6.	Transients	4	-
7.	D.C. Machines.	8	-
8.	Transformers.	8	-
9.	Induction Motor	10	-
10.	Synchronous Machines.	8	-
11.	Single phase motors.	3	-
	Total	94	56

SECOND YEAR DIPLOMA IN INSTRUMENTATION.

(3.4) ELECTRICAL ENGINEERING.

1. Electrical Engg. Materials:- Common conducting materials and their electrical properties, Copper and copper alloys, aluminium, Tungsten steel, Nichrome, Manganin chromel, Eureka, and their applications.
Semiconductor materials - silicon and germanium, Intrinsi and Extrinsic semiconductors.
Insulating materials-commonly used insulating materials- paper, preelain, bakelite, mica, rubber p.v.c., cotton, insulating oils. Permittivity, dielectric strength, volume and surface resistivity and dielectric loss angle, effect. of frequency, temperature and moisture on above properties, Magnetic materials-classificati n of magnetic materials as par amagnetic, dimagnetic and ferromagnetic materials. Magnetization characteristics, permeability, hysteresis loss and coercivity. Ferrite and Ceramic materials, materials for permanent magnets.
2. Circuit Analysis :- Active and passive elements, ideal current and voltage source, representation of actual source with either of above, network solution by nodal and mesh equation, two terminal pair network, input and output impedance and hybrid parameters.
3. Network theorems :- Star/Delta transformation, Thevenin's theroem, Norton's theroem, Maximum power transfer theorem. Solution of simple problems based on above theorems.
4. Single Phase a.c. Circuits:- Phasor representation, Representation of a.c. quantities by rectangular and

polar co-ordinates and as exponential functions. Various combinations of R-L-C- series and parallel circuits, reactance, impedance, power and power factor, conductance, susceptance and admittance. Series and parallel resonance, resonance curves, Quality factor, half power frequencies, band width.

5. Polyphase Circuits:- Advantages of polyphase circuits; generation of 3phase voltage, phase sequence, three phase circuits, vector and wave diagram; star and delta connections, relationship between phase and line values of (a) currents & (b) voltages, expression for power, solve Problems for balanced and unbalanced system-3 wattemeter method; two wattmeter method; expression for p.f. and vector diagram for balanced case, variation of wattmeter reading withp.f.

6. Transients:- Rise and decaay of current in R.L- and R-C- circuits, with d.c. excitation. Time constnts.

7. D.C. Machines :- Constructional features, field system, armature and material used, commutator and brush gear, types of armature winding.

Generator action, e.m.f. equation, inter-poles and compensating winding, magnetisation characteristics. Motor action torque equation, back e.m.f., speed, torque/current, speed/current and speed/torque, characteristics of series, shunt and compound motors. Motor starters. Field control and armature control method of speed control.Losses and efficiency of d.c.machine.Application.

8. Transformer:- Principle of transformer, e.m.f., equati transformation ratio.

Construction :- Core and core materials, ideal transf assumptions, voltage ratio, current ratio, impedance transformation, action at no load, and no load phasor diagram. Transformer on load, equivalent circuit of actual transformer, phasor diagram, losses and efficie Open circuit and short circuit tests. Regulation and al day efficiency. High frequency transformer.

9. Three phase induction motor:- Construction; stator, stator winding, squirrel case and slip ring types of ro Production of rotating magnetic field, rotor induced voltage & Current, slip, slip frequency, principle of torque production and torque equation, speed-torque charateristics, condition for max.torque. Various types of starters. Speed control by pole changing and rotor resistance method.

10. Synchronous Machines:- Construction-stator, salient pole and cylindrical rotor.

Synchronous speed, frequency and their relationship Alternator:- E.M.F. equation, form factor, coilspan factor and distribution factor, synchronous impedance, O.C. & S.C. test. Regulation(definition only)

Synchronous motor-principle of action, operation at constant load and constant excitation, synchronous condensor and its application. Methods of starting.

11. Single phase motors:- Revelving field theory, methods of producing starting torque. Different types of motor and their connection.

SECOND YEAR DIPLOMA IN INSTRUMENTATION

LIST OF RECOMMENDED PRACTICALS FOR ELECTRICAL ENGINEERING.

1. Study of different types of conducting, insulating and magnetic materials.
2. Vertification of Kirchhoff's current and voltage laws in a given network.
3. Vertification of thevenin's and Norton's theorem using a circuit.
4. Vertification of maximum power transfer theorem.
5. Performance of R, L, C, series circuit.
6. Permformance of R, L, C, parallel circuit.
7. Star/Delta connection and measurement of line and phase values of voltage & current and their verification.
8. Electrical resonance insingle phase series and parallel circuits.
9. Measurement of power in a three phase circuit by two wattmeter method.
10. Magnetisation charateristics of d.c. shunt generator.
11. Study of d.c. motor starters and their connection.
12. Speed control of d.c. shunt motor by (a) armature voltage control (b) field control.
13. Transformation ratio of single phase transformer.
14. O.C. and S.C. tests on a simple phase transformer and determination of circuit parameters and efficiency.
15. Measurement of slip of induction motor by (a) centre zero ammeter (b) stroboscope.
16. Stuly of various types of starters for three phase induction motors and their connection.
17. Measurement of frequency of alternator and its vertification.
18. Study of synchronous motor and its starting methods.
19. Study and connection of different types of single phase induction motors.

-// LIST OF REFERENCE BOOKS //-

1. Electrical Engg. Materials by G.K. Mithal-Khanna Pub.
2. Electrical Engg. Materials by G.I. Chhalotra-Khanna Pub;
3. A Curse in Circuit Analysis by Soni & Gupta- Dhanpat Rai Sons Pub.
4. Electrical Circuit theory by Arnugam and Prem Kumar- Khanna Pub.
5. Principles of Elect. Engg. by Vincent Del Toro- Prentice Hall of India
6. Electrical Machines Vol I and II by Bhattacharya- TITI Chandigarh Pub.
7. Electrical Machines by Nagrath & Kothari- Tata Mc Graw Hills Pub.
8. Electrical Machinery by S.K. Sen- Khanna Pub.

FOURTH SEMESTER DIPLOMA IN INSTRUMENTATION

(4-3) INSTRUMENTATION I

14/13 (18)

CONTENTS

FOURTH SEMESTER-

SECOND YEAR DIPLOMA IN INSTRUMENTATION

(4.3) INSTRUMENTATION-I

1. Basic principles of measurment:- Elements of measuring system, block diagram, accuray, precision & sensitivity, errors-static and dynamic.

2. Transducers:- Transducer, actuating mechanisms, Transducer classification-variable paramater-potentiometric, strain gauge, resistance thermometer, thermister (PTC, NTC), Variable capacitance and variable inductance types, L.V.D.T.? self generating, piezo electric, thermoelectric, Magneto-strictive, photo electric, ionization transducers. Frequency generating and digital transducers. Selection of transducer, transducer loading.

3. Signal conditioner:- Purpose, classification, Input modifier, frquency range, a.c. amplifier, d.c. amplifier chopper amplifier, chopper stabilized amplifier, summing amplifier, signal generator, schmmit trigher, function generator, modulator and demodulators, V.C.O., multivibrators, potentiometric and bridge devices. A to D and D to A converters. Frequency divider. Crystal oscillator.

4. Indicators and Recorders:- End devices, classification precesion of analouge indicators and classification, digital indicators mode of display, seven segment & alphanumeric display LED and LCD.

Recorders :- Types and objectives, chart recorder :- Classification, other forms of recording-prints,

punched cards, punched tapes, maegnetic tapes, pen recorders, heated stylus recorders UV recorder, fibreoptics face plate recorder, direct recording oscillograph.

5. Oscilloscope :- Delay line-its function, lumped parameter type and distributed parameter type. Delayed Trigger. Oscilloscope probes- 10:1 attenuation probe and current probes. Long persistance type storage oscilloscope and sampling oscilloscope.

6. Signal analysis :- Wave analyser (1) Frequency elective, (2) Hetrodyne wave analyser, Harmonic distortion analyser- tuned circuit harmonic analyser, Hetrodyne harmonic analyser, wave meter, fundemental suppression harmonic ananlyser, spectrm analyser and their application.

7. Frequency counters and time interval measurements :- Simple frequency counter, period measurement.

(1) Semiconductor transducers - Semiconductor strain gauge, Hall probe, thermistor,

Optical transducers, Photo-electric transducers

Photoconductive, photovoltaic & photoemissive cells, Phototransistor & photodiodes, IR transducers.

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FOURTH SEMESTER (13)

(SECOND YEAR) DIPLOMA IN INSTRUMENTATION.

List of recommended practicals for: Instrumentation-I

—0—

1. Study of various types of transducers and determination of characteristics.
2. Study of different signal processing circuits and system
3. Study of complex wave form and determination of harmonic by spectrum analyser.
4. Measurement of frequency and phase by C.R.O.
5. Study and operation of display devicas like LED, LCD etc.
6. To construct a frequency divider and study it.
7. To construct and study A to D and D to A converters.
8. To construct and study voltage controlled oscillator and measure its frequency for a given voltage.
9. To construct & study a frequency counter.
10. Study of electronic timer and its operation.

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List of Refrence Books.

1. Principles of Industrial Instrumentation by Patranabis-Tata Mc Graw Hill Pub.

2. Industrial Instrumentation & Control by S.K. Singh-Tatal Mc Graw Hill Pub.

3. A Course in Electrical & Electronic Measurements & Instruments by A.K. Sawhney-Dhanpat Rai Pub.

4. Experimental Methods for Engineers by Holl man-Mc-Graw Hill Pub.

5. Electronics Instrumentation by Prenskey-Prentice Hall of India Pub.

6. Mechanical & Industrial Measurement by R.K. Jain-Khanna Pub.

7. Instrumentation for Engineering Measurement by Cerni & Foter.

8. Instrumentation by Kirk & Rimbo- D.H. Taraporewala Pub.

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FOURTH SEMESTER (15)

SECOND YEAR DIPLOMA IN INSTRUMENTATION.

(404) ENGINEERING DRAWING.

S.No.	Topic	Theory & Practice Hours.
1.	Introduction	18
2.	Scales	06
3.	Engineering Curves	09
4.	Orthographic projections of point, lines and planes	12
5.	Projection of solids and sections of solids.	15
6.	Oblique and isometric projections.	10
7.	Projection of simple machine parts & components	12
8.	Symbols and notation related to Electrical Engineering.	08
9.	Instrumentation symbols	06
10.	Domestric Wiring.	08
11.	Instrument Circuits:	08
	Total	112

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FOURTH SEMESTER (16)

[SECOND YEAR] DIPLOMA IN INSTRUMENTATION

(A-14) ENGINE RING DRAWING

1. INTRODUCTION:- Introduction to drawing equipment/ instruments, methods of using drawing instruments. Planning of drawing sheets as per IS 696-1972, line and letter printing, dimensioning, practice, problems and correct methods of dimensioning.

2. SCALES:- Importance of scales in Engineering Drawing representative fraction, types of scales plain, diagonal and vernier-construction of above scales.

3. ENGINEERING CURVES:- Common Engineering Curves, Ellipse, construction of ellipse by parallelogram method and areas of circle method, Parabola, hyperboal, cycloid, epicycloid, hypocycloid, involute, helix and spiral.

4. ORTHOGRAPHIC PROJECTION OF POINTS & LINES:- Definition of various terms associated with orthgraphic projections, planes of projections, first angle and third angle projection, projection of points, projection of lines in various positions w.r.t. H.P. and V.P., projections of planes having different shapes.

5. PROJECTIONS OF SOLIDS AND SECTIONS OF SOLIDS :- Various types of solids, projections of solids placed in different positions (prisms, pyramic, cone, Cylinder, Cube etc.) General concept of sectioning, setional planes, auxilliary planes and true shapes of the section.

6. OBLIQUE AND ISOMETRIC PROJECTIONS :- Oblique proje projections of simple geometric figures and solids, Isometric projection - isometric scale, isometric projection of simple geometric figures and solids, isometric projection of simple machine parts.

7. PROJECTION OF SIMLE MACHINE PART AND COMPONENTS:- Procedure for drawing projections and sectional views of simple machine components, Practice problems of skeetching and drawing the projections and sections of simple machine components. Assembl drawing of simple machine parts. Free hand sketchi of common instrumentation and control devices.

8. ELECTRICAL SYMBOLS AND NOTATIONS :- Symbols of principal units, their multiples and submultiples, types of supply, methods, of operation of instrume and accessories, indicating instruments, recording instruments, fush board, ceiling out lets, switch out lets, bells and buzzers, aerials, motor starte circuit elements, instruments and machines and electronic components.

9. INSTRUMENTATION SYMBOLS:- Basic instrumentation symbols, symbols for llow, temperatiuce, level and pressure, other, miscellaneous symbols.

10. DOMESTRIC WIRING:- Lamp and fluorescent tube circuits, intermediate switch control fan connect testing board, godown wiring and corridior wiring.

11. INSTRUMENT CIRCUITS :- Connection of ammeter, voltmeter, watt meter, P.F. meter, frequency meter, synchroscope, M.D. indicator including application of rotary switch. Extension of range of AC and DC. instruments by conventional method and C.T. & P.T.; power and energy measurement.

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THIRD SEMESTER (20)

SECOND YEAR DIPLOMA IN INSTRUMENTATION.

(13.5) WORKSHOP PRACTICE

CONTENTS

S.No.	Topic	Hours.
1.	General Instructions,	6
2.	Fitting	12
3.	Electrical workshp.	36
4.	Electronic workshp.	30
	Total	84

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- // LIST OF REFERENCE BOOKS //-

1. Geometrical Drawing by D.D.Agrawal, N.N.Mithal and V.C. Bhavsar- Vikas Publishing House Pvt.
2. Engineering Drawing by C.L.Verma - Khanna Pub.
3. Geometrical and Elementery Drawing- Charoter Publishing House Pvt.
4. Engineering and Machine Drawing by N.D.Bhattcharoter Publishing House Pvt.
5. Electrical Engineering Drawing Work Book- TTTI, Bhopal Pub.
6. Electrical Drawing by Marang.
7. Instrumentation by Kirk and Rimboi- D.S. Tarapore Vala & Sons Pub.

THIRD SEMESTER (21)

SECOND YEAR DIPLOMA IN INSTRUMENTATION.

(3.5) WORKSHOP PRACTICE.

1. General Instructions :- Safety precautions and safety rules for the workshop. Measurements, errors, sources of error, methods of measurements, accuracy and precision, use of various measuring tools such as callipers, rule vernier scales, micrometers etc.

2. Fitting :- Different fitting operations, fitting tools practice in sawing, drilling, taping, threading etc.

3. Electrical Workshop :- Different electrical tools and devices, electrical fittings and accessories, Wiring materials, simple wiring circuits, Winding machine, winding and impregnation of chokes and transformers. Electric shock and its prevention. Earthing. Relevant I.E. rules. Resuscitation. from electric shock.

4. Electronic workshpp :- Various components- resistors, coils, capacitors and devices, Colour code, soldering practice and preparation of PCBS.

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(1)

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION.

5.1- DIGITAL ELECTRONICS.

RATIONALE

The rapidity with which digital technology has pervaded our daily life more astonishing and therefore the need for todays students and older Engineers to gain familiarity with digital circuits felt very strongly.

This subject forms the foundation of digital electronics to the students of Electronics and Instrumentation as the basic requirement to understand the concepts of numerical machines and computer system.

With the above objectives, the contents of this subject are chosen to provide the beginning course to the junior level students. After mastering the material in this subject the students will possess all necessary tools and concepts for pursuing advanced studies in the areas of switching theory and finite automation theory of logical machines.

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION.

5.1- DIGITAL ELECTRONICS.

(Common with paper code EY-202 and paper Digital electroni components and applications of "Fifth Semester Electronics and Telecommunication".)

SCHEME OF STUDIES

S.No.	Topic	Theory	Practical	Total
1.	NUMBER SYSTEM	08	02	10
2.	BOOLEAN ALGEBRA	08	06	14
3.	LOGIC GATES	12	06	18
4.	LOGIC FAMILIES	10	06	16
5.	LOGIC DESIGN	20	14	34
6.	ARITHMETIC LOGIC UNIT	12	12	24
7.	COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS	16	14	30
8.	MEMORIES	10	04	14
		96	64	160

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION.

5.1- DIGITAL ELECTRONICS.

1. NUMBER SYSTEM :- Introduction, Decimal, Binary, Octal and hexa decimal, Conversion of number system- Binary to decimal, decimal to binary, Hexadecimal to Binary and binary to hexadecimal. Complement of numbers - 10's, 9's and 2's complements of any number. Binary operations-addition, subtraction, multiplications and division of binary numbers. Binary codes - types of binary codes - weighted and unweighted codes, Excess 3 code; Error correction and Detection codes; reflected codes; BCD codes.

2. BOOLEAN ALGEBRA :-Basic Boolean functions and Boolean theorems- basic Boolean laws-commutative, Associative and distributive law. Demorgan's Theorems and verification, Dual function explanation. Simplification of Boolean functions using Boolean Algebra. KARNAUGH MAP :- Simplification of Boolean functions using Karnaugh map for 2,3,4 variables; Explain sum of products and product of sum method expressions. Simply SOP and POS (Product of sum) expression using Karnaugh map. Explain "DON'T CARE" condition conversion of 'SOP' to "POS" expression and vice versa. (Pair, Quad, Octet explanations)

3. LOGIC GATES :- Perform Logic operations using Boolean Algebra. Define the functions of Logic gates and Basic gates. Difference between basic gates and universal gates, Preparation of truth Tables of each gate, symbols of gates. Make Basic gate using universal gates-i.e.,-NAND,NOR,Describe digital network synthesis AND,OR,NOT etc; Operation with the help of NAND GATE.

4. LOGIC FAMILIES :- Introduction to logic families-74 series IC, 40 series IC, and 54 series IC and their specifications. Identification of individual IC for various gates. Define FAN-IN and FAN-OUT and its utility; Concept of Resistor-diode, Diode-Transistor, Transistor. Transistor, Emitter coupled logic, Differact circuit configurations used in IC families; Advantages and Disadvantages of each configuration. Define LSI, VLSI and ITL integration. Basic characteristic of CMOS.

5. LOGIC DESIGN :- Introduction to flip-flops-RS, JK, D and T flip flops. Meaning of flip flop, their circuits analysis and their outputs. Master-slave flip-flop - with and without clock. Advantages and disadvantages of each flip-flop. Explain Monostable and Bistable multivibrator. Clock-triggering-level, positive & negative clock function. Explain Edge triggering in digital circuits. Counters-Synchronous and Asynchronous-function, their types and explanation, Registors-function, serial/parallel; shift Counters; Ripple counter, Up/down counter, decade counter BCD counter Ring counter Advantages and disadvantages. Design of counters with the help of excitation table.

6. ARITHMETIC LOGIC UNIT (ALU) :- Function of ALU and its use in the computer. Various important features of ALU.
Adder circuits - Half and full adder and subtractor using logic gates, Make 3 bit binary adder, 3 bit binary subtractor (1's complements and 2's complements); Decimal adder and BCD adder their use in shift register

14/29 (5)

COMBINATIONAL AND SEQUENTIAL LOGIC CERCUITS :- Introduction, Importance of combinational digital circuits, Encoding and decoding of binary signals. Principle of A:1 and 8:1 line Encoder using gates and F/FS. Ladder and Tree Type encoder and decoder circuits. Explain multiplexer and Demultiplexer. BCD to Binary, and Binary to BCD decoder. BCD to 7 segment decoder. Buffer in digital circuits-its necessity, uses, Tristate Buffer, Biderechional buffer, Identification of IC 74150, 74154, 74139, 54155, 4511, 40147, 7447, 7442,etc. & their uses.

A/D and D/A converters - Principal of conversion, Various methods commonly used for A/D and D/A conversion - Ramp Conversion, Dual slope intigration, successive approximation, digital to analog conversion and vice-versa. Construct various circuits for A to D conversion; DAC - resolution, accuracy, ladder network, magnitude of comparator - 4 bit and BCD comparator and their logic diagrams.

MEMORIES:

Introduction : Magnetic memory, semiconductor memory, Paper memory - classification, uses, memories for data storage media and types of memories. Classification - magnetic disk (Floppy and Hard Disk), magnetic drum, magnetic tape. Semiconductor memory - static, dynamic memories, RAM/ROM Programable RAM ROM/EPROM, EAPROM/EAROM, various types of paper memories :- Punched cards, Punched tapes, Punched paper.

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION.

5.1- DIGITAL ELECTRONICS.

LIST OF PRACTICALS.

1. Setting up of AND/OR/NOT/NOR/NAND gates using digital trainer and verify truth table. Study the general specifications and pin configuration of TTL/CMOS ICs.
2. Verification of Demorgen(s theorem using gate circuitry.
3. Set up exclusive OR/EX-NOR gates using NAND/NOR gates on trainer and verify the truth table.
4. Construct full adder using IC 7488 and subtract using IC 74
5. Construct full adder using logic gates.Construct half adder using logic gates.
6. Prepare circuit with 7 segment display and check the operati using logic input surtches, BCD code, Truth Table using 74
7. Realise the minimised network of a given function and verify the truth table.
8. Test the function of TTL (74 series)/CMOS-40 series ICs.
9. Prepare clocked and undocked flip-flop circuit using NAND/N
10. Make a master slave, JK, flip-flop, verify the output with truth table.
11. Make a T and D flip-flops and verify its output with the tr table.
12. Prepare a 3 bit ripple counter, ring, up-down counter decade counter using J-K, DF/F with TVE and -VE clock input and ana its output.
13. Pripare BCD to decimal decoder using IC 7414L and verify i output using 7 segment display circuit.
14. Suggest Decimal to BCD decoder using logic gates.
15. Study operation of 4 line to 1 line multiplexer.

14/31, (7)

LIST OF BOOKS

1. Digital Principles and applications — T M H
   Malvino & leach
2. Digital computer fundamentals — T M H
   T. Bartee
3. Digital logic and computer design — P H I
   M.M. Mano
4. Modern Digital design — Mc Graw Hill
5. Pulse, digital puntching circuits — Dhanpat Rai
   and computer fundamentals - Venkatraman
6. Digital Computer Electronics and — P H I
   Introduction to microcomputers
   A.P. Malvino
7. H I L 2921, Digital Trainers user manual.

Fifth Semester Diploma in Instrumentation

5.2 CONTROL SYSTEM

R A T I O N A L E

Control Systems is an essential subject for advanced courses and research in Control Engineering field. Majority of practical control system design are very satisfactority worked-out using classical and analytical methods augmented by computer simulation and experemental developments.

The specific purpose of this subject is to prepare students for practical control system design and proper use in industry. This subject contains -introduction of basic feedback principles analysis, and overview of all the important application areas and categories of control systems. Advanced mathematical background with physical system modelling of controllers, proportional control, integral control, derivative control mode combined and approximate control modes and stability of system etc.

This subject provides on integrated knowledge of all the aspects of control Engineering and this prepares the students for early and better productivity upon entering industrial practice.

14/33 (9)

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

5.2 CONTROL SYSTEMS

SCHEME OF STUDIES

S.No.	Topic.	Theory hours.	Practical hours.
1.	Introduction to control systems.	14	-
2.	Servo components.	20	-
3.	Transfer function calculation.	10	-
4.	Transient response.	20	-
5.	Control action.	10	-
6.	Stability of Control system.	22	-
	Total:-	96	64

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

6.2. CONTROL SYSTEM

1. INTRODUCTION TO CONTROL SYSTEM : Open and clos
their merits and demerits. Block representation
simple systems. Differential equation represent
system definition of Laplace transform, Laplace
transforms of some important functions (No deriv
required) Transfer function. Type and order of
system.

2. SERVO COMPONENTS :- Potentio meter as error de
Synchro-transmitter, Synchro-receiver, Synchro
transformer, Differential Synchro, Servo amplif
Magnetic amplifier-D.C. Generator as amplifier,
amplidyne, D.C. Servo Motor, A.C. Servo Motor, Gear
Techogenerator A.C. and D.C. Transfer functions
above components. Simple systems using these co

3. TRANSFER FUNCTION CALCULATION: Block reduction
for calculating transfer function. Signal flow
Manson's gain formula.

4. TRANSIENT RESPONSE: Transient response of fi
second order system to step, ramp and accelera
input. Damping ratio, natural frequency, damped
frequency of oscillation, rise time, settling ti
static error co-efficients.

5. CONTROL ACTION :- ON OFF, proportional, integ
derivative actions and their combination. Effe
these actions on error. Examples of simple con

6. STABILITY OF CONTROL SYSTEM: Determination of
lity of simple systems using Routh Hurwitz cr
Bode's Plot, Nyquist Plot and root locus techni
Different types of compensation.

14/35 (11)

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

LIST OF RECOMMENDED PRACTICALS FOR CONTROL SYSTEMS

1- Charecteristics of Synchrotransmitter.

2- Operation of Synchro transmitter and receiver connected together.

3- Transfer function of d.c.generator.

4- Transfer function of an amplidyne.

5- Time response of second order system to step input. (square wave applied to series R.L.C.Circtuits)

6- Bode plot of simple electrical system.

7- Characteristics of magnetic amplifier and to control

8- Visit for practical control systems being used in industries -Preparation of details study report.

LIST OF REFERENCE BOOKS

1.	Automatic Control System -by	B.C.Kuo.
2.	Control System Engineering- by	Nagrath and [illegible]
3.	Modern Control Engineering-by	K.Ogata.
4.	Linear Control System -by	B.S.Manke.
5.	Automatic Control Engineering-by	F.H.Raven.
6.	A combine Control System for process Industries by	Paulin [illegible]
7.	Control System Principles and design by	Ernest O. [illegible] John Wiley & Sons, New York.

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION.

5.3. MECHANICAL MEASUREMENTS.

RATIONALE

This subject is practically a science of measurements of different types of physical quantities with precision and accuracy, which can be exoressed in linear or angular units. This subject requires a knowledge of mathematics, workshop practice, drawing and science, the application of these subjects makes the study of this subject very interesting.

In the modern time, the use of automatic and precision machines depend upon operation on sophisticated instruments to give accurate measurements and perfect product.

The present demand of industry of mechanism and asemblies which must meet stringent design requirements will result in even closer attention being paid to the science of measurements. Therefore, the knowledge of mechanical measurements is of atmost importance in present industry.

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

5.3. MECHANICAL MEASUREMENTS.

SCHEME OF STUDIES

S.No.	Topic	Theory hours	Practical hours
1-	Measurements of Force and Torque	16	12
2-	Pressurement of Pressure	14	08
3-	Measurement of Fluid Flow	12	08
4-	Measurement of temprature	20	16
5-	Measurement of strain	16	10
6-	Measurement of speed and Accderation.	16	10
	Total	96	64

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(15)

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

Subject - 6.8 Mechanical Measurements

1. **MEASUREMENT OF FORCE AND TORQUE**

Definitions of Mass, Weight, force, torque and power. Methods of force measurement, use of pendulum scale, springs, Load cells and proving rings. Hydraulic and pneumatic methods of force measurement.

Measurement of torque and power - Absorption dynamometers mechanical and hydraulic dynamometers, eddy current dynamometers, d-c dynamometer, Transmission dynamometers Belt dynamometers, Strain gauge torque meter, Elastic torsion bar torquemeter, Comparison of Absorption Dynamometers.

2. **MEASUREMENT OF PRESSURE**

Pressure, absolute pressure and Gauge pressure, Pressure measuring devices, Manometers simple, Inclined and cistern manometers, Elastic gauges, Bourdon tube gauges, diaphragm gauges and bellow gauges, Measurement of low pressure - McLeod gauge, Names of secondary transducers used with elastic gauges, Calibration of pressure gauges using Dead Weight gauge tester.

3. **MEASUREMENT OF FLUID FLOW**

Flow characteristics - laminar and turbulent flow, Reynold's number, Bernoulli's equation, Constriction type rate-of-flow meters-venturi, flow-nozzle and orifice flow meters, Variable area flow meters, Fluid velocity meters-pitot tube, Hot wire anemometer, Volumetric flow meters Bellow type, Rotating impeller type and Rotating-disk type volumetric flow meters, special flow measuring devices- Turbine type meters, Electromagnetic flowmeters, Ultrasonic flow meters, Primary and secondary calibration of flow measuring devices.

4. **MEASUREMENT OF TEMPERATURE**

Conduction, convection and radiation, Temperature scales, Temperature measuring instruments-Liquid-in-glass thermometers, Liquid-in-metal thermometers, constant volume gas expansion thermometers, Vapour pressure thermometers, Bimetal strip thermometers, Temperature indication by change of state of solids, Thermoelectricity, Thermoelectric pyrometers, Applications of thermocouple pyrometers, Thermocouplerres, Temperature measurement by Radiation pyrometers

Contd

...d optical pyrometers. Photo-electric pyrometers. Temperature measurement by change of electrical resistance - resistance thermometers, and thermistors. Calibration of temperature measuring devices. Cold Jn. compensation, compensating cables. selection of resistance thermometers & thermocouples.

MEASUREMENT OF STRAIN

Strain, requirement for accurate strain measurement, Bonded electrical resistance strain gauge. Gauge factor. Rosette gauges. Metallic resistance strain gauges, selection and installation factors for bonded metallic strain gauges. The strain gauge bridge circuit. Temperature compensation, self-temperature-compensating strain gauges. Lead connections, semiconductor or piezoelectric strain gauges. Commercial strain measuring systems. strain gauge calibration, Extensometers. Use of strain gauges on rotating shafts.

MEASUREMENT OF SPEED AND ACCELERATION

Measurement of Speed- Mechanical Tachometers-Revolution counter type, Centrifugal-force type and Resonance type. Electrical Tachometers-Eddy-current type and Electric generator type. Frequency type tachometers, Ignition type tachometers and stroboscopic tachometers.

Measurement of Acceleration - Elementary accelerometers. seismic accelerometers, effect of temperature on seismic instruments.

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

Subject:- Mechanical Measurements

LIST OF REFERENCE BOOKS

Engineering Measurements by	C.V.Collett & A.P.Hope Publisher - E.L.B.S.(U.K)
Mechanical Measurements by	Thomas G.Beckwith & N.Lewis Buck. Pub.- Addison-Wesley publishing co. (U.S.A.)
Mechanical and Industrial Measurements by	R.K.Jain Pub.- Khanna publishers, New Delhi.
Mechanical Engineering Measurements by	Mark D.Moore Pub.- D.Van Nostrand Co. Pvt.Ltd.Printed in India by Affiliated East-West press Pvt.Ltd,New Delhi.

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

List of Recommended practicals for

Subject-5.3 Mechanical Measurements

- Measurement of power by using Absorption dynamometer and Transmission dynamometer.
- Determination of torque using a torque meter.
- Measurement of pressure by using manometers.
- Measurement of pressure by using Bourdon tube pressure gauge.
- Measurement of rate of fluid flow by using a venturimeter orifice meter.
- Measurement of flow rate using a Rotameter.
- Comparison of temperature measuring methods using a bimetal thermometer, resistance thermometer/thermistor and a thermocouple.
- Measurement of strain using a strain gauge.
- Measurement of speed of a fly wheel using mechanical/ electrical tachometer.
- Measurement of acceleration using an accelerometer.
- Measurement of flow by electromagnetic flow meter.

-7 Measurement of acceleration by any accelerometer.

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

5.4. MICROPROCESSOR AND MICROCOMPUTER COMPUTER

RATIONALE

With the advancement of technology it has become the necessity of the day to familiarise the students of technical institutions with microprocessor and micro computer with a view to handle the problems of routine and special nature.

The idea of incorporating this subject in the branch of instrumentation Engineering is to lay more emphasis on the technique and software. It is expected that the student will be able to understand the subject and practical aspects as is such a course.

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

5.4. MICROPROCESSOR AND MICROCOMPUTER TECHNOLOGY

SCHEME OF STUDY

Sr.No.	Topic	Theory hours	Practical hours
1.	Introduction to Computer	03	
2.	Storage devices	06	
3.	Addressing methods and Machine programme sequencing	06	
4.	Software	05	
5.	Microprocessors	05	
6.	Microcomputer fundamentals	06	
7.	Programming the Microprocessor	06	
8.	Interfacing the Microprocessor	08	
9.	Interfacing devices peripheral subsystems	08	
10.	Study of various Microprocessors	05	
11.	Application of Microprocessor	06	
		64	32

14/48 (21)

FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

5.4: MICRO PROCESSORS AND MICRO COMPUTER TECHNOLOGY

1. INTRODUCTION TO COMPUTER :- Computer Organisation, Micro Computer, Mini Computer and Main frame operations.

2. Storage Devices:- Volatile, non-volatile, sequential, Random Memories, Semi Conductor, RAM, ROM, EPROM, Three state devices Floppies, Hard Disc, Tapes, Streamer, Cache Memories & Virtual Memories concepts.

3. ADDRESSING METHODS AND MACHINE PROGRAM SEQUENCING:-

Introduction, Memory locations, Addresses, encoding of information, Main Memory operation, Instruction formats and instruction sequencing, Addressing modes, stacks, sub routines.

4. SOFTWARE:- Introduction to languages, Translators, Loaders, Linkers, System monitors, Text editor, Operating system, Assembler, Micro assembler, compilers, Micro programming & Emulators.

5. THE MICRO PROCESSOR: Data sheet Descriptions, Pin diagram and functions, Microprocessor, Architecture, (Register Organisation Timing and controls Unit, using the data/address Register, using the stack pointer.)

6. MICRO COMPUTER FUNDAMENTALS:- Simplified Microcomputer architecture simplified memory organisation, Instruction set, simplified CPU organisation, Microcomputer operation principle Description of Key board and its operation.

7. PROGRAMMING THE MICROPROCESSOR:- Machine & Assembly languages Instruction sets-Arthamatic Operations, Logical operations, Data transfer operation, Branch Operations, subroutine call & Return operations, Miscellaneous operations.
(Writing a program, Addressing modes, program branching.
(program looping, using subroutines.

8. INTERFACING THE MICROPROCESSOR:- Address bus partitioning Interfacing with ROM, Interfacing the RAM, Input/output Interface Basics, Interfacing with practical I/O ports, Data transfer schemes.

(a) Programme data transfer (Synchronous, Asynchronous, Interput, Multiple interputs, Enabling, disabling & Masking of interrupts)

(b) Direct Memory Access Data Transfer.

(c) Serial Data Transfer.

Address decoding.

Contd...2

9. INTERFACING DEVICES, PERIPHERAL SUBSYSTEMS:- Types of interfacing devices, I/O ports, programmable peripheral interface, Programmable XXX interput controller.

Programmable DMA Controller, Programmable communication interface, Analog input subsystems, Analog output subsystems.

10. STUDY OF VARIOUS MICROPROCESSORS:-

8085/8086, Z-80, 6800, 6502

11. APPLICATIONS OF MICROPROCESSORS:-

- Temprature Monitoring System.
- Closed loop process control.
- Data acquisition systems.
- Input/output device control.
- Programmable logic controllers.

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FIFTH SEMESTER DIPLOMA IN INSTRUMENTATION

LIST OF RECOMMENDED PRACTICALS FOR MICRO PROCESSOR LAB

1. Study of various Microprocessor instruction sets .
2. Study of interface devices.
3. Software programmes in Machine Language.

i- Addition of two numbers (BCD/Binary) using direct indirect Register and Index addressing.

ii- Addition of numbers -do-

iii- Multipilication of two numbers(8 bit by 8 bit) using successive addition /shifting.

iv- Division of two numbers (16 bit by 16 bit) using successive substraction/shifting.

v- Concersion of numbers between Binary, Hexadecimal, octel and Decimal.

vi- Digital clock (Hour, Minute, Seconds).

vii- Digital stop watch (Minute, Seconds, 0.01 seconds)

viii- Input/Output through 8155 I/O liner.

ix- Generation of programmable frequency square oscillations.

x- Debugging of programmes using single instruction execution.

xi- Multibyte binary and Multi digit BCD addition and substraction.

xii- Solution of Boolean equation.

xiii- Generation of Programmable height ramp.

xiv- Function conversion using look-up table.

xv - Generation of an arbitrary respectitive Wave form for analysis of a system under test.

xvi- Message display on 7 segment LED display.

xvii- Entering data through key board.

xviii- Generating " lout of 6" die.

xix- Memory block transfer.

Studty of EPROM programmer and UV eraser.

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List of Reference Books

1- Introduction to Microprocessor
by- A.P.Mathur -T.M.H.Publication

2- Microprocessor
by B.Ram

3- Micro Processor by
by Hebber & Seth

4- Micro computer/Microprocessor -T.M.H.Publication
by- Hebber and Julich

5- Digital Computer Electronics -do-
an introduction to
microcomputers
by- A.P.Malvino

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION.

6.1 - INSTRUMENTATION - II

RATIONALE

Measurement provides us with a means of describing various phenomena in quantitative terms. The art of measurement plays an important role in all branches of engineering and science. With the advancement of technology, the measurement techniques have also taken rapid strides during recent years with the introduction of instrumentation devices, innovations, refinements and altogether new techniques. The object of this subject is to bring these developments within easy reach of the students.

The primary emphasis of this subject is on measurement of physical quantities and mechanical variables encountered in experimental investigations and industrial processes. It is presumed that the students have the knowledge of physics and electrical engineering. It is also presumed that subject has been made sufficiently attractive through a training like this to tempt the students to take this discipline as a career for industries, research development establishments.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION.

6.1 INSTRUMENTATION -II

SCHEME OF STUDY

S.No.	Name of Topic	Theory hours	Practical hours
1.	Measurement of solid & liquid level.	14	
2.	Miscellaneous measurements.	24	
3.	Analytical measurements.	08	
4.	Biomedical Instrumentation.	06	
5.	Nuclear Instrumentation.	08	
6.	Data Acquisition system & event loggers.	16	
7.	Telemetry.	20	
		96	

PROCESS INSTRUMENTATION

P7/S1 (27)

SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

6.1 - INSTRUMENTATION -II

1. MEASUREMENT OF SOLID AND LIQUID LEVEL:-

Direct and Indirect methods- Hook gauges, sight glasses, Buoyant floats, pressure gauge methods, Bubbler level gauge, capacitance level gauge. Ultrasonic and Nucleonic methods. Solid level measurement- by use of motor, and by weighing.

2. MISCELLANEOUS MEASUREMENTS:-

Measurement of specific gravity by weighing, float and L.V.D.T. methods, U-tube manometer.

Viscosity measurement:-

Applications of radioistopes in Industrial measurements

Vibration measurement techniques: Comman causes of vibration measurement quantities. Seismic type motion measuring instrument; Velocity transducer, Bonded strain gauge accelerometer. Piezolelectric accelerometer.

Measurement of Displacement: Measurement by use of potentiometric devices, variable inductance, L.V.D.T, variable capacitance transducer. Use of Synchros and resolvers in angular data transmission and computing systems. Basic concept of polution control and its measurements.

3. ANALYTICAL MEASUREMENT:-

Measurement of pH, conductivity, moisture and Humidity. Gas analysers, gas chromotograph-Thermal conductivity type, oxygen analysers, Hydrogen gas analyser, Carbon dioxide and Carbon monoxide measurement.

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4. BIOMEDICAL INSTRUMENTATION:

Pace Maker, ECG, EEG, CAT-Scanner, Blood pressure.

5. NUCLEAR INSTRUMENTATION:

Ionization chamber, G.M. Counter, proportional counter and scintillation counter.

6. DATA ACQUISITION SYSTEM:

Functions and objectives, Block diagram of a Generalized data acquision system and function of each block. Single and multichannel data acquisition system.

Data loggers- Primery purpose of data logging. Basic elements of data loggers, block diagram and functions of each block.

7. TELEMETRY:

Definition, General telemetering systems, D.C. Systems and A.C. Systems.

R.F. Telemetry systems- block digram and its elements.

Land Line telemetry system-classification and its elements.

Pulse Telemetering system- (1) analog pulse telemetry (2) Digital Pulse telemetry-P.C.M. PAM, PFM and PUM

Multiplexing- Time division multiplexing, sample and hold system, Frequency division multiplexing.

Topic-2

Temperature measurement — Construction of resistance thermometer, thermistor circuits, temperature compensation, Thermistor & their Circuits. Construction of thermocouple, material used types and calibration, Thermocouple indicator, temp. Compensation. Optical & radiation pyrometers, Solid State temp measuring devices, infrared & cryogenic oscillator temperature sensors

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

LIST OF RECOMMENDED PRACTICALS FOR INSTRUMENTATION - II

1. Measurement of liquid level by
   i) Sight glass.
   ii) Capacitance level gauge.
2. Study of piezoelectric accelerometer and measurement of vibration.
3. Measurement of Linear displacement by -
   i) Potentiometric.
   ii) L.V.D.T.
   iii) Capacitive transducer.
4. Measurement of angular displacement by synchros.
5. Study of p-h meter and measurement of conductivity, moisture and Humidity.
6. Study of pace maker and ECG.
7. Study and use of Data logger.
8. Study of telemetry system.

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LIST OF REFERENCE BOOKS:

1. Electrical and Electronic measurement and Instrumentation by - A.K. Sawhney - Dhanpat Rai & Sons, Delhi.
2. Mechanical and Industrial Measurements - by R.K. Jain, Khanna publisher.
3. Industrial Instrumentation Fundamentals by - FRIBANCE. TMH edition.
4. Instrumentation Devices & Systems by - Rangan, Sharma & Mani TMH pub.
5. Instrumentation for Engg. Measurements - by Cemi Foster - John Wiley and Sons pub.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION.

6.2 - PROCESS CONTROL.

RATIONALE

Modern technological and scientific developments have changed the mannal control system to automatic or changed the era to automation. The automatic control systems result in better and desired products of desired properties and characteristics. It is tried here to incorporate these aspects in this subject.

The efforts have been made to make rationalised curricula for suiting the needs of students for process industries and other fields of industrial developments. So this is broadbased subject touching the salient features but not giving specialisation to the students of instrumentation.

An attempt has been made to provide all necessary information and basic knowledge of the subject needed at the diploma level.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION.

6.2 - PROCESS CONTROL.

SCHEME OF STUDY.

S.No.	Topic	Theory hours	Practical hours
1.	Introduction to automatic control	04	
2.	Process characteristics	12	
3.	Control characteristics	12	
4.	Confrolling Elements and Actuators	20	
5.	Industrial Unit Operations	16	
		64	32

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

6.2 - PROCESS CONTROL

1. INTRODUCTION TO AUTOMATIC CONTROL:

Basic concept, functional block diagram, fields of applications, advantages.

2. PROCESS CHARACTERISTICS:

Process variables, degree of freedom, characteristics of physical systems, electrical systems, liquid systems, thermal systems, Gas systems-comparison, elements of process dynamics, liquid processes, gas processes, flow processes and thermal processes.

3. CONTROLLER CHARACTERISTIC:

Definitions of basic terminology. Basic concept of proportional control, integral control, proportional-integral control, derivative control and their combinations. Two position control, comparison amongst the above modes of control action.

4. CONTROLLING ELEMENTS AND ACTUATORS:

Self-operated controllers-pressure regulators, float level controllers and temperature controllers, Pneumatic controllers, displacement typeand force type proportional, proportional-integral and proportional derivate functions. Air supply for pneumatic controllers.

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Hydraulic Controllers	: Hydraulic power supply, proportional and integral control.
Electrical controllers	: D.C. and A.C. bridge controllers.
Electronic controllers	: Proportional and proportional-integral controllers. Two position controllers.

ACTUATORS:- Pneumatic actuators-different types, electro-pneumatic actuators, Hydraulic actuators, electro-hydraulic actuators, Electric motor actuators, two position motor actuators. Speed control of motors by thyristors.

5. INDUSTRIAL UNIT OPERATIONS:

1. Inorganic chemical Industries-acids-sulphuric and Nitric acids, alkalies-Soda ash. Fertilizer Industry-Nitrogen, potash industry, Cement industry.
2. Natural products- Petroleum, paper and pulp industry. Soap, detergents, paints and Varnishes.
3. Synthetic organic chemicals- Pharmaceutical industry.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

LIST OF RECOMMENDED PRACTICALS FOR 6.2 PROCESS CONTROL

1. Study of various process characteristics.
2. Study of various controller characteristics on simulators.
3. Study of construction of various actuators.
4. Industrial visits.

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LIST OF REFERENCE BOOKS

1.	Automatic process control	by P. Donald and Eckman
2.	Process control systems	by F.F. Shinskey
3.	Process control	by Harriot
4.	Applied instrumentation in process Industries	by Andrews
5.	Hand Book of process Instrumentation	by Considine

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION COMMUNICATION ENGINEERING

6.3. RATIONALE

Communication is the nerve centre of any country and industry .We have wittnessed a collosal development in the field during the last decade.

With a humble beginning with communicating by line telegraphy when only two parties could communicate on a pair of wires but now thousands of persons are talking on a single microwave link,world wide television has now become a comman affair.

It is has become necessary to include the fundamentals of developments of field of communication in the subject course contents. The modern time digital communication is gaining popularity and favour in the field of communication, hence it is also included. So that the students may have the necessary knowledge at diploma level.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION
COMMUNICATION ENGINEERING

6.3. RATIONALE

Communication is the nerve centre of any country and industry .We have wittnessed a collosal development in the field during the last decade.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

6.3 COMMUNICATION ENGINEERING

SCHEME OF STUDY

S.No.	Topic	Theory hours	Practical hours.
1.	Review of Signal Representation	6	
2.	Communication Network	10	
3.	Transmission line	6	
4.	Modulation	16	
5.	Demodulation	8	
6.	Television	6	
7.	Digital Communication	12	
		64	64

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

COMMUNICATION ENGINEERING

1. REVIEW OF SIGNAL REPRESENTATION:- Time domain and frequency domain, analysis of signals. Energy and power density spectrum of signals. Sampling theory -Noise.

2. COMMUNICATION NETWORK:- Single port and two port networks, symmetrical and asymmetrical networks, characteristics, iterative and image impedance of networks. Attenuators and equalisers. P-roto and mderived low pass, high pass band pass, and band stop filters. Active filters.

3. TRANSMISSION LINES:- Principle of transmission line. Parameters. General solution for transmission line. Standing waves, Distortionless lines.

4. MODULATION:- Different types of modulation-AM, F.M., P.M, pulse modulation, PAM, PWM, PFM, PCM, PSK, their merits and demerits. Circuits for generating AM, FM, and PM. Single side band and vestigial side band system.

5. DEMODULATION:- General principles of linear and square law detection circuits for detection of AM and FM signals super hetrodyne AM receivers and F.M. receivers.

6. TELEVISION:- Principles of colour television, T.V. Camera and picture tube. Synchronisation.

7. DIGITAL COMMUNICATION Principles of Digital communication Nyquist criterion. Digital codes. Noise consideration, channel capacity for information flow. T.D.M. threshold detection delta modulation.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

LIST OF RECOMMENDED PRACTICALS FOR COMMUNICATION ENGG.

1. Determination of sensitivity of a Receiver.
2. Determination of Selectivity of a Receiver.
3. Determination of Fidelity of a Receiver.
4. Determination of Intermidiate frequency of a Receiver.
5. Determination of Image ratio of a Receiver.
6. Determination of A.V.C. characteristic of a Receiver.

LIST OF REFERENCE BOOKS

1. Electronic Communication Engg. by Kennedy
2. Tele-communication by Fraser.
3. Communication System by B.P. Lathi
4. Principles of Communication System
   Taub and Shilling by- McGraw Hill

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION.

6.4 - INDUSTRIAL MANAGEMENT.

The curriculum of Industrial Management is common to 6th Semester Mechanical Engineering and 6th Semester Electrical Engineering.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION.

6.5 - PROJECT

RATIONALE

The approach to this subject is different from other subjects in the sense that while in other subjects, the learning is controlled by teachers. But in this subject the students are exposed to self learning and using their knowledge to practical based problem. This strategy promotes the habit of inquiry develops confidence to tackle new problem. This is deemed necessary because after leaving the institution, student himself has to solve many live problems in job.

This will develop the abilities of compilation of information, preparation of report, solve the problem - analyses and how to attack the problem-layout, design, estimation, material and its specifications. This will also remove the hesitation.

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SIXTH SEMESTER DIPLOMA IN INSTRUMENTATION

G.5 - PROJECT

SCHEME OF STUDIES.

S.No.	Topic	Practical Hrs.
1.	Fabrication project.	60
2.	Library Project.	24
3.	Report writing on Industrial visits.	12
	TOTAL	96

NOTE:

Total Number of periods alloted for project work in the schems of studies are 96. However a student is expected to involve himself in execution of the above projects in such a way that he must apply much more time in procuring appropriate materials and components, reading material and in acquiring staff advice.

The students should be divided into number of batches in accordance with A I C T E norms, and every group should work on its seperate project.

The list of projects mentioned in the syllabus should not be treated as exclusive. The staff members are expected to exercise freedom in selcting projects not mentioned in the following pages.

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Govt. Polytechic Raghugarh (Dist Guna)

MADHYA PRADESH BOARD OF TECHNICAL EDUCATION, BHOPAL
Third Semester/Second Yr. Diploma Programme in Electrical Engg.
(REVISED)
BASIC ELECTRONICS

SCHEME OF STUDIES

S.No.	TOPICS	THEORY Hrs.	LAB./TUT. Hrs.	TOTAL Hrs.
3.41.	Electron Emission	04	-	04
3.42.	Semiconductor devices	16	12	28
3.43.	Power supply	08	04	12
3.44.	Resonating and Filter circuits	06	04	10
3.45.	Amplifiers	16	10	26
3.46.	Oscillators	08	06	14
3.47.	Non Sinusoidal Generators	08	06	14
3.48.	Modulation and Demodulation	08	04	12
3.49.	Logic gates and Circuits	08	08	16
3.410.	Integrated Circuits and Logic Families	14	10	24
	TOTAL :-	96	64	160

Attention please : Mr. U.R. Surange
Dipl. Sec.
RGPV.
Gaulam Nagar
Bhopal.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION, BHOPAL
Third Semester/Second Year Diploma Programme in Electrical Engg.

SUBJECT - BASIC ELECTRONICS

ONALE

Electronics has occupied the attention and thereby attracted persons from all walks of life in their day to day routine, whether it may be Entertainment, communicaton, Transportation or control.

The syllabus of Basic Electronics have been designed to introduce basic concepts of electronic components and devices with their field of application on one hand & fundamentals of IC,s and digital techniques on the other, keeping in view to develop laboratory skills and confidence in the subject.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION, BHOPAL G
Third Semester/2nd Yr. Diploma Programme in Electrical Engg.
(REVISED)
SUB. : BASIC ELECTRONICS
CONTENTS

Topic [3.41]. ELECTRON EMISSION

Principle, Characterstic and application of Diode and Triode. (4+0)

Topic [3.42]. SEMICONDUCTOR DEVICES

Junction Diode, Zenerdiode, Tunnel diode, Characterstics applications, PNP. NPN Transistors, Parameters, ratings characterstics, currentgain. JFET MOSFET UJT. SCR. DIAC. TRIAC construction, characterstic Application of semi conductor photodevices LED LDRLCD VCD, Photodiode Phototransistor Principle of working and applications.

Topic [3.43]. POWER SUPPLY

HW. FW. and Bridge Rectifier (Single Phase) Filters, calculation of output voltage, Ripple Factor, Rectifier efficienay PIV RMS and Average value. Voltage Doubler (8+4)

Topic [3.44]. RESONATING AND FILTER CIRCUITS

Review of resenance Filter in communication and measuring circuits-Low pass High pass, Band pass and Band eliminating Filters (6+4)

Topic [3.45]. AMPLIFIERS

Transistor as amplifier CB. CE and CC configurations methods of Biasing, voltage, current and power gains Input and Output impedances (No derivation) classification of Amplifiers on the basis of applications Frequency response Band width, Coupling methods-R-C coupled Transformer couple], push pull, Tuned and DC. Amplifiers.

Feed back Amplifiers-Block diagram only types of feed back series/shunt voltage/Current feed back. OP Amplifier introduction and application as multiplier, summer Integrator and Differentiator. (12+8)

Topic [3.46]. OSCILLATORS

L.C. Oscillators,- Hartley colpitts, Tuned collecter, Expression of Frequency of Oscillatons, crystal oscillators-application and advantages

R.C. Oscillators- Phase shift and Wein bridge oscillator working priciple BFO. Block diagram. (8+6)

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Topic [3.47]. NON SINUSOIDAL GENERATOR:

Astable, Monostable, Bistable Multivibrators - circuit working principle wave form, Schmitt trigger UJT oscillator - circuit working and application. (8+6)

Topic [3.48]. MODULATION & DEMODULATION

Principle of AM.FM. and phase modulation. DETECTION /DEMODULATION (Principle only) - Linear Diode deletor, Am, Quadrature detector for F.M. (6+4)

Topic [3.49]. LOGIC GATES & CIRCUITS

Symbols and Truth table of OR AND NOT NOR, NAND, XOR Gates. Half adder, Full adder Nalf subtractor, Full Subtractor-Block diagram and Truth table (8+8)

Topic [3.410]. INTEGRATED CIRCUITS AND LOGIC FAMILIES

Concept of IC,s classification and advantages Application of common IC,s 741,555,723,810 and digital IC,s . Basic circuits of DTL, RTL, TTl and ECL. (12+8)

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION, BHOPAL G
Third Semester/2nd Yr. Diploma Programme in Electrical Engg.
(REVISED)
SUB.: BASIC ELECTRONICS

LIST OF PRACTICALS :

1. Study of practical Resistors.
2. Study of practical Capacitors.
3. Identification of Electronic Compenents.
4. Study of Transistor Manual.
5. Forward and Reverse characterstic of PN junction diode.
6. Characterstic of Zererdiode.
7. Input and Output chacterstic of PNP/NPN transistor in CB and CE configuration.
8. Study of Half wave and Full wave Rectifier without and with Filter Circuit.
9. Study of series and paralled Resonance Circuits.
10. To assemble two stage R-C coupled amplifier and plot frequency response characterstic.
11. To assemble Transformer coupled amplifier and plot frequency response characterstic.
12. To assemble Hartley and colpitts Oscillator and measure output frequency.
13. To study Zener regulated power supply .
14. To study Inverting and Non inverting amplifier and calculation of its gain .
15. To study Astable, Monostable and Bistable Multivibrators.
16. Study of UJT oscillator and observe its wave-form on CRO.
17. Application of SCR/TRIALC in speed control/illumination control.
18. Verification of various Logic gates and Logic Circuits such as Half adder, Full adder, Half subtractor. Full subtracter.
19. Introduction to application of Madern control processors in the Office Automation, Aviation etc.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION, BHOPAL
Third Semester/2nd Yr. Diploma Programme in Electrical Engg.
(REVISED)
SUB. : BASIC ELECTRONICS

REFRENCE BOOKS

Electronic Circuits and Devices by Allen Mottershed.

Electronic principle by Malvino.

Electronics Engineering Fundamentals and Application by J.D. Ryder.

Digital Electronics Principle by Malvino and Leach.

Principle of Electronics by V.K. Mehta.

Basic Electronics and Linear Circuits by Bhargava, TTTI. Chandigarh.

Basic Electronics by S. Ram Chadran.

Intrgrated Electronics by Millman & Halkins.

Electronic Devices and Circuits by G.K. Mithall.

ECTIVE OF LABORATORY PRACTICE

Introduction to various electronic devices and compenents.

To understand concepts of characterstical behaviour of electronic devices.

To verify principle of scientific phenomenon.

To develop laboratory skills.

To develop confidence in repair and maintence of common electronic equipment.

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MADHYA PRADESH BOARD OF TECHNICAL EDUCATION BHOPAL
SEMESTER/2nd YEAR DIPLOMA PROGRAMME IN ELECTRICAL ENGINEERING
(REVISED)

Sub. :- Electrical Materials and Workshop.

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1.	Lecturer Hours	4(64) Hours
2.	Practical Hours	4(64) Hours
3.	Total Hours	8(128) Hours

SESSIONAL - MARKS

1.	Term Work	15
2.	Lab. Work	25
3.	Progressive Assesment	20 (each of 10 marks)

BOARD EXAMINATION

1.	Theory Paper	100 Makrs (3 hrs. duration)
2.	Practical	50 Marks (3 hrs. duration)

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प्रति,

सचिव,
राजीव गांधी प्रौद्योगिकी विश्वविद्यालय,
गौतम नगर, भोपाल ।

विषयः– हरतालिका तीज का राज्य शासन द्वारा घोषित महिला स्पेशन अवकाश स्वीकृति बाबत् ।

महोदय,

निवेदन है कि दिनांक को हरतालिका तीज का राज्य शासन द्वारा घोषित महिला स्पेशल अवकाश स्वीकृति करने की कृपा करें ।

धन्यवाद ।

भवदीया,

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राजीव गांधी प्रौद्योगिकी विश्वविद्यालय,
भोपाल