


<div> MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI</div> <div>TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES</div>																
COURSE NAME : DIPLOMA IN MEDICAL ELECTRONICS																
COURSE CODE : MU																
DURATION OF COURSE : 6 SEMESTERS										WITH EFFECT FROM 2012-13						
SEMESTER : FIFTH										DURATION : 16 WEEKS						
PATTERN : FULL TIME - SEMESTER										SCHEME : G						
SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			PAPER HRS.	EXAMINATION SCHEME								SW (17500)
				TH	TU	PR		TH (1)		PR (4)		OR (8)		TW (9)		
1	Computer Hardware & Networking β	CHN	17533	02	--	02	02	50	20	--	--	--	--	25@	10	50
2	Microcontroller β	MIC	17534	03	--	02	03	100	40	50#	20	--	--	25@	10	
3	Applications of Biomaterial	AOB	17543	03	--	02	03	100	40	--	--	--	--	25@	10	
4	Analytical Equipment	AEQ	17544	02	--	02	02	50	20			--	--	25@	10	
5	Diagnostic Equipment	DEQ	17545	03	--	02	03	100	40	--	--	50#	20	25@	10	
6	Behavioural Science \$	BSC	17075	01	--	02	--	--	--	--	--	25#	10	25@	10	
7	EDP and Project β	EDP	17066	01	--	02	--	--	--	--	--	--	--	25@	10	
8	Professional Practices-III	PPT	17070	--	--	03	--	--	--	--	--	--	--	50@	20	
TOTAL				15	--	17	--	400	--	50	--	75	--	225	--	50
Student Contact Hours Per Week: 32 Hrs.																
THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.																
Total Marks : 800																
@- Internal Assessment, # - External Assessment, <div></div> No Theory Examination, \$ - Common to all branches, #- Online Theory Examination,																
β - Common to ET / EJ / EN / EX / IE / IS / IC / DE / EV / IU / ED / EI / EL																
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work.																
➤ Conduct two class tests each of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).																
➤ Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms.																
➤ Code number for TH, PR, OR and TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.																

**Course Name** : Electronics Engineering Group  
**Course Code** : ET/EN/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI/EX/EL  
**Semester** : Fifth for ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU/EL and Sixth for IU/ED/EI  
**Subject Title** : Computer Hardware and Networking  
**Subject Code** : 17533

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	02	02	50	--	--	25@	75

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

Today is the age of information technology. Hence everyone is required to work on computers and internet. This subject is introduced to focus on basic working of the computer motherboard, peripherals and networking components.

Theoretical and Practical approach while studying this subject will help in understanding for troubleshooting, diagnosing computer and its peripheral related problems. Students will aware of basic concept of networking, its applications, topologies, communication media, network directing devices, protocol used, OSI reference model and TCP/IP model.

This subject will give exposure to students on computer hardware, peripherals, specifications, installation, faults and troubleshooting. Students will also be able to plan, analyze, design, install, configure, test, implement and maintain networking systems. Study of this subject will enable students to select appropriate hardware, list specifications, will identify simple to complex problems and their solutions. The subject is practical oriented and will develop the debugging skills in the students.

**General Objectives.**

Students will able to.

- Understand principle, construction, working of computer peripherals
- Select cost effective, good quality reliable peripherals and equipment
- Identify the problem as hardware or software related.
- Identify and repair the simple faults in computer systems.
- Plan, analyze, design, install, configure, test, implement and maintain networking systems

## Learning Structure

### Applications

- Selection of appropriate hardware based on application
- Repair and maintenance of PC's
- Plan, analyze, design, install, configure, test, implement and maintain networking systems

### Procedure

Learning architectural details	<ul style="list-style-type: none"> <li>• Write everything down</li> <li>• Do the easy stuff first</li> <li>• Check for operator error</li> <li>• Check the software</li> <li>• Check external signals</li> <li>• Run diagnostic programs</li> </ul>	Repairing the different components of PC by using different methods	Follow step by step procedure to install TCP/IP Protocols and TCP/IP configuration	Testing and troubleshooting of network connectivity	Network configuration, installation and maintenance Network utilities
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### Principle

Logic of components	Rules of troubleshooting	Rules of repairing	Principle of TCP/IP reference model	Principle of OSI reference model
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### Concept

Motherboard, drive formatting, latency, landing zone, HDD, FDD, Active, Passive, modular motherboard	Error codes, memory package, styles and structures, memory signals, memory manager, disk manager, EZ-Drive, DMI, SCSI, Video adapter etc.	Types of Topology LAN, WAN, MAN	Types of Network devices	Types of Transmission media
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### Facts

AT, ATX, motherboard, AGP, PCI Port etc.	Problems of system boards, display problems	Tools for repairing the faults, types of tests	Computer Network and Benefits	Classification of Network	Network Features
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**Theory:**

Chapter	Topic and Contents	Hours	Marks
01	<b>Topic 1] Motherboard And Peripherals</b> <b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ Identify different components and their function on motherboard</li> <li>➤ Identify and compare storage devices</li> <li>➤ Write specifications, select appropriate monitor and compare LCD and CRT monitors</li> <li>➤ Understand principle, construction and working of peripherals</li> </ul> <b>Contents:</b> <ul style="list-style-type: none"> <li>• Different types of PC configurations and their comparison,</li> <li>• Chipset basic, Architecture of Intel 945 G</li> <li>• Overview and features of ISA, PCI-X, PCI-Xpress</li> <li>• Overview features and types of DDR RAMs, Concept of cache memory : Internal cache, External cache (L1, L2, L3 cache), BIOS Basics</li> <li>• CD/DVD ROM drive : Construction, recording, comparison</li> <li>• LCD monitor: functional block diagram of LCD monitor, working principle, Types-Passive matrix and Active matrix. Important characteristics - Resolution, Refresh rate, Response time. Comparison of CRT display and LCD display</li> <li>• Construction, working &amp; Installation of Keyboard, mouse, scanner and printer. Keyboard: Membrane and mechanical only. Mouse: Optical only, Scanner: Flatbed only, Printer: Dot matrix, Inkjet, and Laser only</li> </ul>	10	14
02	<b>Topic 2] Power Supply and Interfaces</b> <b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ Select, identify, measure and troubleshoot power related problems</li> <li>➤ Differentiate online and offline UPS.</li> <li>➤ Identify, select and use different interfaces</li> </ul> <b>Contents:</b> <p>2.1</p> <ul style="list-style-type: none"> <li>• Block diagram and working of SMPS, Signal description and pin diagram of ATX power supply.</li> <li>• UPS : Block diagram working, Types, Rating</li> </ul> <p>2.2</p> <ul style="list-style-type: none"> <li>• USB features and operation, RS232: Voltages &amp; 9 pin Signal description.</li> </ul>	04	06
03	<b>Topic 3] Diagnostic, Testing And Maintenance</b> <b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ Identify importance of preventive maintenance</li> <li>➤ Realize the need of practices of preventive maintenance of peripheral</li> </ul> <b>Contents:</b> <ul style="list-style-type: none"> <li>• Maintenance : Preventive and passive maintenance</li> <li>• Preventive maintenance of peripherals of PCs: Mouse, keyboard, hard disk, CDROM drive, laser printer, scanner.</li> </ul>	04	08

	<ul style="list-style-type: none"> <li>PC problems and troubleshooting, POST.</li> </ul>		
04	<p><b>Topic 4] Introduction to networks</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Classify types of networks</li> <li>➤ Plan and design network</li> <li>➤ Install, configure and use networking devices</li> <li>➤ Test and maintain networks</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>Network classification: LAN, WAN, MAN. Peer to peer and client server networks</li> <li>Network topology, Benefits of networks</li> <li>Network cables- coaxial, UTP, STP, fiber optics their comparison and characteristics</li> <li>Network standards- Ethernet, Ring, Token, wireless</li> <li>Principle, operation and function of Hubs, Switches, Routers, Bridges, Repeaters, Gateways, firewalls</li> </ul>	06	10
05	<p><b>Topic 5] Networking devices and Reference Models</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Understand layered approach</li> <li>➤ Compare TCP-IP and OSI models</li> <li>➤ Setup and configure network in laboratory environment</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>OSI Reference Model - Interlayer Communication – Data Encapsulation, Functions of each layer.</li> <li>TCP/IP Reference Model – Link, Internet, Transport, Application layer.</li> <li>Comparison of the OSI and TCP/IP reference models</li> <li>TCP/IP Protocols – IP, ICMP, ARP, TCP, FTP and UDP.</li> <li>IP Addressing - IP Address Assignments, IP Address Classes, Subnet Masking.</li> <li>TCP/IP Configuration- Installing the TCP/IP Protocol; Configuring TCP/IP - Configuring Basic TCP/IP Properties, Configuring Advanced TCP/IP Properties</li> </ul>	08	12
<b>Total</b>		<b>32</b>	<b>50</b>

**Skills to be developed:****Intellectual Skills:**

1. Identify and select appropriate peripherals
2. Plan schedule for preventive maintenance of computer systems and network
3. Test and troubleshoot the problems in computer systems
4. Plan, analyze, design, configure networking systems
5. Select different hardware and software diagnostic tools of networking.

**Motor Skills:**

1. Handling of computer system and peripherals
2. Assembly of computer systems

3. Install and testing of network components
4. Crimping of cables.

**Practical: List of experiments**

1. **Computer System:** Show different types cabinets and motherboards to students. Identify CPU types, motherboard architecture, form factor, chipsets used, RAM slots, different types of buses, on board peripherals, different connectors like sata/pata, ATX/AT, FDD, and other connections terminated at front or rear panels. CMOS battery, BIOS type, jumper settings. List the standard specifications of latest PC.
2. **Keyboard:** Identify different types of keyboards, types of keys, number of keys, different type of keyboard connectors, their details, Keyboard installation, wireless keyboard, typical keyboard errors and troubleshooting procedures of it, Guidelines for preventive maintenance of keyboards  
**Mouse:** Identify different types of mouse, disassemble mouse, and show different parts / mechanisms of mouse, principle of operation, connectors of mouse, wireless mouse, typical mouse faults and trouble shoot procedure of it. Guidelines for preventive maintenance of mouse
3. **Hard Disk:** Identify different types of hard disk, classify them into PATA and SATA, Open hard disk show different parts of hard disk, identify pins and connectors of HDD, How to make HDD primary/secondary i.e. jumper settings of IDE disk, SCSI hard disk and its controller card. Explain terms related to Hard Disk : Track, Sector, cylinder, cluster, Head parking, MBR, Zone recording.
4. **Formatting and Partitioning of Hard disk:** Low level and high level formatting of hard disk, partitioning of hard disk into different logical drives using fdisk or similar third party utilities. Install multiple Operating systems on same hard disk. Identify different errors, Standard procedures to troubleshoot hard disk
5. **Display Adapter:** Identify display adapters and its types. Identification of appropriate drivers of connected display device. Installation of display drivers, setting resolutions, factory settings, different controls on front panel of monitor. Types of monitors, their comparison, typical faults of monitor, Troubleshooting procedure of monitors
6. **Scanner:** Identify different types of scanners, principle of operation, typical specifications, installing scanner, scanning of images, typical faults of scanner and trouble shoot procedure of it. Preventive maintenance of scanner.
7. **Modem:** Identify different types of modem, installation of modem, modem operations, different types of indicators on front panel of external modem and their meanings, modem connectors, Typical faults and maintenance of modem
8. **Power Supply:** ATX power supply, pin details, voltage measurement, typical faults and troubleshooting procedure of SMPS, Preventive maintenance.
9. **Printer:** Identify printers, typical components of each printer, printer specifications, printer installation of local and network printers. Typical faults of printer and trouble shoot procedure of it. Guide lines for preventive maintenance of printer.
10. **Network Cables:** Identify different types of network cables, comparison , prepare straight and cross cable by crimping and test the same with network tester.
11. **Setup of client server network in a Lab:** Connect one computer lab in client server configuration using hub/ switch, UTP cables, RJ-45 connectors. Install network cards, Test them, set IP addresses in class-c network, test connectivity of clients to server using software utilities, demonstrate client server based application

**Learning Resources:****Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
01	Mark Minasi	The Complete PC Upgrade & Maintenance Guide	Wiley Publication
02	Scott Mueller	Upgrading & Repairing PCs	Pearson Education
03	Bigelow	Bigelow's Troubleshooting, Maintaining & Repairing PCs	Tata McGraw Hill
04	William Stalling	Local and metropolitan Area Networks 6/e	Pearson
05	Douglas E Comer & M S Narayanan	Computer Networks and Internet	Pearson

**Websites:**

1. [ccna.com](http://ccna.com)
2. [ccna.com/ccna-training](http://ccna.com/ccna-training)
3. [learningnetwork.cisco.com](http://learningnetwork.cisco.com)
4. [www.mcse-training.com](http://www.mcse-training.com)
5. [www.microsoft.com/learning/en/us/certification/mcse.aspx](http://www.microsoft.com/learning/en/us/certification/mcse.aspx)
6. [www.intel.com/products/processor](http://www.intel.com/products/processor)
7. [www.intel.com/products/desktop/motherboard](http://www.intel.com/products/desktop/motherboard)
8. [www.seagate.com](http://www.seagate.com)
9. [www.scsisource.com](http://www.scsisource.com)
10. [www.w3schools.com/tcpip](http://www.w3schools.com/tcpip)
11. [www.protocols.com](http://www.protocols.com)

**Course Name : Electronics Engineering Group**  
**Course Code : ET/EN/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI/EX/EL**  
**Semester : Fifth for ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU/EL and Sixth for IU/ED/EI**  
**Subject Title : Microcontroller**  
**Subject Code : 17534**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	50#	--	25@	175

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

This subject comes under technology area. The subject is an extension of concepts covered in digital technique. 8051 microcontroller architecture, peripheral interfacing to it, assembly language programming is covered in this subject.

Microcontroller is heart of all domestic, industrial, consumer goods and other high end products. Automation in every field of life is being used and microcontroller is inbuilt element of these systems and devices.

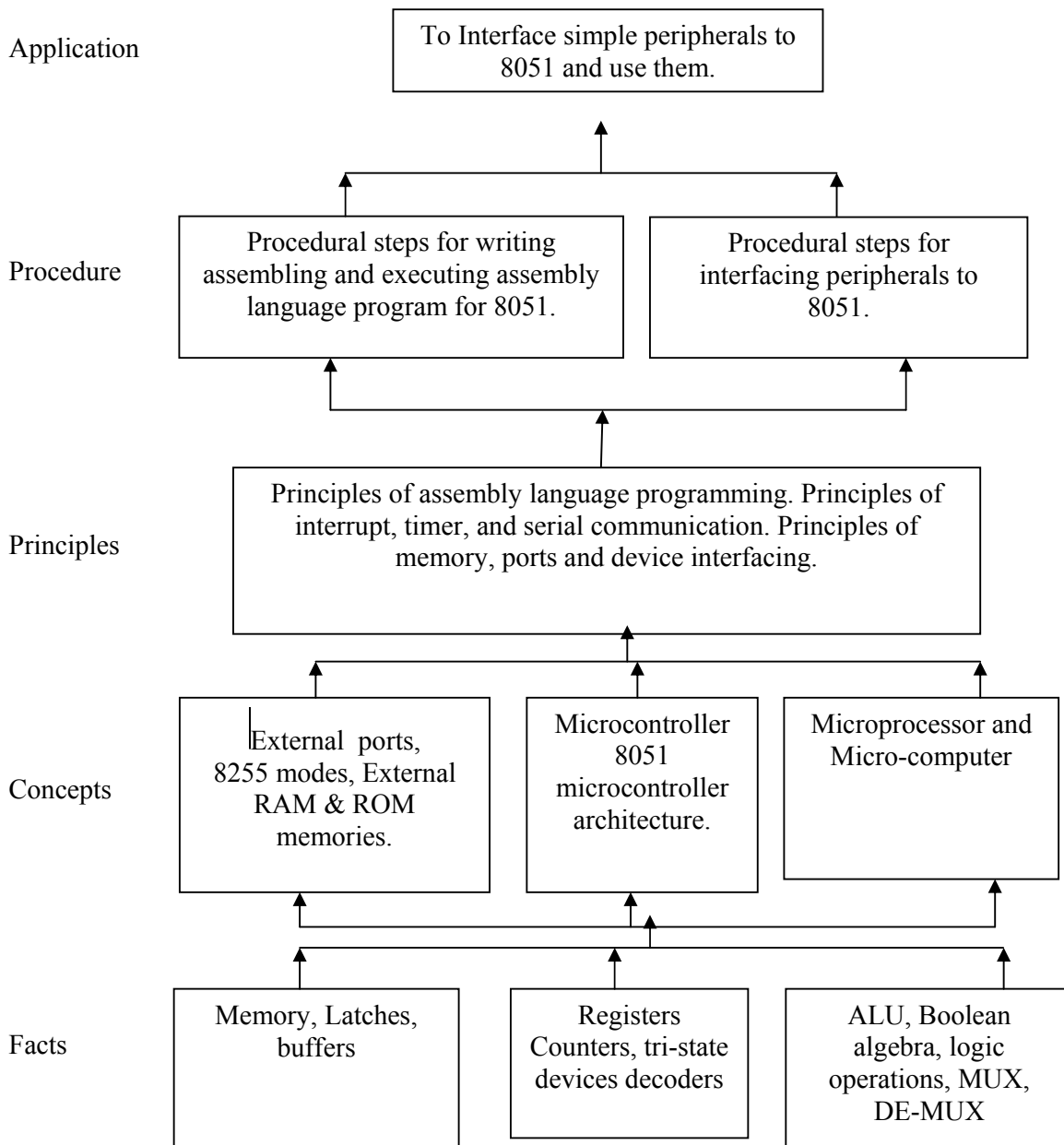
The student will gain the knowledge of peripheral interfacing and programming them. Microcontroller is in built element of embedded system. The subject will help the students to study concepts of embedded system. It will also help to understand design of simple microcontroller systems.

**General Objectives.**

Students will able to:

- Understand concepts of microcomputer, microprocessor and microcontroller.
- Interface peripherals to microcontroller.
- Develop logic for assembly language programming.
- Understand the principles of working of present day microcontroller systems in various fields.



**Learning Structure:**

**Theory:**

Topic and Contents	Hours	Marks
<b>Topic 1: Introduction to Microcomputers and Microcontrollers</b> <b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ Distinguish microcomputer, microprocessor, and microcontroller</li> </ul> <b>Contents:</b> <p>1.1 Introduction to single board microcomputer. (Marks 04)</p> <ul style="list-style-type: none"> <li>• Block Diagram of Microcomputer.</li> <li>• Elements of Microcomputer. (Buses, Microprocessor, memory, I/O devices).</li> <li>• Different types of buses: address, Data, and control bus</li> </ul> <p>1.2 Introduction to Microcontroller (Marks 06)</p> <ul style="list-style-type: none"> <li>• General block diagram of microprocessor and microcontroller</li> <li>• Comparison of Microprocessors and Microcontrollers.</li> <li>• Types of architectures - Harvard and Von-neuman.</li> <li>• Selection factors of microcontroller(Architecture type, speed, Word size, instruction set, memory, and I/O capability)</li> </ul>	04	10
<b>Topic 2: 8051 Microcontroller</b> <ul style="list-style-type: none"> <li>➤ Identify Hardware features and internal registers with their functions</li> <li>➤ Identify physical difference between external and internal memory and between different ports</li> <li>➤ Compare different members of 8051 family.</li> </ul> <b>Contents :</b> <p>2.1 8051 architecture (Marks 10)</p> <ul style="list-style-type: none"> <li>• Features, Architecture, Pin description.</li> </ul> <p>2.2 Special Features of 8051 (Marks 06)</p> <ul style="list-style-type: none"> <li>• Boolean Processor, Power saving options- idle and power down mode, Derivatives of 8051.</li> </ul>	08	16
<b>Topic 3: 8051 Instruction Set and Programming</b> <ul style="list-style-type: none"> <li>➤ Comprehend addressing modes and instruction set.</li> <li>➤ Develop and realize assembly language programs.</li> </ul> <p>3.1 Addressing modes and instruction set. (Marks 10)</p> <ul style="list-style-type: none"> <li>• Assembler directive- ORG, DB, EQU, END, CODE, DATA</li> </ul> <p>3.2 Assembly language programming (Marks 10)</p> <p>3.3 Software development cycle- Editor, Assembler, cross compiler, linker, locater, compiler (Marks 04)</p>	12	24

<b>Topic 4: MCS 51 Interrupt and Timers</b> <ul style="list-style-type: none"> <li>➤ Realize Concept of Interrupts, timer, and related SFRs</li> <li>➤ Use timers and Interrupts through programs</li> <li>➤ Compare interrupts and polling method.</li> </ul> <b>Contents:</b> <p>4.1 8051 Timer/counter (Marks 12)</p> <ul style="list-style-type: none"> <li>• Timer / Counter logic and modes</li> <li>• Simple programs on timer to generate time delay using polling and interrupt method.</li> </ul> <p>4.2 8051 Interrupts (Marks 10)</p> <ul style="list-style-type: none"> <li>• Interrupts and polling.</li> <li>• SFR - IE, IP</li> <li>• Simple programs based on interrupts and polling method</li> </ul>	10	22
<b>Topic 5: Serial Communication and Parallel Ports:</b> <ul style="list-style-type: none"> <li>➤ Comprehend Serial and parallel communication</li> </ul> <b>Contents:</b> <p>5.1 Serial port of 8051</p> <ul style="list-style-type: none"> <li>• Serial Communication-SCON, SBUF</li> <li>• Modes of serial communication</li> <li>• Simple programs for serial communication.</li> <li>• I/O port structure &amp; its Programming.</li> </ul>	06	12
<b>Topic 6: Memory and I/O Interfacing</b> <ul style="list-style-type: none"> <li>➤ Interface I/O devices and memory devices</li> <li>➤ Expand memory and I/O</li> </ul> <b>Contents:</b> <p>6.1 Memory Interfacing: (Marks 06)</p> <ul style="list-style-type: none"> <li>• Interfacing External RAM and ROM</li> </ul> <p>6.2 I/O Interfacing: (Marks 10)</p> <ul style="list-style-type: none"> <li>• 8255-Block diagram, operating modes</li> <li>• Port expansion with 8255</li> <li>• Interfacing of LED, keys, Relays, Seven segment display, Stepper motor.</li> </ul>	08	16
<b>Total</b>	<b>48</b>	<b>100</b>

**Practical's:**

Skills to be developed:

**Intellectual skill**

1. Understand hardware and instruction set.
2. Develop assembly programs.

**Motors skills**

1. Handle trainer kits, computer.
2. Interface peripherals.

**List of practicals:**

1. Know 8051 kit and simulation software in your lab.
2. Develop program for arithmetic operation such as addition, subtraction multiplication, division.
3. Develop program for block exchange and block transfer with external memory.

4. To develop program for finding smallest/largest number and arranging numbers in ascending/descending order.
5. Generate square wave and rectangular wave on port pin with a program.
6. Interface LED and key with 8051 and making LED on/off with a key press.
7. Interface 7-segment display and design up/down counter on it with a program.
8. Display of key depression in decimal format on 7- segment display using lookup table through program.
9. Interface 8 bit DAC to generate different patterns and interface 8 bit ADC and develop program to convert analog data and store it.
10. Develop program for level controller/Traffic Controller.

**Learning resources:****1. Books**

Sr. No.	Title	Author	Publisher
01	8051 Microcontroller architecture programming & application.	K. J. Ayala	EEE/ prentice hall of India
02	The 8051 microcontroller & embedded system.	Mohmad-ali-mazidi, Janice-Gelispel-mazidi , Roline D. Mckinlay	Pearson / Prentice hall
03	Microcontroller principal & application	Ajit pal	Prentice Hall of India
04	Microcontroller theory & application.	Ajay Deshmukh	Tata McGraw- Hill
05	Microcontroller Architecture, programming, interfacing, & system design	Rajkamal	Pearson
06	8051 Microcontroller Mcs-51 family and its variant.	Satish shaha	Oxford

**2. C.D's / PPT's :** [www.osvn.com](http://www.osvn.com)**3. Websites:**[www.youtubecom](http://www.youtubecom)[www.keil.com](http://www.keil.com)[www.faqs.org/microcontroller](http://www.faqs.org/microcontroller)

**Course Name : Diploma in Medical Electronics****Course Code : MU****Semester : Fifth****Subject Title : Application of Biomaterial****Subject Code : 17543****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

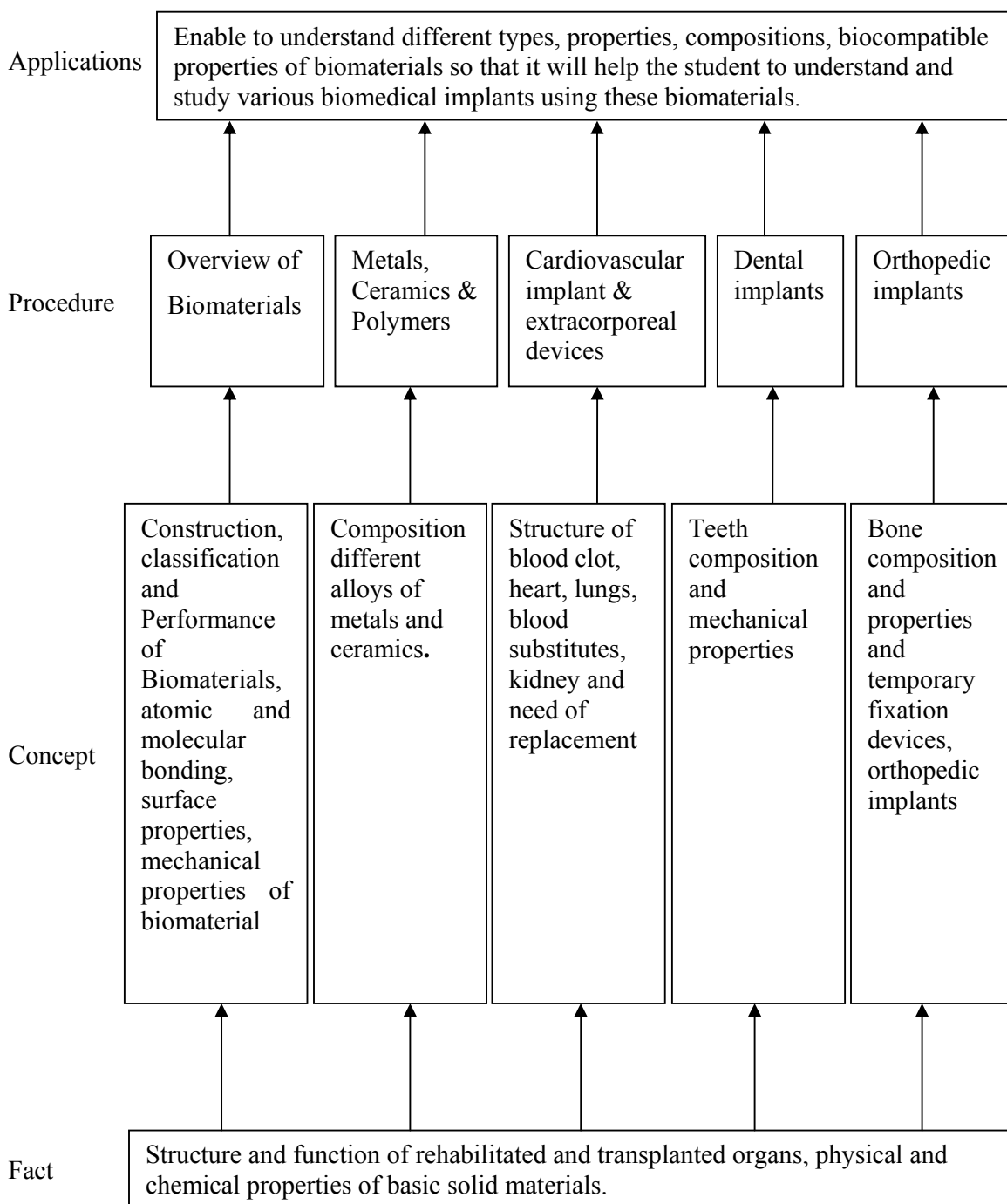
**Rationale:**

Biomaterials are used for implant manufacturing. These are needed in surgeries like ophthalmology, cardiology, neuromuscular surgery, orthopedics and dentistry. Biomaterials which are used in implants must have direct contact with patient's blood, tissue or body fluid. These artificial implants act as life saver. So study of biomaterials has vital importance in healthcare.

**General Objectives:**

Students will able to.

- 1) Understand the different types and properties of materials that are used as a biomaterial.
- 2) Understand the types of various implants along with their structure, and the way of implantation.

**Learning Structure:**

**Theory:**

Topic and Contents	Hours	Marks
<b>Topic 1) Overview of Biomaterials</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Describe the construction, Classification and Performance of Biomaterials</li> <li>➤ List the surface properties, mechanical properties of biomaterial.</li> </ul> Contents: <b>1. 1 Introduction of Biomaterials</b> <ul style="list-style-type: none"> <li>• Historical developments , construction stages, atomic and molecular bonds, crystal structure of solids,</li> <li>• surface properties (surface energy, contact angle method, electro kinetic theory),</li> <li>• Mechanical properties(stress-strain behavior, mechanical failure), thermal treatments, sterilization</li> <li>• testing of biomaterials,</li> <li>• biocompatibility &amp; concept of corrosion &amp; wear (numerical on mechanical properties)</li> </ul>	06	16
<b>Topic 2) Metals, Ceramics and Polymers</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Describe composition of different alloys of metals and ceramics.</li> <li>➤ State the properties of metals, ceramics &amp; polymers to be biocompatible.</li> <li>➤ State different implant applications of metals, ceramics &amp; polymers</li> </ul> Contents: <b>2.1 Metals [08 Marks]</b> <ul style="list-style-type: none"> <li>• Composition of stainless steels, Cr alloy, Ti based alloys, Nitinol</li> <li>• Process of metallic corrosion, corrosion rate measurements, effect of corrosion, biological tolerance of implant metals</li> </ul> <b>2.2 Ceramics [08 Marks]</b> <ul style="list-style-type: none"> <li>• Properties of carbons, alumina, zirconia, resorbable ceramics, composites, analysis of ceramic surfaces</li> </ul> <b>2.3 Polymers [08 Marks]</b> <ul style="list-style-type: none"> <li>• Types of polymers ,structure and biomedical use of polymers: acrylic polymers, hydrogels, biodegradable polymer, silicon rubber, collagen, elastin</li> </ul>	12	24
<b>Topic 3) Cardiovascular Implant and Extracorporeal Devices</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Describe structure of blood clot, heart, lungs, blood substitutes, and kidney.</li> <li>➤ State the need of replacement and different types of implants for above human body parts</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Formation of blood clot, structure and function of heart (including valves), blood circulation ,structure and function of lungs,</li> <li>• Blood compatibility of synthetic vascular implant materials, cardiac valve replacements, cardiac pacemaker, blood substitutes,</li> <li>• structure and function of kidney, artificial kidney(types of dialyzers)</li> </ul>	10	20

<b>Topic 4) Dental Implants</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ State the composition and mechanical properties of teeth.</li> <li>➤ List the types and properties of dental implants.</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Need of dental materials, Teeth composition with its mechanical properties,</li> <li>• filling and restoration materials, materials for deep cavities, oral implants, reimplantation of natural teeth, mandibular reconstruction, use of collagen in dentistry,</li> <li>• testing and evaluation of dental implants</li> </ul>	09	16
<b>Topic 5) Orthopedic Implants</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ State the composition and properties of bone</li> <li>➤ Describe temporary fixation devices and joint replacement (hip &amp; knee)</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Bone composition (structure of typical bone), factors affecting bone formation and resorption, mechanical properties of bone, bone healing,</li> <li>• Joint replacement(total hip replacement), Knee joint repair, Total knee replacement ,</li> <li>• Bone regeneration with resorbable material</li> </ul>	09	20
<b>Topic 6) Ophthalmic Implants</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ State the concept of artificial implants of eye.</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Review of structure of eye, cornea transplantation, contact lenses,</li> <li>• Optical implants, vitreous implants, eye shields.</li> </ul>	02	04
<b>Total</b>	<b>48</b>	<b>100</b>

**Practicals:**

Skills to be developed:

**Intellectual skills:**

- Classify biomaterials
- Selection of biomaterial according to application

**List of Tutorials:**

Tutorials are expected to be taken after power point presentation including live videos of implant making processes. Teachers should arrange visit to rehabilitation center. Teacher should assign at least 5 questions on each of the following topic.

1. Mechanical properties of biomaterial.
2. Composition and properties of different types of metals and their alloys.
3. Composition and properties of different types of ceramics.



4. Describe structure of organs in circulatory & excretory system.
5. Need & advantages of various biomaterials.
6. Different parts of temporary fixation devices.
7. Different types and use of metals and collagen in dentistry.
8. Different types of biomaterials used for artificial knee.
9. Different types of biomaterials used in the manufacturing of dialyzer.
10. Different types of biomaterials used for Optical implants.

### Learning Resources:

#### 1. Books:

Sr. No.	Title	Author	Publisher
01	Biomaterials	Sujata V.Bhat	Narosa Publishing House (2 <sup>nd</sup> edition)
02	Biomaterial Science and Engineering	J.V. Park	Plenum Press- New York
03	Biomaterials	J. S. Temenoff A.G. Mikos	Pearson Education(First)
04	Encyclopedia of Medical Devices and Instrumentation	John G. Webster.	Vol. I, II, III, IV (Marcel Dekkar Pub).
05	Biological Performance of Materials, 2 <sup>nd</sup> Edition	Jonathan Black, Marcel Dekker	New York. Basel. Hong Kong
06	Fundaments of Biomedical Engineering	G S. Sawhney	New Age International Publication

#### Websites

2. [www.biopolymer.net](http://www.biopolymer.net)
3. [www.biomatnet.org](http://www.biomatnet.org)
4. [www.biomaterials.org](http://www.biomaterials.org)
5. [www.orthoapospl.com](http://www.orthoapospl.com)
6. [www.massdevice.com](http://www.massdevice.com)

**Course Name : Diploma in Medical Electronics****Course Code : MU****Semester : Fifth****Subject Title : Analytical Equipments****Subject Code : 17544****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	02	02	50	--	--	25@	75

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

A medical electronics engineer must be familiar with modern analytical equipments for the purpose of diagnosis of various physiological abnormalities.

This subject is useful in understanding the design concept, working principle; application oriented operating procedure, installation & maintenance of almost all analytical equipments used in hospital and pathology laboratory.

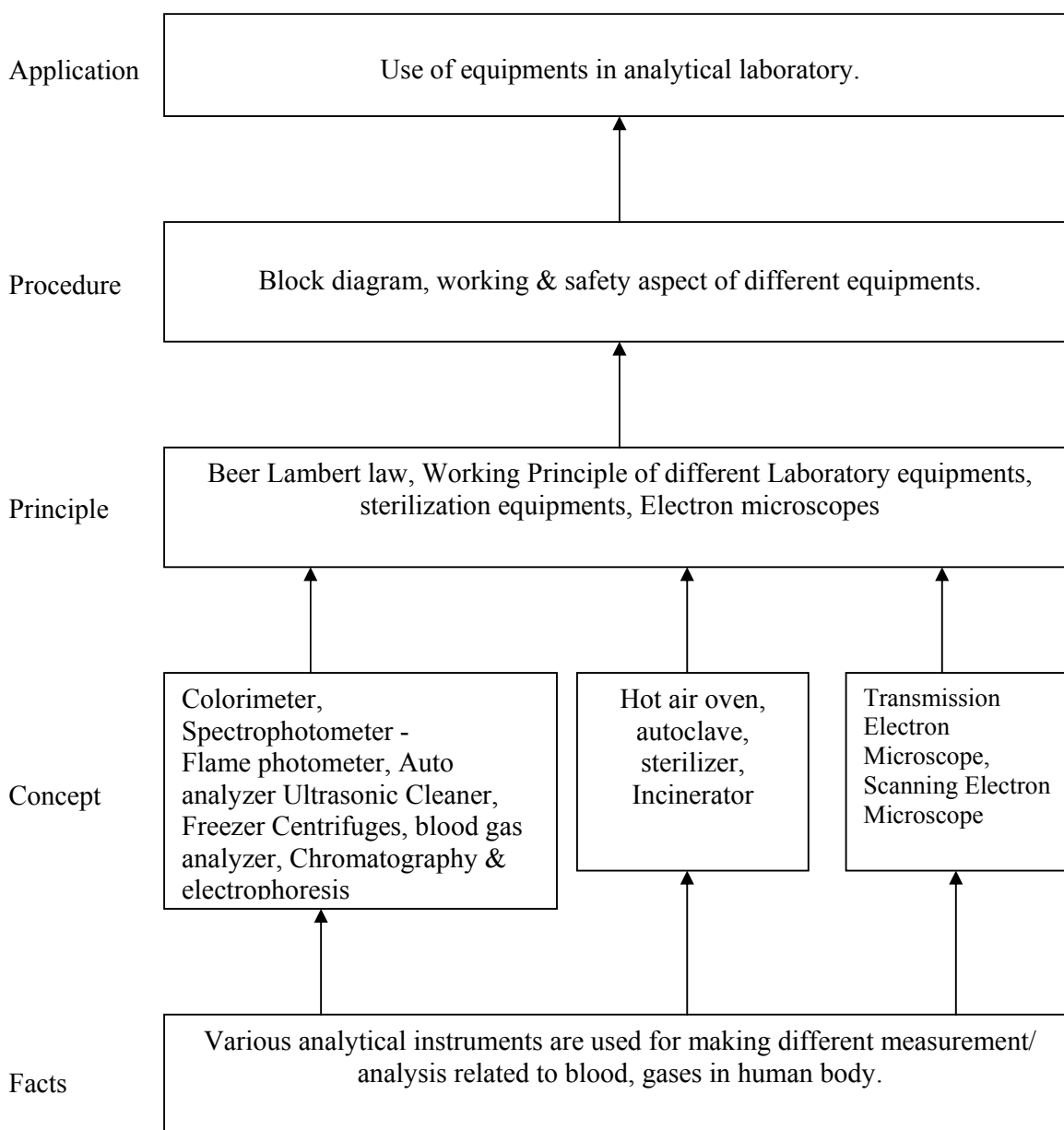
This subject's pre-requisite is photoelectric theory, body fluid samples, biosensors, chemical analysis theories.

With this subject the students will be capable of handling modern equipments in the hospitals & research laboratories.

**General Objectives**

Students will be able to

1. Understand working principle of the analytical equipments.
2. Write technical specification of these equipments.
3. Understand working of these equipments.
4. State the applications of the equipments in medical fields.

**Learning Structure:**

**Theory:**

Topic & Contents	Hours	Marks
<b>Topic 1) Laboratory Equipments</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ State Beer &amp; Lambert's law.</li> <li>➤ State Elements of Analytical Instruments</li> <li>➤ Draw constructional diagram of various analytical equipments</li> <li>➤ State the application of analytical equipments</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Elements of Analytical Instruments</li> <li>• Photometry laws(Beer &amp; Lambert's Law)</li> <li>• Colorimeter</li> <li>• Spectrophotometer – Single and dual beam</li> <li>• Flame photometer</li> <li>• Autoanalyzer</li> <li>• Ultrasonic Cleaner</li> <li>• Freezer</li> </ul> Principle, diagram, construction ,working, technical specifications and applications of the above mentioned equipments	10	16
<b>Topic 2) Centrifuges &amp; Sterilizing Equipments</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ State importance of sterilization</li> <li>➤ Draw constructional diagram of centrifuges &amp; sterilizing equipments</li> <li>➤ List the applications of Centrifuges &amp; sterilizing equipments</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Centrifuges-Hand, clinical, Large Capacity Refrigerated, High Speed Refrigerated, Continuous</li> <li>• Ultracentrifuges-Preparative, Analytical</li> <li>• Hot air oven</li> <li>• Autoclave (Horizontal &amp; vertical)</li> <li>• Sterilizer (Clinical)</li> <li>• Incinerator (Medical)</li> </ul> Principle, diagram, construction ,working, technical specifications and applications of the above mentioned equipments	09	12
<b>Topic 3) Blood Gas Analyzer &amp; Blood Cell Counter.</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Identify dissolved gasses &amp; cells present in blood</li> <li>➤ Draw constructional diagram of Equipments used to measure dissolved gasses &amp; cells present in blood</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Measurement of pH, PO<sub>2</sub>, PCO<sub>2</sub>, HCO<sub>3</sub>, TCO<sub>2</sub>, base excess using blood gas analyzer</li> <li>• Electro- Conductive blood cell counter, Dark field blood cell counter</li> </ul> Principle, diagram, construction ,working, technical specifications and applications of the above mentioned equipments	05	08

<b>Topic 4) Chromatography &amp; Electrophoresis Equipments.</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Describe separation techniques used in labs.</li> <li>➤ Draw constructional diagram of Chromatography &amp; electrophoresis Equipments.</li> <li>➤ Define Chromatography &amp; electrophoresis</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Definition of Chromatography &amp; electrophoresis</li> <li>• Principle of chromatography, Classification of Chromatography</li> <li>• Gas Chromatography – Principle, Basic elements of Gas Chromatography</li> <li>• Liquid Chromatography – Principle, Basic elements of Liquid Chromatography</li> <li>• Capillary electrophoresis</li> <li>• Polyacrylamide gel electrophoresis (PAGE)</li> </ul> Principle, diagram, construction ,working, technical specifications and applications of the above mentioned equipments	05	08
<b>Topic 5) Electron Microscopy</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Draw constructional diagram of electron microscopes.</li> <li>➤ List the parts of electron microscope.</li> </ul> Contents: <ul style="list-style-type: none"> <li>• TEM (Transmission Electron Microscope)</li> <li>• SEM (Scanning Electron Microscope)</li> </ul> Diagram, construction ,working of the above mentioned equipments	03	06
<b>Total</b>	<b>32</b>	<b>50</b>

**Practicals:**

Skills to be developed:

**Intellectual skills**

1. Select proper equipment as per the requirement

**Motor Skills**

1. Operate the instruments used in pathology laboratory.

**List of Experiments: Operation of**

- 1) Colorimeter
- 2) Spectrophotometer
- 3) Flame photometer
- 4) Ultrasonic Cleaner
- 5) Centrifuge
- 6) Hot air oven
- 7) Autoclave
- 8) Sterilizer(Clinical)
- 9) Electrophoresis
- 10) Incinerator

(Scrap equipments from pathology laboratories or hospitals may be procured for observing internal parts & circuitry. Draw the constructional details & write specifications.)

### Assignments:

Information search (manufacturers, technical specifications, applications, costing, installation & maintenance etc.) on any three of the following

- Chromatography
- Auto analyzer
- Freezer
- Blood cell counter
- SEM & TEM
- Blood gas analyzer

### Learning Resources:

#### Books:

Sr. No.	Title	Author	Publisher
1	Bioinstrumentation	L. Veerakumari	MJP Publishers
2	Handbook of Analytical Instrumentation	R. S. Khandpur	Tata McGraw hills
3	Handbook of Biomedical Instrumentation	R. S. Khandpur	Tata McGraw hills
4	Biomedical Instrumentation & Measurements	R. Ananadnatarajan	PHI learning Pvt. Ltd.
5	Handbook of Bioinstrumentation	Chinmoy Goswami Abhijit Paintal Rabindra Narain	Wisdom Press
6	Handbook of Laboratory Instrumentation	Chinmoy Goswami Abhijit Paintal Rabindra Narain	Wisdom Press

### List of required Equipments:

- 1) Colorimeter
- 2) Spectrophotometer
- 3) Flame photometer
- 4) Ultrasonic Cleaner
- 5) Centrifuge
- 6) Hot air oven
- 7) Autoclave
- 8) Sterilizer(Clinical)
- 9) Electrophoresis
- 10) Medical Incinerator (Visit can be arranged to an incinerator plant)

**Course Name : Diploma in Medical Electronics****Course Code : MU****Semester : Fifth****Subject Title : Diagnostic Equipments****Subject Code : 17545****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	50#	25@	175

**NOTE:**

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

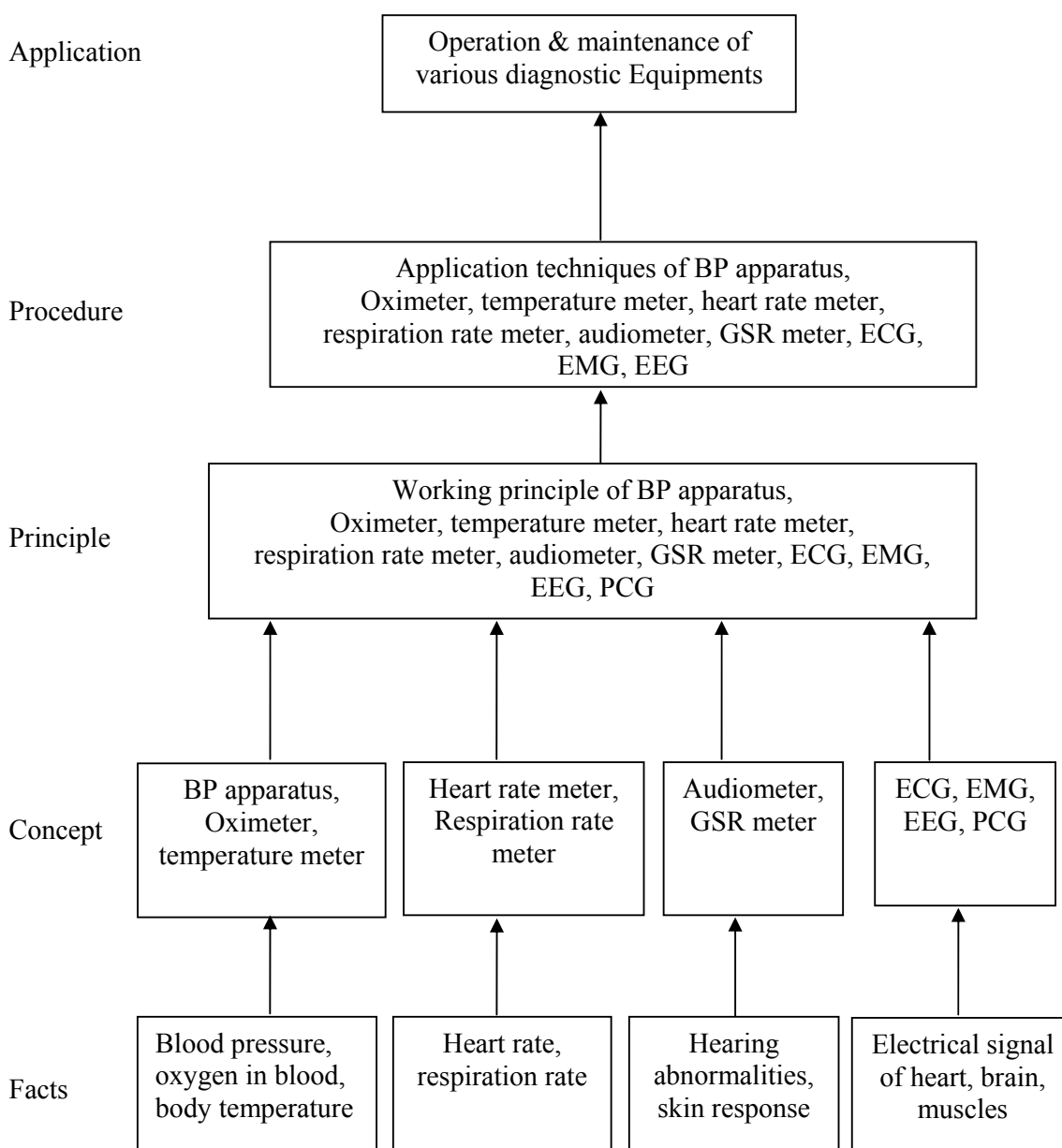
**Rationale:**

Diagnostic Equipment is based on basic knowledge of subject such as Biosensor & Human biology. In the area of healthcare, diagnostic equipments play a vital role in either recording or monitoring information about different physiological parameters like ECG, BP etc. related to the human body. Medical practitioners are provided with this vital information to diagnose the diseases & can therefore treat the patient in time. After studying this subject student will understand principle, block diagram & technical specification of various diagnostic equipments.

**General Objectives:**

Students will be able to

1. Identify physical parameters related to human body.
2. Understand principle of operation of various diagnostic equipments.
3. Operate these equipments.
4. State technical specifications of these equipments.
5. Perform troubleshooting & maintenance of ECG, EEG machine.

**Learning Structure:**



**Theory**

Topic & Contents	Hours	Marks
<b>Topic 1) Blood Pressure, Oxygen Saturation &amp; Temperature Measurement</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ State concept of BP, SPO2 &amp; temperature</li> <li>➤ State the principle &amp; working of sphygmomanometer, pulse oxymeter &amp; digital temperature meter</li> <li>➤ Write down technical specifications of these equipments</li> <li>➤ Differentiate between direct and indirect blood pressure measurement</li> </ul> Contents:           1.1 Blood Pressure Measurement <b>[08 Marks]</b> <ul style="list-style-type: none"> <li>• Concept of direct, indirect, relative BP measurement &amp; BP waveform</li> <li>• Block diagram &amp; technical specification of: indirect System sphygmomanometer, digital blood pressure meter, Direct System</li> </ul> 1.2 Oxygen Saturation Measurement & Temperature Measurement <b>[08 Marks]</b> <ul style="list-style-type: none"> <li>• Block diagram and principle of operation of pulse oxymeter, Beer &amp; lamberts law, Technical specification of pulse oxymeter</li> <li>• Introduction of systemic &amp; skin temperature, Block diagram &amp; technical specification of digital temperature meter</li> </ul>	07	16
<b>Topic 2) Heart Rate &amp; Respiration Rate Measurement</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Calculate heart rate</li> <li>➤ Draw block diagram of heart rate meter, fetal heart rate meter &amp; respiration rate meter</li> <li>➤ Write technical specification of heart rate meter, respiration rate meter</li> </ul> Contents:           2.1 Heart Rate Measurement <b>[08 Marks]</b> <ul style="list-style-type: none"> <li>• Methods of calculation of heart rate (average, bit to bit, bit to bit &amp; average). Block diagram &amp; technical specification of heart rate meter. Concept of fetal heart rate &amp; Block diagram of Ultrasonic FHR meter.</li> </ul> 2.2 Respiration Rate Measurement <b>[08 Marks]</b> <ul style="list-style-type: none"> <li>• Respiratory parameters with standard spirogram</li> <li>• Working principle of spirometer. Block diagram &amp; technical specification of respiration rate meter</li> </ul>	07	16
<b>Topic 3) Ear &amp; Skin Responses</b> Specific Objectives: <ul style="list-style-type: none"> <li>➤ Draw block diagram of pure tone audiometer, Bekesy audiometer, hearing aids &amp; GSR meter</li> <li>➤ State the technical specification of these equipments</li> </ul> Contents: <ul style="list-style-type: none"> <li>• Concept of : Audiometer, speech audiometer, impedance audiometer, air &amp; bone conduction.</li> <li>• Block diagram &amp; principle of operation of : Pure tone audiometer, Bekesy audiometer, hearing aid.</li> </ul>	06	12

<p>Technical specification of: audiometer, hearing aid.</p> <ul style="list-style-type: none"> <li>• Concept of Galvanic skin reflex, Block diagram &amp; principle of operation of GSR meter.</li> </ul>		
<p><b>Topic 4) Electrocardiography</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ State concept of ECG and its lead configuration</li> <li>➤ Draw block diagram of ECG machine &amp; different circuits in ECG machine</li> <li>➤ Write the technical specifications of ECG machine</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• Generation of ECG signal</li> <li>• 12 lead configuration- unipolar &amp; bipolar leads</li> <li>• Block diagram, technical specification &amp; principle of operation of ECG machine, ECG preamplifier circuit, right lead drive circuit, Wilson's network circuit, 1mV calibration circuit used in ECG machine</li> <li>• Concept of vectorcardiography</li> <li>• Troubleshooting &amp; maintenance of ECG machine</li> </ul>	12	24
<p><b>Topic 5) Electroencephalography and Electromyography</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ Learn concept of EEG, EMG signal</li> <li>➤ Write Technical specifications of EEG, EMG</li> <li>➤ Draw block diagram of EEG and EMG</li> <li>➤ Trouble shooting &amp; maintenance of EEG, EMG machine</li> </ul> <p>Contents:</p> <p><b>5.1 Electroencephalography [12 Marks]</b></p> <ul style="list-style-type: none"> <li>• Generation of EEG signals</li> <li>• Unipolar, bipolar &amp; average recording techniques, EEG spectrum, 10-20 electrode system</li> <li>• Technical specification, block diagram &amp; principle of operation of EEG machine, Preamplifier circuit of EEG</li> <li>• Troubleshooting &amp; maintenance of EEG machine</li> </ul> <p><b>5.2 Electromyography [12 Marks]</b></p> <ul style="list-style-type: none"> <li>• Generation of EMG signal</li> <li>• Motor &amp; sensory nerve conduction</li> <li>• Technical specification, block diagram &amp; principle of operation of EMG machine, Preamplifier circuit of EMG</li> <li>• Troubleshooting &amp; maintenance of EMG machine</li> </ul>	12	24
<p><b>Topic 6) Phonocardiography.</b></p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> <li>➤ State the significance of heart sound</li> <li>➤ State technical specification of phonocardiography</li> <li>➤ Draw block diagram of phonocardiography</li> </ul> <p>Contents:</p> <ul style="list-style-type: none"> <li>• Heart sound &amp; its significance.</li> <li>• Technical specification, block diagram &amp; principle of operation of Phonocardiography.</li> <li>• Relationship between ECG &amp; PCG &amp; arterial B.P.</li> </ul>	04	08
<b>Total</b>	<b>48</b>	<b>100</b>

**Practicals:****Skills to be developed****Intellectual skills**

1. Selection of instruments for various applications.
2. Diagnosis and Interpretation.

**Motor Skills**

1. Operate various diagnostic equipments.
2. Troubleshooting and maintenance of diagnostic equipments.

**List of Experiments:**

1. Measurement of blood pressure using sphygmomanometer.
2. Measurement of SpO<sub>2</sub> using pulse oxymeter.
3. Measurement of pulse rate, relative blood pressure & observation of blood pressure waveform using plethysmograph.
4. Measurement of respiration rate using respiration rate meter
5. Measurement of body temperature using digital temperature meter.
6. Recording of ECG using 12 lead configurations on patient and study of its controls.
7. Operate the EEG machine and observe its waveform.
8. Measurement of ear response using audiometer & study of its controls.
9. Measurement of skin response using GSR meter.
10. Record the different heart sound by using Phonocardiogram & study its control

**List of Assignments:**

1. Identify physiological parameters related to human body. Define these parameters. Write down their ranges for adults and children.
2. Fatal heart rate measurement and its methods.
3. Measurement of CMRR and gain of ECG preamplifier.
4. Troubleshooting and maintenance of ECG/ EEG/ EMG machine.

**Learning Resources:****Books:**

Sr. No.	Title	Author	Publisher
1	Handbook Of Biomedical Instrumentation	R.S.Khandpur	Tata McGraw Hill
2	Biomedical Instrumentation & Measurements	Lesli P Cromwell, Fred J. Weibell, Erich A. Pfeiffer	Prentice Hall of India
3	Introduction To Biomedical Equipment Technology	Carr Joseph J., Brown J.M	Pearson Education Delhi
4	Medical Instrumentation Application & Design	John G. Webster	John Wiley and Sons
5	Medical Electronics	A. G. Patil	Excel Book New Delhi

**List of Equipments:**

1. Sphygmomanometer
2. Pulse oxymeter
3. Digital temperature meter
4. Heart rate meter
5. Ultrasonic fetal heart rate meter
6. Respiration rate meter
7. Audiometer
8. GSR meter
9. ECG machine
10. EEG machine
11. EMG machine
12. Phonocardiograph

**Course Name : All Branches of Diploma in Engineering & Technology**

**Course Code : EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/ CO/CM/IF/EE/EP/CH/PS/CD/ED/EI/CV/FE/FG/IU/MH/MI/TX/TC/DC/AU**

**Semester : Fifth for EJ/EN/ET/EX/EV/IC/IE/IS/MU/DE/ME/PG/PT/AE/CE/CS/CR/CO/CM/IF/EE/EP/CH/PS/AU and Sixth for CD/MH/IU/CV/FE/FG/MI/ED/EI/DC/TC/TX**

**Subject Title : Behavioural Science**

**Subject Code : 17075**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	25 #	25 @	50

#### **Rationale:**

With increased globalization and rapid changing business expectations, employers are looking for wide cluster of skills to cater to the changing demand. Personality traits and soft skills are playing a key role in a student's career in this changing scenario. Corporate houses look for soft skills that supplement hard skills.

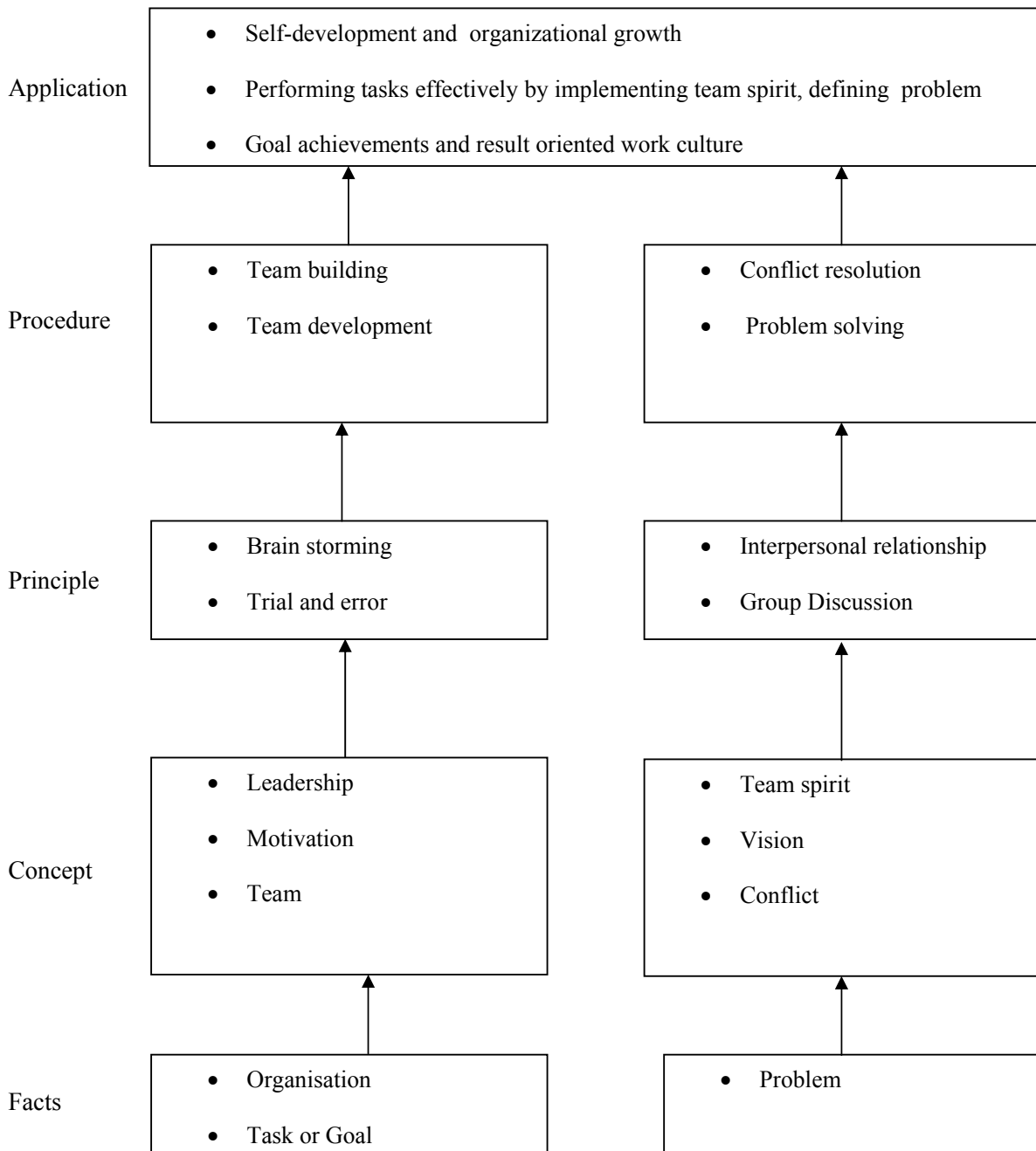
Addition of behavioural science in curriculum is intended to enhance the efficiency of a person so that he can contribute to overall growth of organisation. It aims at developing insight into leadership, team building, motivation, interpersonal relationship, problem solving, decision making and aspects of personality in a technician's profile. Addition of the topic of organizational culture will further mould him/ her in the organisational role.

This subject of 'Behavioural Science' provides a broad base in which a technician can develop a successful career in the world of work.

#### **General Objectives:**

After studying this subject, the students will be able to:

1. Develop him/her as Team leader.
2. Use self-motivation and motivate others.
3. Build a team and develop team spirit among the team members.
4. Improve the interpersonal relationship skills.
5. Learn Problem solving and decision making skills.
6. Discuss a particular topic in a group and face the interview.

**Learning Structure:**

**Theory:**

Topic and Contents	Hours
<b>Topic 1: LEADERSHIP</b> Contents: 1.1 Introduction – Importance, examples of different types of leaders. 1.2 Meaning and Definition of Leadership. 1.3 Leadership qualities – Confidence, Vision, Communication Skills, influencing people etc. 1.4 Types of Leadership styles, their advantages and disadvantages – Autocratic, Democratic, Delegative, Bureaucratic and Laissez Fairie.	02
<b>Topic 2: MOTIVATION</b> Contents: 2.1 Meaning and Definition of motivation. 2.2 Types of motivation. 2.3 Maslow's Motivation theory. 2.4 Job characteristic model to enhance motivation.	03
<b>Topic 3: TEAM BUILDING</b> Contents: 3.1 Definition of Team. 3.2 Difference between Group and Team. 3.3 Need for formation of good team (vision, trust, cooperation, initiative, etc.) 3.4 Approach to Team building (Personality based, activity based, skill based, problem solving based, etc.)	02
<b>Topic 4: CONFLICT RESOLUTION</b> Contents: 4.1 Definition of Conflict. 4.2 Types of Conflict – Functional and Dysfunctional 4.3 Sources of Conflict – Ego, Authority, Frustration etc. 4.4 Positive and Negative effects of conflicts. 4.5 Methods of Conflict resolution – Compromising, withdrawal, forcing.	04
<b>Topic 5: PROBLEM SOLVING AND DECISION MAKING</b> Contents: 5.1 Steps in Problem Solving. 5.2 Methods used for solving problems – trial and error method, brain storming, lateral thinking method. 5.3 Techniques used for Decision making- Decision tree, Decision Matrix, Mind Mapping etc.	03
<b>Topic 6: GROUP DISCUSSION AND INTERVIEW TECHNIQUES</b> Contents: 6.1 GROUP DISCUSSION <ul style="list-style-type: none"> <li>Objectives of Group Discussion (ability to work in team, speaking and listening skills, leadership, creativity)</li> <li>Does and Don'ts of Group Discussion.</li> <li>How to conclude Group Discussion.</li> </ul>	02

6.2 INTERVIEW TECHNIQUES	
<ul style="list-style-type: none"> <li>• Types of Interviews. (patterned, stress, behavioural)</li> <li>• Dress Code, Body Language and Communication Skill.</li> <li>• Probable questions for Interview.</li> <li>• Telephonic or Video Interview.</li> </ul>	
<b>Total</b>	<b>16</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

- Develop ability to find his strengths.
- Select proper source of information.
- Follow the technique of time and stress management.
- Set the goal.

**Motor Skills:**

- Follow the presentation of body language.
- Work on internet and search for information.
- Prepare slides / transparencies for presentation.

**List of Practicals / activities:**

1. Form a group of 4 or 5 students and discuss the topic 'Qualities of an effective leader'. Each group will prepare its list with justification to the entire class and write an assignment under the guidance of subject teacher.
2. Form a pair of student and each one from pair will ask each other questionnaire on motivation, self-motivation, experiences that motivated him or other which him for success in the past and write an assignment under the guidance of subject teacher based on discussion.
3. Form a group of 4 or 5 students and assign them a group activity such as 'making a shape from match stick (50 to 100 match sticks) without guidance and without group discussion.
4. The group as in activity 3 will now perform the same activity. After group discussion and under guidance of subject teacher, each student from a group will write an assignment for both the activities and write their inferences with reference to group discussion, team development, team building, etc.
5. Form a group of 8 to 10 student and arrange a group activity such as;
  - Industrial visit.
  - Visit to any historical place/fort/museum, etc
  - Housekeeping and cleaning of any laboratory/seminar hall for any function.
 After the execution of activity student will write an assignment under guidance of teacher keeping in mind individual role, purpose of activity, inter dependency of work or task, coordination of person and task involved and final performance.
6. Write an assignment on interpersonal relationship and conflict management with student's personal experience of solving conflicts.
7. Form a group of 20 students and ask them to prepare a list of 8 to 10 problems affecting the institute. Subject teacher should analyze one such problem on black board using 'Fish bone technique' with the participation of students. Students will write an assignment consisting;
  - Apparent problem statement.
  - Analysis of the causes.



- Definition of real problem.
8. The subject teacher starts the session with 'Statement of the problem' written on the black board. After ensuring that all the participants are at the same level of understanding the statement of problem, he initiates NGT (Normal Group Technique) to arrive at maximum possible number of creative solutions.  
Based on ranking matrix the group will arrive at feasible solutions and students will write an assignment consisting of;
    - Problem Statement.
    - Model of problem solving.
    - List of creative solution suggested by participants.
    - Write the most feasible solution based on given criteria.
  9. Form a group of 4 to 5 students and give them a topic for GD for 10 to 15 minutes. Teacher should analyse GD on certain parameters and students will write an assignment on aspects of GD and prepare a format (suggested or designed by teacher) which gives details of GD carried out.
  10. Arrange a guest lecture of H.R. Person from industry/expert in interview technique and conduct mock interview of each student. Student should write a report on this activity.
  11. Arrange a visit to industry and gather information about organisation, product, turnover, work culture, vision/mission statement, quality policy, Corporate social responsibility etc and write a report on it.

**Note - Subject teacher shall guide the students in completing the assignments based on above practicals.**

#### **Learning Resources:**

##### **Books:**

<b>Sr. No.</b>	<b>Author</b>	<b>Name of Book</b>	<b>Publication</b>
1	Subject Experts-MSBTE	Handbook and assignment book on Development of Life Skills-II	MSBTE
2	Dr. Kumkum Mukherjee	Principles of management and organizational behaviour	Tata McGraw Hill Education Pvt Ltd.
3	Dr.T.Kalyana Chakravarti Dr.T.Latha Chakravarti	Soft Skills for Managers	Biztantra
4	Barun K Mitra	Personality Development and soft skills	Oxford University Press
5	Priyadarshini Patnaik	Group discussion and interview skills	Foundation Books

**Course Name** : Electronics Engineering Group  
**Course Code** : ET/EN/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI  
**Semester** : Fifth for ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU and Sixth for IU/ED/EI  
**Subject Title** : Entrepreneurship Development and Project  
**Subject Code** : 17066

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
01	--	02	--	--	--	--	25@	25

**NOTE:**

- Two practical hours are for project
- One theory and one tutorial hours are for Entrepreneurship Development (EDP). Twenty five marks are for term work report prepared under EDP.

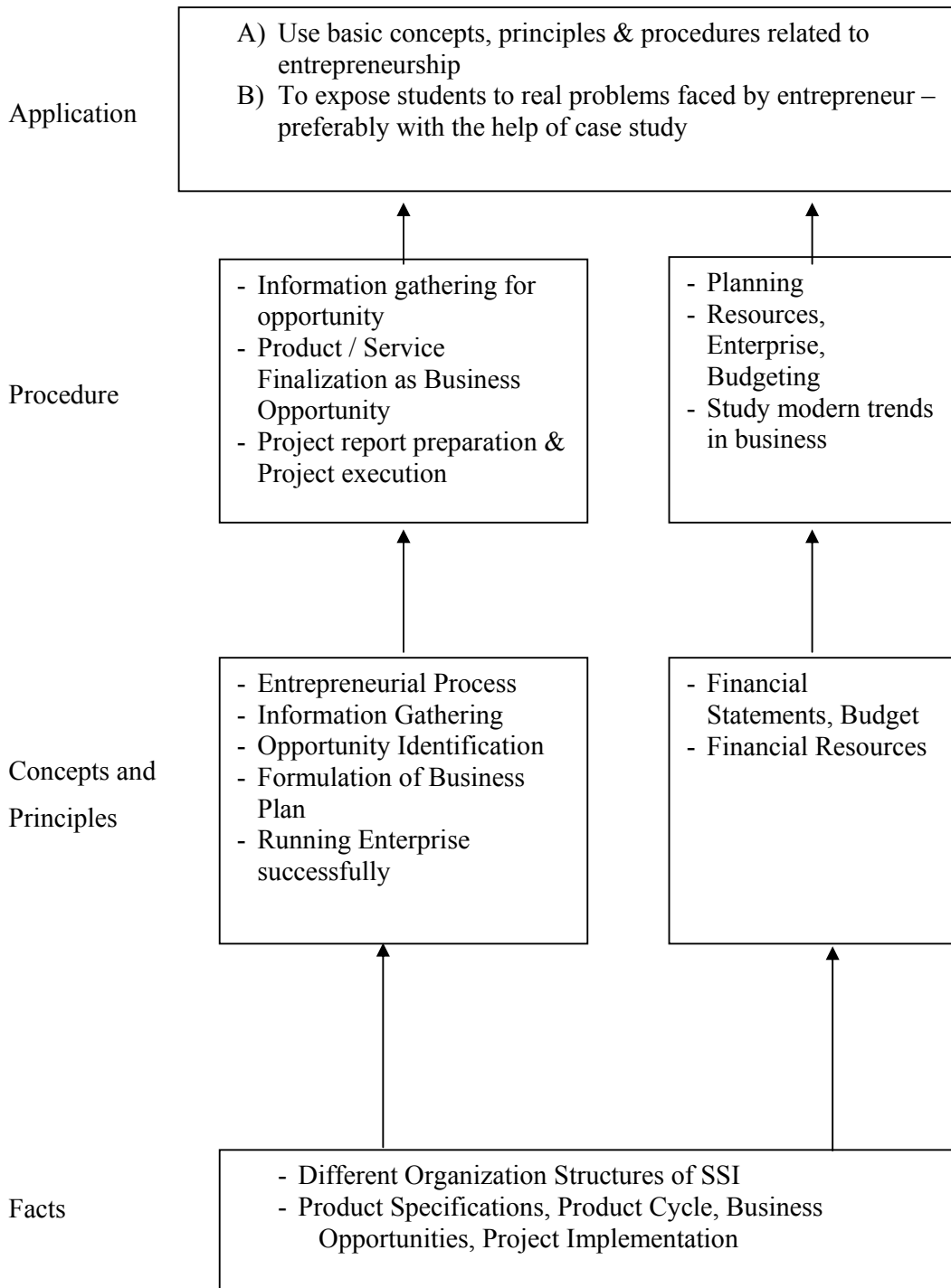
**Rationale:**

Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white-collar jobs. The educational institutions should also demonstrate their uniqueness in the creation of enterprising personalities in their colleges. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

**General Objectives:**

The students will be able to

- 1) Appreciate the concept of Entrepreneurship
- 2) Identify entrepreneurship opportunity.
- 3) Develop entrepreneurial values and attitude.
- 4) Collect and use the information to prepare project report for business venture.
- 5) Develop awareness about enterprise management.

**Learning Structure:**

**Content:****Part A) Industrial Project**

Following activities related to project are required to be dealt with, during this semester.

1. Form project batches & allot project guide to each batch. (Max. 4 students per batch)
2. Each project batch should select topic / problem / work by consulting the guide & / or industry. Topic / Problem / work should be approved by Head of department.
3. Each project batch should prepare action plan of project activities & submit the same to respective Guide
4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.
5. Action Plan should be part of the project report.

**Part B) Entrepreneurship Development****Theory:**

Topic and Contents	Hours
<b>Topic 1: Entrepreneurship, Creativity &amp; Opportunities</b> Contents: 1.1 Concept, Classification & Characteristics of Entrepreneur 1.2 Creativity and Risk taking. 1.3 Business types and Reforms 1.4 SWOT Analysis	03
<b>Topics 2: Information and Support Systems for Development of Entrepreneurship:</b> Contents: 2.1 <b>Information Sources:</b> Information related to project, procedures and formalities 2.2) <b>Support Systems</b> 1) Business Planning & Requirements for setting up an SSI 2) Govt. & Institutional Agencies (Like MSFC, DIC, MSME, MCED, MSSIDC, MIDC LEAD BANKS) Statutory Requirements and Agencies.	03
<b>Topics 3: Market Assessment and Product feasibility</b> Contents: 3.1) Marketing -Concept and Importance Market Identification, 3.2) Customer need assessment, Market Survey Product feasibility analysis	02
<b>Topics 4: Business Finance &amp; Accounts</b> 4.1) <b>Business Finance:</b> Costing basics, Sources of Finance, Break Even Analysis, 4.2) <b>Business Accounts:</b> Book Keeping, Financial Statements, Financial Ratios and its importance, Concept of Audit,	03
<b>Topics 5: Project Report Preparation</b> 5.1) Business plan: Steps involved from concept to commissioning 5.2) <b>Project Report</b> 1) Meaning and Importance 2) Components of project report/profile 5.3) <b>Project Feasibility Study:</b> 1) Meaning and definition 2) Technical, Market, Financial feasibility	03
<b>Topics 6: Enterprise Management And Modern Trends</b> 6.1) <b>Enterprise Management:</b> - 1) Essential roles of Entrepreneur in managing enterprise	02

2) Probable Causes Of Sickness	
6.2) E-Commerce: Concept and process	
6.3) Global Entrepreneur	
<b>Total</b>	<b>16</b>

**Tutorial:**

Sr. No	Assignments
1	Assess yourself-are you an entrepreneur?
2	An Interview with an Entrepreneur.
3	Feasibility study of a product.
4	Prepare a Project Report for starting a small scale business.

**FONT SIZE OF PROJECT REPORT CONTENTS BE AS FOLLOWS:**

1. MAIN TITLE: 16 BOLD TIMES NEW ROMAN/ ARIAL
2. SUB TITLES: 14 BOLD TIMES NEW ROMAN/ ARIAL
3. RUNNING MATTER: 12 TIMES NEW ROMAN / ARIAL

**Format of the Project report should be designed by the department.**

**Learning Resources:****1) Reference Books:**

Sr. No.	Name of Book	Author	Publisher
1	Entrepreneurship	Trehan	Dream Tech Press
2	Entrepreneurship 2/e	Rajeev Roy	Oxford University Press
3	Entrepreneurship and Small Business	Schaper	Wiley India Publication
4	Entrepreneurship Development	Colombo plan staff college for Technical education.	Tata Mc Graw Hill Publishing co. ltd. New Delhi.
5	Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises	Pearson Education
6	Entrepreneurship Development	E. Gorden K.Natrajan	Himalaya Publishing. Mumbai

**2) Video Cassettes:**

No.	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmedabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : <a href="mailto:ediindia@sancharnet.in">ediindia@sancharnet.in</a> / <a href="mailto:olpe@ediindia.org">olpe@ediindia.org</a> Website : <a href="http://www.ediindia.org">http://www.ediindia.org</a>
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	

**Course Name : Diploma in Medical Electronics****Course Code : MU****Semester : Fifth****Subject Title : Professional Practices-III****Subject Code : 17070****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	03	--	--	--	--	50@	50

**Rationale:**

Most of the diploma holders are employed in industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities, which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

**Objectives:**

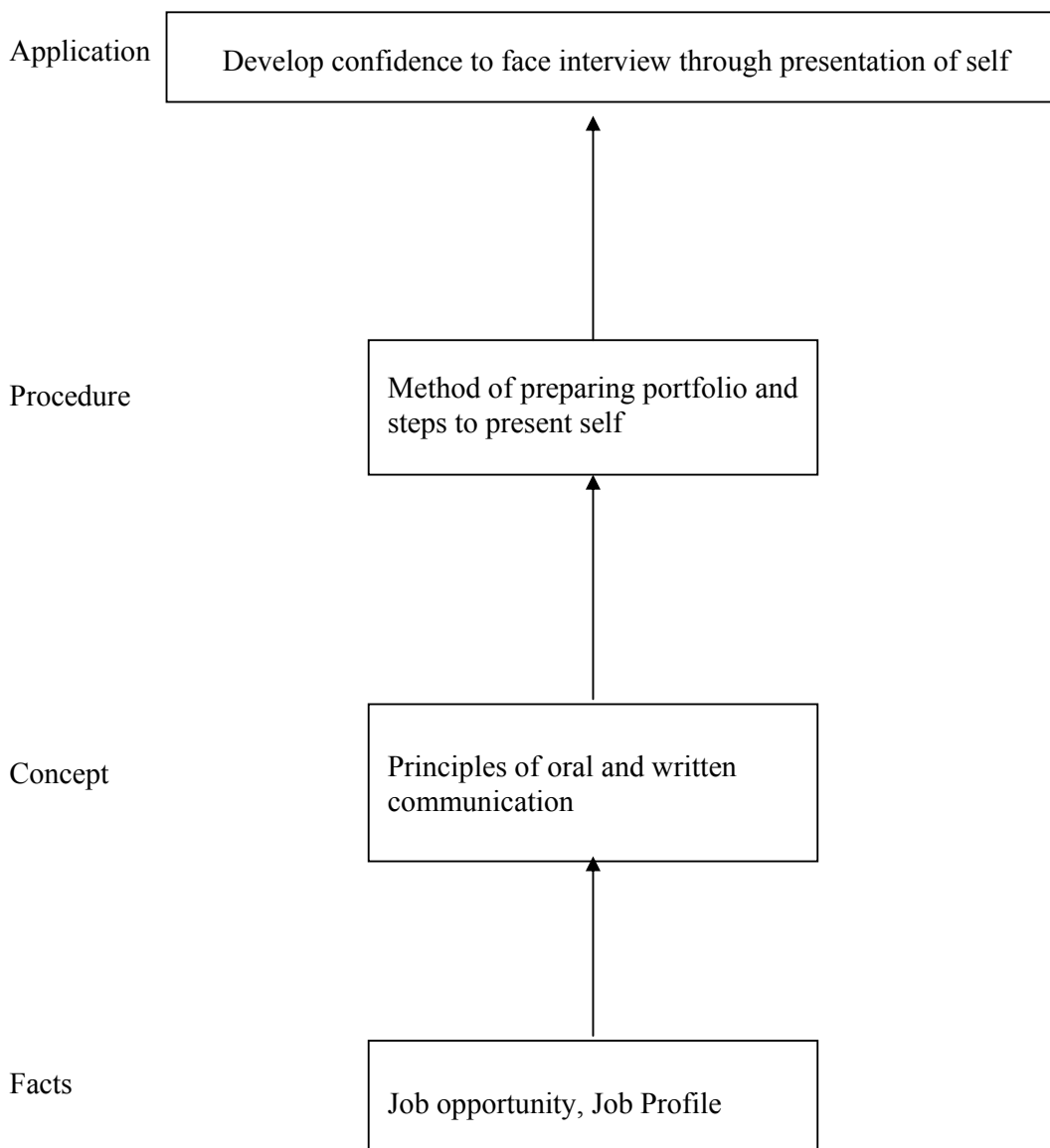
To develop the following skills:

**Intellectual Skills:**

1. Analyze the information received from different sources.
2. Prepare report for given topic.

**Motor Skills:**

1. Present given topic in a seminar.
2. Interact with peers to share thoughts.
3. Prepare a report on industrial visit, expert lecture.

**Learning Structure:**

Activity	Name of the Activity	Hours
1	<b>Industrial Visits</b> Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / Industries. <ul style="list-style-type: none"> <li>• Satellite earth station</li> <li>• Radar Establishment</li> <li>• Mobile Telephone Office</li> <li>• Any other relevant area</li> </ul>	16
2	<b>Lectures by Professional / Industrial Expert to be organized from the following areas.</b> <ul style="list-style-type: none"> <li>• Mobile Communication</li> <li>• Software Debugging</li> <li>• Fuzzy logic and Neural network</li> <li>• Recent trends in digital communication</li> <li>• Nanotechnology</li> <li>• Carrier guidance and interviewing techniques</li> <li>• Self- employment</li> <li>• Blue tooth technology.</li> <li>• Any topic related to social awareness</li> </ul>	08
3	<b>Information Search:</b> Students should prepare report as a part of term work of searching and collecting the information regarding their final project/industrial project	06
4	<b>Seminar</b> Student will deliver a seminar on technical topic. The topic will be on his project or new trends in technology or the subject of the Sixth semester	10
5	<b>Group Discussion</b> The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. The Faculty may suggest the topic for group discussion	08
<b>Total</b>		<b>48</b>



**Industrial Training (Optional)**

- Students who have completed industrial training in summer vacation after 4<sup>th</sup> Semester will be granted exemption for activities related to topic 1 to 4.
- These students shall submit report of Industrial training signed and certified by authorities from Industry. Student will give seminar on industry training attended by him.
- Evaluation will be done on seminar and report submitted by student.