

DEPARTMENT OF TECHNICAL EDUCATION

<p>From The Commissioner of Technical Education Directorate of Technical Education Chennai 600 025.</p>	<p>To All the Principals of Government, Government Aided and Self-financing Polytechnic Colleges and Self-financing Engineering Colleges(offering Diploma programme)</p>
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File No: 32739/Y3/CDC/2017, Dated .12.2017

Sir / Madam,

Sub:		Technical Education – Curriculum Development Center – Intimation concerning the Changes incorporated and Implemented in the M' Scheme VI Semester Diploma in ECE & ICE – Regarding.
Ref:	1.	This office Letter No. 22639/Y3/CDC/2014, Dated 18.07.2017
	2.	Mail and Letter received from various Polytechnic College.
	3.	This office Letter No. 22639/Y3/CDC/2014, Dated 05.10.2017
	4.	Minutes of the Meeting held on 10.10.2017 at DOTE
	5.	This office Letter No. 22639/Y3/CDC/2014, Dated 23.10.2017
	6.	This office Letter No. 22639/Y3/CDC/2014, Dated 27.10.2017
	7.	Minutes of the meeting held on 04.12.2017 at DOTE

With reference to the letters cited above, it is informed that the changes specified in the ANNEXURE I have been incorporated and implemented from the ensuing VI Semester 'M' Scheme ECE (Electronic and Communication Engineering) Department syllabus and also informed that changes specified in the ANNEXURE II have been incorporated and implemented from the ensuing VI Semester "M" Scheme ICE (Instrumentation and Control Engineering) Departments syllabus.

Hence, All the Principals of Government, Government Aided, Self Financing Polytechnic Colleges and Engineering colleges running diploma programme are hereby requested to follow the changes specified in the Annexure I and Annexure II for the respective branches meticulously and the same has to be disseminated to the concerned HODs, Staff and the students.

The Copy of the intimation may be acknowledged.

Sd/-  
for Commissioner of Technical Education

## Annexure I

### For ECE Department

1. The Core Subject "Test Engineering Theory (34062)" is being shifted as Elective Subject. The New subject code for Test Engineering is 34082.
2. The already available Elective Subject "Bio Medical Instrumentation (34082)" is being shifted to Core Subject in the place of Test Engineering. The New Subject code for Bio Medical Instrumentation is 34062.
3. The "Test Engineering Practical(34065)" is being moved as Elective Practical. The New Subject code for Test Engineering Practical is 34085.
4. The New Practical Subject PCB Design Practical has been introduced as Elective Practical. The Subject code for PCB Design Practical is 34084.
5. As per these Changes, Sixth semester Subjects are as follows:

#### VI Semester Curriculum Outline

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/Drawing	Practical Hours	Total
34061	Computer Hardware Servicing & Networking	6			6
34062	Bio Medical Instrumentation	6			6
	Elective II				
34081	1. Television Engineering	5			5
34082	2. Test Engineering				
34083	3. Mobile Communication				
34064	Computer Hardware Servicing & Networking Practical			4	4
	Elective Practical				
34084	1.PCB Design Practical			4	4
34085	2.Test Engineering Practical				
34066	Embedded System Practical			5	5
34067	Project Work			4	4
	Seminar	1			1
	Total	18		17	35

6. The Institutions who are offering Test Engineering Theory as Elective theory may offer the Test Engineering Practical as Elective Practical. The Institutions who are offering other Elective theory may offer PCB Design practical as Elective Practical.

**VI Semester**  
**Scheme of Examination**

SUBJECT CODE	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment marks	Board Exam Marks	Total Mark		
34061	Computer Hardware Servicing & Networking	25	75	100	40	3
34062	Bio Medical Instrumentation	25	75	100	40	3
	<b>Elective II</b>					
34081	1. Television Engineering	25	75	100	40	3
34082	2. Test Engineering					
34083	3. Mobile Communication					
34064	Computer Hardware Servicing and Networking Practical	25	75	100	50	3
	<b>Elective Practical</b>					
34084	1. PCB Design Practical	25	75	100	50	3
34085	2. Test Engineering Practical					
34066	Embedded Systems Practical	25	75	100	50	3
34067	Project Work	25	75	100	50	3
	Total	175	525	700		

Equivalent subject form April 2018 onwards

VI Semester ( L Scheme )	VI Semester ( M Scheme )
24082 Bio Medical Instrumentation	34062 Bio Medical Instrumentation



**DIRECTORATE OF TECHNICAL EDUCATION**

**DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING**

**III YEAR**

**M SCHEME**

**VI SEMESTER**

**2015-2016 onwards**

**TEST ENGINEERING**

**CURRICULAM DEVELOPMENT CENTRE**

## M-SCHEME

(Implemented from the Academic year 2015-2016 onwards)

Course Name: Electronics and Communication Engineering

Subject code : 34082

Semester : VI Semester

Subject title : TEST ENGINEERING

### TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			Duration
	Hrs/ week	Hrs/ semester	Marks			
Test Engineering			INTERNAL ASSESMENT	BOARD EXAM	TOTAL	
	5	75	25	75	100	3Hrs

### TOPICS AND ALLOCATION:

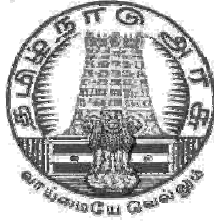
Unit	TOPIC	Hrs
I	INTRODUCTION TO TEST ENGINEERING	13
II	AUTOMATED TESTING METHODS AND TECHNOLOGY	13
III	V-I(SIGNATURE) TESTING METHODS AND TECHNOLOGY	13
IV	BOUNDARY SCAN TESTING METHODS AND TECHNOLOGY	13
V	ATE TEST PROGRAM GENERATION AND SEMICONDUCTOR TESTING	13
	Revision & Test	10
	TOTAL	75

**34082 - TEST ENGINEERING**  
**DETAILED SYLLABUS**  
**NAME OF THE TOPIC**

UNIT	NAME OF THE TOPIC	HOURS
<b>INTRODUCTION TO TEST ENGINEERING.</b>		
1	Need and Importance of Test Engineering – Principles of Fundamental Testing Methods – Basic Principles of Memory Testing – PCB Track Short Testing Methods – Concepts of Trouble Shooting PCBs - Manual and Automated PCB Trouble Shooting Techniques.	13
<b>AUTOMATED TESTING METHODS AND TECHNOLOGY</b>		
2	Introduction to Automated Test Techniques – Fundamental of Digital Logic Families - Concepts of Back-Driving / Node Forcing Technique and its International Defense Standard - Concepts of Digital Guarding - Auto Compensation - Clock Termination – Functional Test Methods - Functional Testing of Digital, Analog and Mixed Integrated Circuit – Different types of Memory Module Functional Test.	13
<b>V-I(Signature) TESTING METHODS AND TECHNOLOGY</b>		
3	Fundamentals of Electrical Characteristics - Effects of Curve Trace, Characteristics of Passive and Active Components - Understanding Composite VI-Curve and its deviations – Component Identification of Ageing Effects with VI Curve Trace, Input and Output Characteristics of Digital Integrated Circuits - Good Versus Suspect interpretation Comparison.	13
<b>BOUNDARY SCAN TESTING METHODS AND TECHNOLOGY</b>		
4	Introduction to Boundary Scan – Need of Boundary Scan Test Technique - Principle of Boundary Scan Test - Boundary Scan Architecture - Application of Boundary Scan Test- Boundary Scan Standards - Boundary Scan Description Language (BSDL) – Interconnect test – Serial Vector Format (SVF) Test - Basic of JTAG Port - Digital Integrated Circuit Test using Boundary Scan Techniques.	13
<b>ATE Test Program generation And Semiconductor testing</b>		
5	ATE in PCB Test – Test Fixtures - Basics of Automatic Test Program Generation - Standard Test Data Format STDF – Basic of Digital Simulator - Introduction to Semiconductor Test, Use of Load Boards.	13
	Revision & Test	10
	Total	75

## REFERENCE BOOKS:

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



**DIRECTORATE OF TECHNICAL EDUCATION**

**DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING**

**III YEAR**

**M SCHEME**

**VI SEMESTER**

**2015-2016 onwards**

**BIO MEDICAL INSTRUMENTATION**

**CURRICULAM DEVELOPMENT CENTRE**



## M-SCHEME

(Implemented from the Academic year 2015 - 2016 onwards)

**Course Name : Electronics and Communication Engineering**

**Subject code : 34062**

**Semester : VI Semester**

**Subject title : BIO MEDICAL INSTRUMENTATION**

### TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
	Hrs./ Week	Hrs./ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Bio Medical Instrumentation	6	90	25	75	100	3 Hrs

### TOPICS AND ALLOCATION

Unit	Topic	Time (Hrs)
I	Bio - electric signals, electrodes and clinical measurement	16
II	Bio - medical recorders	16
III	Therapeutic instruments	16
IV	Biotelemetry and patient safety	15
V	Modern imaging techniques	15
Vi	Revision, Test	12
	TOTAL	90

## **RATIONALE**

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

## **OBJECTIVES**

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

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

## 34062 - BIO MEDICAL INSTRUMENTATION

### DETAILED SYLLABUS

Units	Name of the topic	Hours
I	<p><b><u>BIO-ELECTRIC SIGNALS AND ELECTRODES</u></b></p> <p>Elementary ideas of cell structure, Bio – potential and their generation – resting and action potential – propagation of action potential. Electrodes – Micro – Skin surface – needle electrodes. <b>CLINICAL MEASUREMENT:</b> Measurement of Blood pressure (direct, indirect) – blood flow meter (Electro magnetic &amp; ultrasonic blood flow meter) – blood pH measurement - Measurement of Respiration rate – measurement of lung volume – heart rate measurement – Measurement of body and skin temperature - Chromatography, Photometry, Flurometry.</p>	16
II	<p><b><u>BIO - MEDICAL RECORDERS:</u></b></p> <p>Electro cardiograph (ECG) – Lead system – ECG electrodes – ECG amplifiers – ECG recording units – analysis of ECG curves. Nervous system – EEG recorder – 10-20 lead system – recording techniques – EEG wave types – Clinical use of EEG – brain tumour Electro – myograph (EMG) – EMG waves – measurement of conduction velocity – EMG recording techniques – Electro – retinograph (ERG) Audiometer – principle – types – Basics audiometer working.</p>	16
III	<p><b><u>THERAPEUTIC INSTRUMENTS:</u></b></p> <p>Cardiac pacemaker – classification – External pace makers – implantable pacemaker – pacing techniques – programmable pacemaker – Cardiac defibrillators – types – AC and DC defibrillators - Heart lung machine with Block diagram. Dialysis – Hemo dialysis – peritoneal dialysis. Endoscopes Endoscopic laser coagulator and applications – physiotherapy equipment – short wave diathermy – micro wave diathermy – ultrasonic therapy unit (block / circuit) – Ventilators – types – modern ventilator block diagram.</p>	16
IV	<p><b><u>BIOTELEMETRY AND PATIENT SAFETY:</u></b></p>	

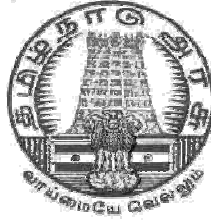
	<p>Introduction to biotelemetry – physiological – adaptable to biotelemetry – components of a biotelemetry system – application of telemetry – elements of biotelemetry; AM, FM transmitter and receiver – requirements for biotelemetry system – radio telemetry with sub carrier – single channel and multi channel telemetry – Telemedicine; introduction, working, applications.</p> <p>Patient safety: Physiological effects of electric current – Micro and macro shock – leakage current – shock hazards from electrical equipment. Methods of Accident Prevention – Grounding – Double Insulation – Protection by low voltage – Ground fault circuit interrupter – Isolation of patient connected parts – Isolated power distribution system. Safety aspects in electro surgical units – burns, high frequency current hazards, Explosion hazards.</p>	15
V	<p><b><u>MODERN IMAGING TECHNIQUES:</u></b></p> <p>LASER beam properties – block diagram – operation of CO2 and NDYag LASER – applications of LASER in medicine. X ray apparatus – block diagram – operation – special techniques in X-ray imaging – Tomogram – computerized Axial tomography – Ultrasonic imaging techniques – Echo cardiography – Angiography – CT scanner - Magnetic resonance imaging techniques.</p>	15
	Revision and Test	12

### **Text Book:**

Dr.M. Arumugam – Biomedical Instrumentation ,Anuradha publications, chennai (Page no. 1-15, 21-33, 117-136,142-159,164-179, 182-195, 202-209, 212-215, 255 – 256, 274-277, 285-286, 266-268, 293-297, 299- 310, 319-320, 329 – 340, 347-358, 360-367, 374-390, 390-400)

### **Reference Books.**

- Leslie Cromwell –Fred j. Wibell, Erich A.P Feither – Bio medical Instrumentation and measurements, II Edition.
- (Page no. 49-64, 63-76, 93-97, 106-149,195-205, 260-276, 296-303, 316 – 339, 363- 383,430-439)
- Jacobson and Webster – Medicine and clinical Engineering.
- R.S .Khandpur – Hand book of Bio –Medical Instrumentation.
- Medical Electronics - Kumara doss
- Introduction to Medical Electronics. B.R. Klin
- Introduction to Biomedical Instrumentation Mandeep Singh Printice Hall India 2010.



**DIRECTORATE OF TECHNICAL EDUCATION**

**DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING**

**III YEAR**

**M SCHEME**

**VI SEMESTER**

**2015-2016 onwards**

**PCB DESIGN PRACTICAL**

**CURRICULAM DEVELOPMENT CENTRE**

## M-SCHEME

( Implemented from the Academic Year 2015-2016 onwards )

Course Name : Electronics and Communication Engineering

Subject Code : 34084

Semester : VI Semester

Subject Title : PCB Design Practical

### TEACHING AND SCHEME OF EXAMINATIONS

Number Of Weeks / Semester : 15 Weeks

Subject	Instruction		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
INTERNAL ASSESSMENT			BOARD EXAM	TOTAL		
PCB Design Practical	4	60	25	75	100	3 Hrs

### RATIONALE:

- This Subject is to appreciate the necessity and evolution of the PCB, types and classes of PCB.
- Understand steps involved in schematic, layout, fabrication and assembly process of PCB design.
- Understand basic concepts of transmission line and crosstalk
- Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits.
- Design (schematic and layout) and fabricate PCB for simple circuit.

### Course Objective:

1. Understand the need for PCB Design and steps involved in PCB Design and Fabrication Process
2. Familiarize Schematic and layout Design flow using Electronic Design Automation ( EDA ) Tools

### **34084 PCB design Practical**

#### **List of Experiments**

**Design the Experiments ( Single side PCB ONLY ) using Any EDA tools like TINA, MultiSim , ORcad**

- 1. Design PCB for Full wave rectifier**
- 2. Design PCB for Bridge rectifier**
- 3. Design PCB for CE or CB or CC Amplifier circuits using discrete components**
- 4. Design PCB for Amplitude Modulator**
- 5. Design PCB for Frequency Modulator**
- 6. Design PCB for Astable Multivibrator using 555 IC**
- 7. Design PCB for half adder using Logic gates**
- 8. Design PCB for full adder using Logic gates**
- 9. Design PCB for 4 bit binary counter using D Flip Flops**
- 10. Design PCB 4 bit shift Register ( PIPO ) using JK Flip Flops**
- 11. Design PCB for Positive Voltage Regulator using 7805 & 7812 IC**
- 12. Design PCB for Analog Multiplier using 741 IC**
- 13. Design PCB for flashing LEDs using 555 IC**
- 14. Design PCB for Fan Regulator**
- 15. Design PCB for Liquid Level Controller**

#### **HARDWARE REQUIREMENT:**

**Desktop/ Laptop Computers : 15 Nos**  
**Laser Printer : 2 Nos**



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**III YEAR**

**M SCHEME**

**VI SEMESTER**

**2015-2016 onwards**

**TEST ENGINEERING PRACTICAL**

**CURRICULAM DEVELOPMENT CENTRE**



## M-SCHEME

(Implemented from the Academic year 2015-2016 onwards)

Course Name: Electronics and Communication Engineering

Subject code : 34085

Semester : VI Semester

Subject title : TEST ENGINEERING PRACTICAL

### TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			Duration
	Hrs/ week	Hrs/ semester	Marks			
			INTERNAL ASSESSMENT	BOARD EXAM	TOTAL	
TEST ENGINEERING PRACTICAL	4	60	25	75	100	3Hrs

### ALLOCATION OF MARKS

CIRCUIT DIAGRAM :	20
PROCEDURE:	25
EXECUTION & HANDLING OF EQUIPMENT :	15
OUTPUT / RESULT :	10
VIVA – VOCE :	05
<hr/>	
TOTAL :	75

## **34085 - TEST ENGINEERING PRACTICAL**

### **List of experiments**

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

### **EQUIPMENTS REQUIRED**

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

## Annexure II For ICE Department

1. The Core Subject "Test Engineering Theory (34062)" is being shifted as Elective Subject. The New subject code for Test Engineering is 34082.
2. The already available Elective Subject "Bio Medical Instrumentation (34082)" is being shifted to Core Subject in the place of Test Engineering. The New Subject code for Bio Medical Instrumentation is 34062.
3. The already existing Elective Theory Embedded System(34283) has been removed and New Theory Subject "Power Plant Instrumentation" has been introduced as Elective Subject in the place of Embedded System. The New Subject code for Power Plant Instrumentation" is 34283.
4. The "Test Engineering Practical (34065)" is being moved as Elective Practical. The New Subject code for Test Engineering Practical is 34085.
5. The New Practical Subject "P&I Drawings using CAD Practical" has been introduced as Elective Practical. The Subject code for P&I Drawings using CAD Practical is 34284.
6. As per these Changes, Sixth semester Subjects as follows:

### VI Semester Curriculum outline

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical Hours	Total
34062	Bio Medical Instrumentation #	6	-	-	6
34262	Industrial Automation and Drives	6	-	-	6
	<b>Elective II</b>				
34763	1 Robotics \$	5	-	-	5
34082	2. Test Engineering #				
34283	3. Power Plant Instrumentation				
34264	Industrial Automation Practical	-	-	5	5
	<b>Elective Practical</b>				
34284	1.P&I Drawings using CAD Practical	-	-	4	4
34085	2.Test Engineering Practical #				
34266	Programmable Logic controller Practical	-	-	4	4
34267	Project Work		-	4	4
	Seminar	1	-	-	1
	Total	18		17	35

\$ Common with Electronics (Robotics) # Common with ECE Branch

7. The Institutions who are offering Test Engineering Theory as Elective theory may offer the Test Engineering Practical as Elective Practical. The Institutions who are

offering other Elective theory may offer P&I Drawings using CAD Practical as Elective Practical.

**VI Semester**  
**Scheme of Examination**

SUBJECT CODE	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment marks	Board Exam Marks	Total Mark		
34062	Bio Medical Instrumentation #	25	75	100	40	3
34262	Industrial Automation and Drives	25	75	100	40	3
	Elective II					
34763	1 Robotics \$					
34082	2. Test Engineering #	25	75	100	40	3
34283	3. Power Plant Instrumentation					
34264	Industrial Automation Practical	25	75	100	50	3
	<b>Elective Practical</b>					
34284	1.P&I Drawings using CAD Practical					
34085	2.Test Engineering Practical #	25	75	100	50	3
34266	Programmable Logic controller practical	25	75	100	50	3
34267	Project Work	25	75	100	50	3
	Total	<b>175</b>	<b>525</b>	<b>700</b>		

\$ Common with Electronics (Robotics) # Common with ECE Branch

Equivalent subject form April 2018 onwards

VI Semester ( L Scheme )	VI Semester ( M Scheme )
24281 Bio Medical Instrumentation	34062 Bio Medical Instrumentation

## M-SCHEME

(Implemented from the Academic year 2015 - 2016 onwards)

**Course Name : Electronics and Communication Engineering**

**Subject code : 34062**

**Semester : VI Semester**

**Subject title : BIO MEDICAL INSTRUMENTATION**

### TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
	Hrs./ Week	Hrs./ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Bio Medical Instrumentation	6	90	25	75	100	3 Hrs

### TOPICS AND ALLOCATION

Unit	Topic	Time (Hrs)
I	Bio - electric signals, electrodes and clinical measurement	16
II	Bio - medical recorders	16
III	Therapeutic instruments	16
IV	Biotelemetry and patient safety	15
V	Modern imaging techniques	15
Vi	Revision, Test	12
	TOTAL	90

## **RATIONALE**

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

## **OBJECTIVES**

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

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

## 34062 - BIO MEDICAL INSTRUMENTATION

### DETAILED SYLLABUS

Units	Name of the topic	Hours
I	<p><b><u>BIO-ELECTRIC SIGNALS AND ELECTRODES</u></b></p> <p>Elementary ideas of cell structure, Bio – potential and their generation – resting and action potential – propagation of action potential. Electrodes – Micro – Skin surface – needle electrodes. <b>CLINICAL MEASUREMENT:</b> Measurement of Blood pressure (direct, indirect) – blood flow meter (Electro magnetic &amp; ultrasonic blood flow meter) – blood pH measurement - Measurement of Respiration rate – measurement of lung volume – heart rate measurement – Measurement of body and skin temperature - Chromatography, Photometry, Flurometry.</p>	16
II	<p><b><u>BIO - MEDICAL RECORDERS:</u></b></p> <p>Electro cardiograph (ECG) – Lead system – ECG electrodes – ECG amplifiers – ECG recording units – analysis of ECG curves. Nervous system – EEG recorder – 10-20 lead system – recording techniques – EEG wave types – Clinical use of EEG – brain tumour Electro – myograph (EMG) – EMG waves – measurement of conduction velocity – EMG recording techniques – Electro – retinograph (ERG) Audiometer – principle – types – Basics audiometer working.</p>	16
III	<p><b><u>THERAPEUTIC INSTRUMENTS:</u></b></p> <p>Cardiac pacemaker – classification – External pace makers – implantable pacemaker – pacing techniques – programmable pacemaker – Cardiac defibrillators – types – AC and DC defibrillators - Heart lung machine with Block diagram. Dialysis – Hemo dialysis – peritoneal dialysis. Endoscopes Endoscopic laser coagulator and applications – physiotherapy equipment – short wave diathermy – micro wave diathermy – ultrasonic therapy unit (block / circuit) – Ventilators – types – modern ventilator block diagram.</p>	16
IV	<p><b><u>BIOTELEMETRY AND PATIENT SAFETY:</u></b></p>	

	<p>Introduction to biotelemetry – physiological – adaptable to biotelemetry – components of a biotelemetry system – application of telemetry – elements of biotelemetry; AM, FM transmitter and receiver – requirements for biotelemetry system – radio telemetry with sub carrier – single channel and multi channel telemetry – Telemedicine; introduction, working, applications.</p> <p>Patient safety: Physiological effects of electric current – Micro and macro shock – leakage current – shock hazards from electrical equipment. Methods of Accident Prevention – Grounding – Double Insulation – Protection by low voltage – Ground fault circuit interrupter – Isolation of patient connected parts – Isolated power distribution system. Safety aspects in electro surgical units – burns, high frequency current hazards, Explosion hazards.</p>	15
V	<p><b><u>MODERN IMAGING TECHNIQUES:</u></b></p> <p>LASER beam properties – block diagram – operation of CO2 and NDYag LASER – applications of LASER in medicine. X ray apparatus – block diagram – operation – special techniques in X-ray imaging – Tomogram – computerized Axial tomography – Ultrasonic imaging techniques – Echo cardiography – Angiography – CT scanner - Magnetic resonance imaging techniques.</p>	15
	Revision and Test	12

### **Text Book:**

Dr.M. Arumugam – Biomedical Instrumentation ,Anuradha publications, chennai (Page no. 1-15, 21-33, 117-136,142-159,164-179, 182-195, 202-209, 212-215, 255 – 256, 274-277, 285-286, 266-268, 293-297, 299- 310, 319-320, 329 – 340, 347-358, 360-367, 374-390, 390-400)

### **Reference Books.**

- Leslie Cromwell –Fred j. Wibell, Erich A.P Feither – Bio medical Instrumentation and measurements, II Edition.
- (Page no. 49-64, 63-76, 93-97, 106-149,195-205, 260-276, 296-303, 316 – 339, 363- 383,430-439)
- Jacobson and Webster – Medicine and clinical Engineering.
- R.S .Khandpur – Hand book of Bio –Medical Instrumentation.
- Medical Electronics - Kumara doss
- Introduction to Medical Electronics. B.R. Klin
- Introduction to Biomedical Instrumentation Mandeep Singh Printice Hall India 2010.



## M-SCHEME

(Implemented from the Academic year 2015-2016 onwards)

**Course Name: Electronics and Communication Engineering**

**Subject code : 34082**

**Semester : VI Semester**

**Subject title : TEST ENGINEERING**

### TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
	Hrs/ week	Hrs/ semester	Marks			Duration
INTERNAL ASSESSMENT			BOARD EXAM	TOTAL		
Test Engineering	5	75	25	75	100	3Hrs

### TOPICS AND ALLOCATION:

Unit	TOPIC	Hrs
I	INTRODUCTION TO TEST ENGINEERING	13
II	AUTOMATED TESTING METHODS AND TECHNOLOGY	13
III	V-I(SIGNATURE) TESTING METHODS AND TECHNOLOGY	13
IV	BOUNDARY SCAN TESTING METHODS AND TECHNOLOGY	13
V	ATE TEST PROGRAM GENERATION AND SEMICONDUCTOR TESTING	13
	Revision & Test	10
	TOTAL	75

## **34082 - TEST ENGINEERING**

### **DETAILED SYLLABUS**

<b>UNIT</b>	<b>NAME OF THE TOPIC</b>	<b>HOURS</b>
	<b>INTRODUCTION TO TEST ENGINEERING.</b>	
<b>1</b>	Need and Importance of Test Engineering – Principles of Fundamental Testing Methods – Basic Principles of Memory Testing – PCB Track Short Testing Methods – Concepts of Trouble Shooting PCBs - Manual and Automated PCB Trouble Shooting Techniques.	<b>13</b>
	<b>AUTOMATED TESTING METHODS AND TECHNOLOGY</b>	
<b>2</b>	Introduction to Automated Test Techniques – Fundamental of Digital Logic Families - Concepts of Back-Driving / Node Forcing Technique and its International Defense Standard - Concepts of Digital Guarding - Auto Compensation - Clock Termination – Functional Test Methods - Functional Testing of Digital, Analog and Mixed Integrated Circuit – Different types of Memory Module Functional Test.	<b>13</b>
	<b>V-I(Signature) TESTING METHODS AND TECHNOLOGY</b>	
<b>3</b>	Fundamentals of Electrical Characteristics - Effects of Curve Trace, Characteristics of Passive and Active Components - Understanding Composite VI-Curve and its deviations – Component Identification of Ageing Effects with VI Curve Trace, Input and Output Characteristics of Digital Integrated Circuits - Good Versus Suspect interpretation Comparison.	<b>13</b>
	<b>BOUNDARY SCAN TESTING METHODS AND TECHNOLOGY</b>	
<b>4</b>	Introduction to Boundary Scan – Need of Boundary Scan Test Technique - Principle of Boundary Scan Test - Boundary Scan Architecture - Application of Boundary Scan Test- Boundary Scan Standards - Boundary Scan Description Language (BSDL) – Interconnect test – Serial Vector Format (SVF) Test - Basic of JTAG Port - Digital Integrated Circuit Test using Boundary Scan Techniques.	<b>13</b>
	<b>ATE Test Program generation And Semiconductor testing</b>	
<b>5</b>	ATE in PCB Test – Test Fixtures - Basics of Automatic Test Program Generation - Standard Test Data Format STDF – Basic of Digital Simulator - Introduction to Semiconductor Test, Use of Load Boards.	<b>13</b>
	Revision & Test	<b>10</b>
	Total	<b>75</b>

### **REFERENCE BOOKS:**

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

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

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

Course Code : **1042**

Subject code : **34283**

Semester : **VI Semester**

Subject title : **POWER PLANT INSTRUMENTATION**

**TEACHING AND SCHEME OF EXAMINATION :**

Number of Weeks/ Semester : 15 weeks

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

**TOPICS AND ALLOCATION**

Unit	Topic	Time(Hrs)
I	Overview Of Power Generation	13
II	Measurements In Power Plant	13
III	Analysers In Power Plant	13
IV	Control Loops In Boiler	14
V	Turbine - Monitoring And Control	12
VI	Revision, Test	10
	<b>TOTAL</b>	75

**RATIONALE**

The per capita consumption is regarded as an index of national standard of living. The fuel and power are the most important items on which national standard of life depend. Therefore the increase and power potential of nation is considered most important among all. This subject enables the students to learn the basic principles of different methods of power generation and the instrumentation and control involved in the power generation process.

## **OBJECTIVES**

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

- The methods of power generation
- The operation of hydro, thermal, solar, wind and nuclear power plants
- The types of boilers and its classification
- The Piping and Instrumentation drawing of boiler
- The Differential pressure measurement of air flow
- The Inferential and Non-Inferential measurements of combustion air flow
- The measurement of Steam flow, Steam pressure and Steam temperature
- The measurement of Dust and Smoke
- The principle of operation of Flue gas Analyser,
- The principle of operation of Electrical conductivity meter
- The principle of operation of Auto analyser
- The principle of operation of Air pollution monitoring system
- The furnace draft control using feed forward and feedback control
- The Boiler feed water pumping and heating system
- The Instrumentation and control in turbines

Units	Name Of The Topic	Hours
I	<p><b>OVERVIEW OF POWER GENERATION</b></p> <p>Hydro electric power plant - Introduction - Hydrology - Hydro graph - Classification of Hydro electric power plant - Basic requirements - Operation - Components used in hydro electric power plant - Thermal power plant – Circuits in thermal power plant - Working of thermal power plant - Coal handling system - Ash and Dust handling system - Draft system - Economizer - Air pre heater - Solar power plant - principle - Flat plate collector - Solar thermal power generation - Photo voltaic power generation - Nuclear power plant - Principle - Pressurized water reactor - Boiling water reactor - Components using nuclear power plant - Wind power plant - Principles - Basic components of wind energy conversion system - Boilers - Steaming process - Basic boilers types and classification - Piping and Instrumentation diagram of boiler - Co-Generation system - topping cycle, bottoming cycle.</p>	13
II	<p><b>MEASUREMENTS IN POWER PLANT</b></p> <p>Differential pressure measurement of air flow measurements - Inferential measurements of combustion air flow - Non-Inferential method of air flow measurements - Oil flow measurements - Steam flow measurements - Steam pressure measurements of high pressure - Steam temperature measurements - Drum level measurements - Dust measurements - Smoke measurements - Radiation Detectors - Pressure Gauges -Strain Gauges.</p>	13
III	<p><b>ANALYSERS IN POWER PLANT</b></p> <p>Flue gas Analyser - Flue gas Oxygen analyser - Measurement of impurity in feed water and steam - Electrical conductivity meter - Steam purity meter - flame Photometer - Dissolved Oxygen analyser - pH meter - Chromotography - Auto analyser - Air pollution monitoring system.</p>	13
IV	<p><b>CONTROL LOOPS IN BOILER</b></p> <p>Boiler control system - Combustion control - Measurement of furnace draft - furnace draft control using feed forward and feedback control - Drum level control Super heat temperature control system - Boiler feed water pumping and heating system - Flue gas dew point control - Soot blowing .</p>	14

<b>V</b>	<b>TURBINE - MONITORING And CONTROL</b>  Introduction – Speed, Vibration, Shell Temperature monitoring and control – Steam pressure control – Lubrication system for steam turbines – Cooling system.	<b>12</b>

**Reference Books:**

1. Sam Duekelow, Control of Boilers, Instrument society of America, 1991.
2. Everett wood ruff, Herbert lammers, Thomas lammers, Steam plant operation, 9<sup>th</sup> edition McGraw Hill, 2012
3. Ragput R.K., a Text book of Power plant engineering. 5<sup>th</sup> edition lakshmi Publications, 2013
4. Bela G.Liptak, ‘Instrumentation in process industries , Chilton book company 2005.
5. P.K.Nag, power plant engineering Tata McGraw Hill education , 3<sup>rd</sup> edition 2007.
6. Tamilmani Power plant instrumentation, Sams Publishers, 2011.
7. Krishnaswamy.K and Ponni bala.M, Power plant instrumentation, PHI Learning private limited ., New Delhi 2011.

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

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

Course Code : **1042**

Subject code : **34284**

Semester : **VI Semester**

Subject title : **P& I DRAWINGS USING CAD PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION :**

Number of Weeks/ Semester : 15 weeks

Subject Title	Instruction		Examination			Duration
	Hrs. Week	Hrs Semester	Marks			
			Internal Assessment	Board Examination	Total	
<b>P&amp;I DRAWINGS USING CAD PRACTICAL</b>	4	60	25	75	100	3Hrs

**Software requirement: CAD package / CAD P&ID 2012/Edraw Max**

**34284 - P&I DRAWINGS USING CAD PRACTICAL**

**List of Experiments**

1. Study of various symbols and abbreviations used in P&ID diagram.
2. Draw the P&ID of a Drum type Boiler with only measurement points.
3. Draw the P&ID of Feedback control system in a chemical reactor for the control of temperature and pressure.
4. Draw the P&ID of Feedback control system in a tank for the control of level and inlet flow rate.
5. Draw the P&ID of Cascade control system in a steam heat exchanger and Distillation column.
6. Draw the P&ID of Feed forward control system in a stirred tank heater.
7. Draw the P&ID of a ratio control system for the control of two flow rates by ratio.
8. Draw the P&ID of Split range control scheme in a process.
9. Draw the P&ID of On/Off Level, Flow and Pressure Control of Centrifugal Pump.
10. Draw the P&ID of any one Batch Dryer.
11. Draw the P&ID of pneumatic power supply and its distribution.



12. Draw the P&ID of a Simple Batch process.
13. Draw the P&ID of a bottle filling process using Conveyer system.

### REFERENCE BOOKS

Refer the below books for the P&ID Diagram of the listed experiments

1. Bela G.Liptak, Instrument Engineers Handbook – Process Control, Third edition.
2. Andrews & William, Applied Instrumentation in Process Industries.
3. C.D. Johnson, Process Control Instrumentation Technology, Prentice Hall of India.

### EQUIPEMENT REQUIRED:

Sr.No	Name of the Equipments	Required Nos
	<b>Software required:-</b>	
1	CAD/ CAD P&ID 2012 /Edraw Max Software for multiuser	1 no
	<b>Hardware required:-</b>	
1	PC Pentium Dual Core	30 nos
2	Laser printer	2 nos
3	UPS 5KVA with one hour backup	1 nos

### SCHEME OF VALUATION

DRAWING P&ID	20 MARKS
P&ID DRAWING USING CAD	35 MARKS
RESULT	15 MARKS
VIVA VOICE	5 MARKS
TOTAL	75 MARKS

## M-SCHEME

(Implemented from the Academic year 2015-2016 onwards)

Course Name: Electronics and Communication Engineering

Subject code : 34085

Semester : VI Semester

Subject title : TEST ENGINEERING PRACTICAL

### TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			Duration
	Hrs/ week	Hrs/ semester	Marks			
INTERNAL ASSESSMENT			BOARD EXAM	TOTAL		
TEST ENGINEERING PRACTICAL	4	60	25	75	100	3Hrs

### ALLOCATION OF MARKS

CIRCUIT DIAGRAM :	20
PROCEDURE:	25
EXECUTION & HANDLING OF EQUIPMENT :	15
OUTPUT / RESULT :	10
VIVA – VOCE :	05
<hr/>	
TOTAL :	75

## **34085 - TEST ENGINEERING PRACTICAL**

### **List of experiments**

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

### **EQUIPMENTS REQUIRED**

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