MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI
TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES

COURSE NAME : ELECTRONICS ENGINEERING GROUP

COURSE CODE : EJ/EN/ET/EX

DURATION OF COURSE : 6 SEMESTERS   **WITH EFFECT FROM 2009-10**

SEMESTER : SIXTH   **DURATION : 16 WEEKS**

PATTERN : FULL TIME - SEMESTER   **SCHEME : E**

SR. NO.	SUBJECT TITLE	Abbreviation	SUB CODE	TEACHING SCHEME			EXAMINATION SCHEME										SW (16006)
				TH	TU	PR	PAPER HRS	TH (01)		PR (04)		OR (08)		TW (09)		
								Max	Min	Max	Min	Max	Min	Max	Min	
1	Management Φ	MAN	12219	03	--	--	3	100	40	--	--	--	--	--	--	
2	Control Systems $	CSS	12270	03	--	02	03	100	40	--	--	--	--	25@	10	
3	Advance Communication System $	ACS	12271	03	--	02	03	100	40	--	--	25#	10	25@	10	
4	Industrial Project $	IPR	12275	--	--	04	--	--	--			50#	20	50@	20	
5	Professional Practices-VI	PPS	12276	--	--	05	--			--	--	--	--	50@	20	
6	**Elective – I (Any One)**															50
	Mobile Communication $	MCN	12272	03	--	02	03	100	40	--	--	25@	10	--	--	
	VLSI Design $	VDN	12273	03	--	02	03	100	40	--	--	25@	10	--	--	
7	**Elective – II (Any One)**															
	Embedded System $	EDD	12269	03	--	02	03	100	40	--	--	25#	10	25@	10	
	Telematics $	TEL	12274	03	--	02	03	100	40	--	--	25#	10	25@	10	
	TOTAL			**15**	**--**	**17**	**--**	**500**	**--**	**--**	**--**	**125**	**--**	**175**	**--**	**50**

Student Contact Hours Per Week: **32 Hrs.**

THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.

Total Marks **: 850**

@ Internal Assessment, # External Assessment, [   ] No Theory Examination, Φ Common to All conventional Diploma, $ Common to Electronics Group

 Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Termwork, 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 : 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/CT/PS/CD/ED/EI/CV/FE/IU/MH/MI/TX/TC

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

Subject Title : Management

Subject Code : 12219

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	--	03	100	--	--	--	100

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)**
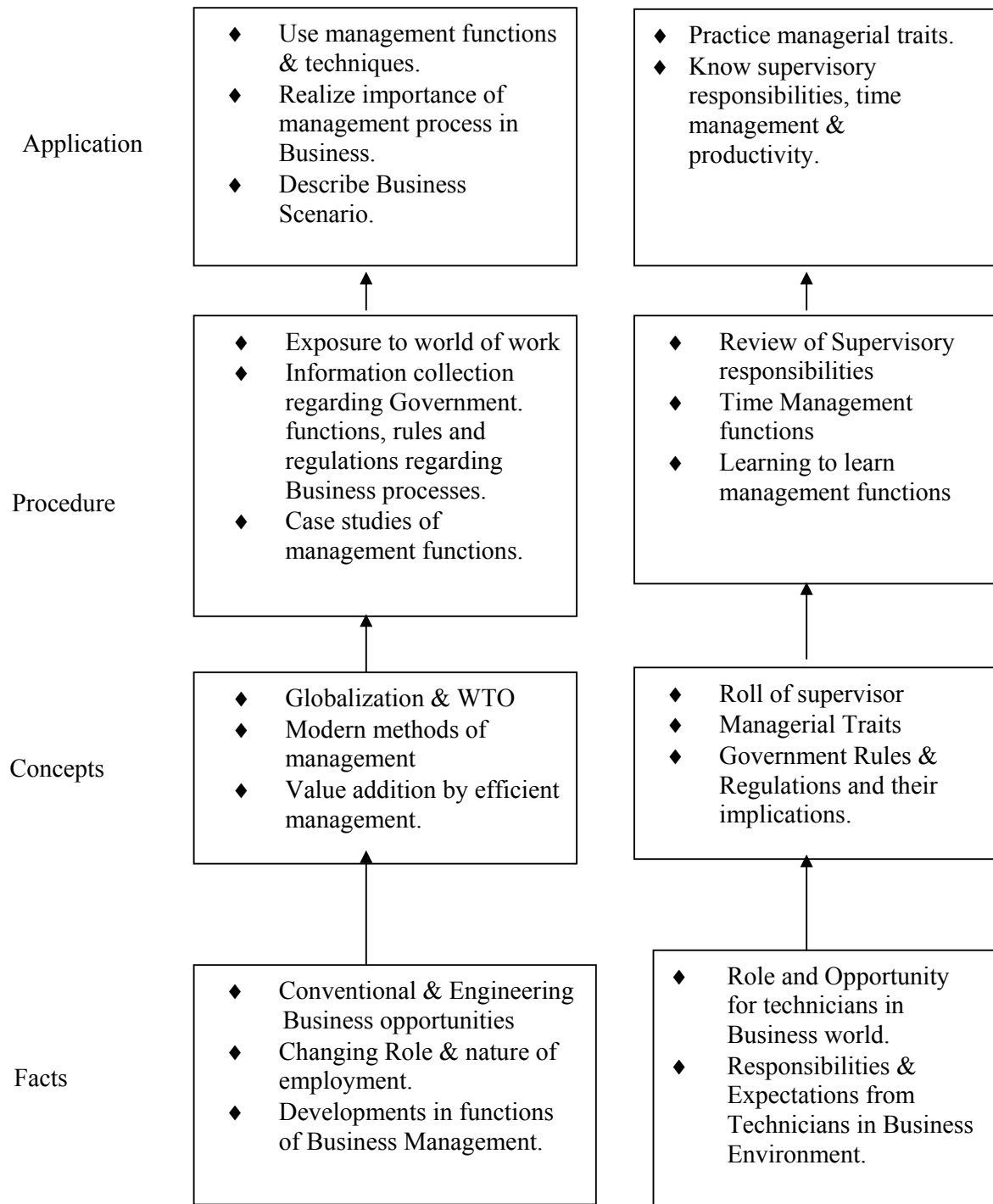
Rationale:

After completion of three years of technical training, Polytechnic students are expected to enter in to the World of Work. The business environment is altogether different and new to the students. A proper introduction and understanding of Business Processes is therefore essential for all Polytechnic students. Management is a subject which deals with basics of Managerial science required to understand the processes in Industrial & Commercial environment. This will enable the students of Polytechnics to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities.

Objective:
The students will able to:
1. Familiarize environment in the world of work
2. Explain the importance of management process in Business.
3. Identify various components of management.
4. Describe Role & Responsibilities of a Technician in an Organizational Structure.
5. Apply various rules and regulations concerned with Business & Social responsibilities of the Technician.

Learning Structure:

Application
| ♦ Use management functions & techniques. |
| ♦ Realize importance of management process in Business. |
| ♦ Describe Business Scenario. |

| ♦ Practice managerial traits. |
| ♦ Know supervisory responsibilities, time management & productivity. |

Procedure
| ♦ Exposure to world of work |
| ♦ Information collection regarding Government. functions, rules and regulations regarding Business processes. |
| ♦ Case studies of management functions. |

| ♦ Review of Supervisory responsibilities |
| ♦ Time Management functions |
| ♦ Learning to learn management functions |

Concepts
| ♦ Globalization & WTO |
| ♦ Modern methods of management |
| ♦ Value addition by efficient management. |

| ♦ Roll of supervisor |
| ♦ Managerial Traits |
| ♦ Government Rules & Regulations and their implications. |

Facts
| ♦ Conventional & Engineering Business opportunities |
| ♦ Changing Role & nature of employment. |
| ♦ Developments in functions of Business Management. |

| ♦ Role and Opportunity for technicians in Business world. |
| ♦ Responsibilities & Expectations from Technicians in Business Environment. |

Contents: Theory

Chapter	Name of the Topics	Hours	Marks
01	**Overview of Business** 1.1. Types of Business • Service • Manufacturing • Trade 1.2. Industrial sectors • Introduction to • Engineering Industry • Process Industry • Textile Industry • Chemical Industry • Agro Industry 1.3 Globalization • Introduction • Advantages & disadvantages w.r.t India 1.4 Intellectual Property Rights I(I P R) • Concept • Types of IPR	02	04
02	**Management Process** 2.1 What is Management? • Evolution • Various Definitions • concept of Management • Levels of Management • Administration and Management • Scientific Management by F W Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management: • Planning • Organizing • Coordinating • Directing • Controlling • Decision Making	07	14
03	**Organizational Management** 3.1 Organization • Definition • Steps in forming organization 3.2 Types of Organization • Line • Line & Staff • Functional • Project type 3.3 Departmentation • Centralized & Decentralized • Authority & Responsibility	07	14

	• Span of Control (Management) 3.4 Forms of ownerships • Proprietorship • Partnership • Joint stock company • Co-operative society • Govt. Sector		

04	**Human Resource Management**
	 4.1 Personnel Management
	 • Introduction
	 • Definition
	 • Function
	 4.2 Staffing
	 • Introduction to HR
	 • Introduction to HR Planning
	 • Recruitment procedure
	 4.3 Personnel – Training & Development
	     • Types of training
	            - Induction
	            - Skill enhancement
	 4.4 Leadership & Motivation
	 • Leadership- Styles & types
	 • Motivation –Definition , Intrinsic & Extrinsic
	 • Moslow's theory of Motivation and its significance
	 4.5 Safety Management
	 • Causes of Accidents
	 • Safety Procedures
	 4.6 Introduction, Objectives & feature of Industrial Legislation such as
	 • Factory Act
	 •ESI Act,
	 •Workman Compensation Act,
	 •Industrial Dispute Act.
		08	20

05	**Financial Management (No Numericals)** 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management • Types of capitals • Sources of finance 5.3. Budgets and Accounts • Types of Budgets • Production Budget (including Varience Report) • Labour Budget • Introduction to Profit & Loss Account (Only concept) • Balance sheet etc. 5.4. Introduction to Various Taxes • Excise Service Tax, • Income Tax • VAT • Custom Duty.	08	18

06	**Materials Management**
	6.1. Inventory Management (No Numericals)
	    • Meaning & Objectives
	6.2 ABC Analysis
	6.3 Economic Order Quantity:
	    • Introduction & Graphical Representation
	6.4 Purchase Procedure
	    • Objectives of Purchasing
	    • Functions of Purchasing Department
	    • Steps in Purchasing
	6.5 Modern Techniques of Material Management
	    • Introductory treatment to Just inTime(JIT)/ System Applications & Products (SAP) /Enterprise Resource Planning (ERP)
		08	18

07	**Project Management (Simple /Elementary Numericals)**
	7.1 Project Management
	    • Introduction & Meaning
	    • Introduction to CPM/PERT Techniques (simple network problems)
	    • Concept of Break Even Analysis and its significance
	7.2 Quality Management
	    • Definition of Quality, Concept of Quality, Quality Circle, Quality Assurance
	    • Introduction to TQM, Kaizen, 5 'S' & Six Sigma
		08	12

	Total	**48**	**100**

Learning Resources:
Books:

Sr. No	Author	Title	Publisher
01	Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New Delhi
02	Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
03	W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall of India Pvt. Ltd. New Delhi - 110001

Video Cassets:

No	Subject	Source
1.	Business opportunity selection and guidance	Website : http://www.ediindia.org
2.	Planning for completion and Growth	

Course Name : Electronics Engineering Group.

Course Code : ET/EN/EX/EJ/IE/IS/IC/EV/DE/IU/ED/EI

Semester : Sixth for ET/EN/EX/EJ/IE/IS/IC/EV/DE and Seventh for IU/ED/EI

Subject Title : Control Systems

Subject Code : 12270

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:

The advancement of both knowledge and technique has resulted in the development of controls in process industry. The progression of human existence from a primitive state to the present complex technological world was paced by learning new and improved methods to control the environment.

Control means methods to force parameters in the environment to have specific values. Varying the room temperature OR guiding a space craft to Saturn necessities to examine elements of control system.
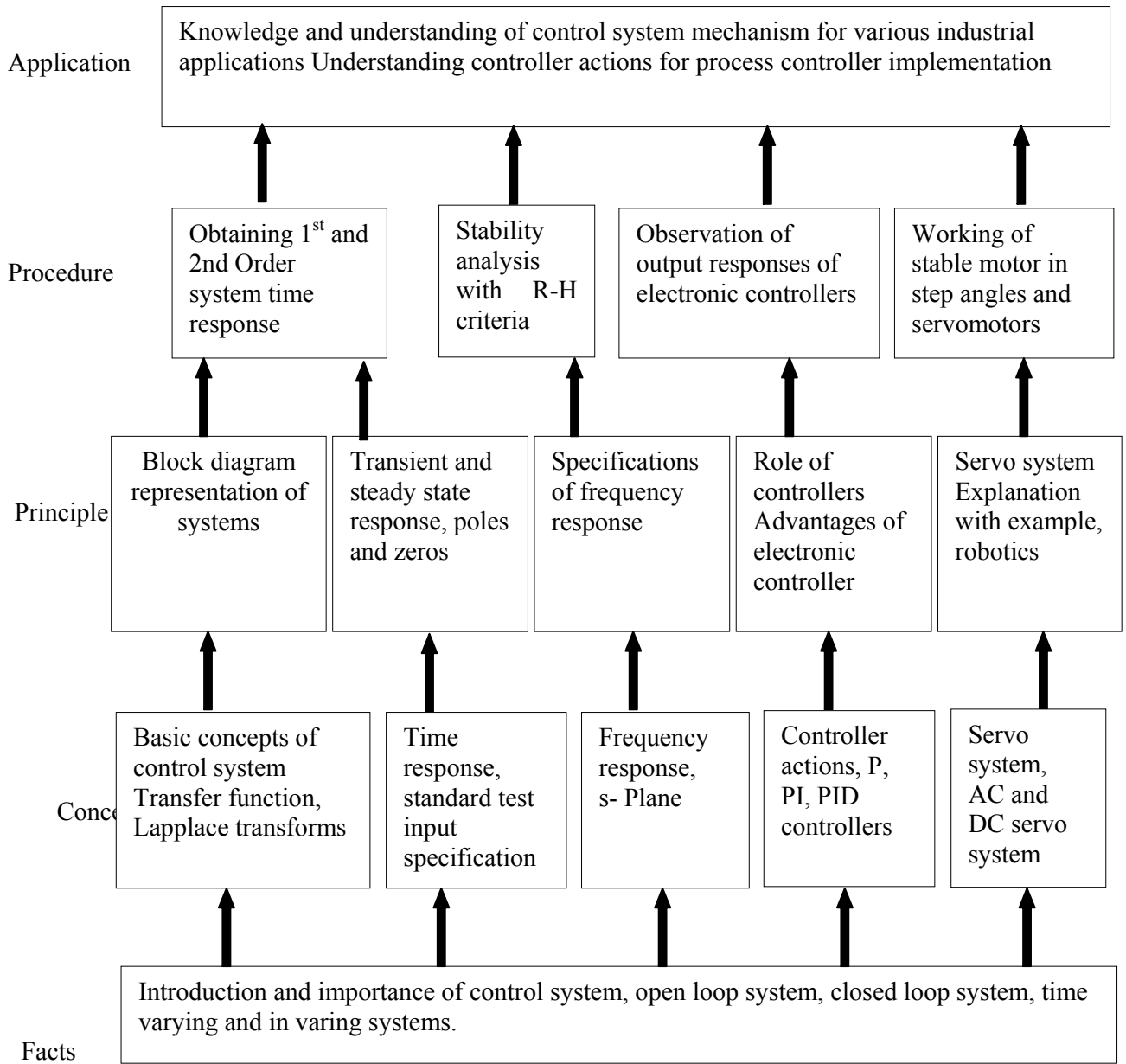
Nature of controller action for systems with operation and variables is highlighted for continuous values. This subject is beneficial for process control variation in any process control industry which equips the student for maintenance and quality analysis.

Objectives:

The student will be able to:
  1. Learn and understand about open loop and closed loop systems.
  2. Feedback control and transfer function.
  3. Steady state, time response, and frequency response analysis.
  4. Study of stability.
  5. Control actions of electronic controllers.
  6. Servo system and its application.
  7. Process control system and controllers
  8. Robotics.

Learning Structure:

Application

Knowledge and understanding of control system mechanism for various industrial applications Understanding controller actions for process controller implementation

Procedure

| Obtaining 1st and 2nd Order system time response | Stability analysis with R-H criteria | Observation of output responses of electronic controllers | Working of stable motor in step angles and servomotors |

Principle

| Block diagram representation of systems | Transient and steady state response, poles and zeros | Specifications of frequency response | Role of controllers Advantages of electronic controller | Servo system Explanation with example, robotics |

Concepts

| Basic concepts of control system Transfer function, Lapplace transforms | Time response, standard test input specification | Frequency response, s- Plane | Controller actions, P, PI, PID controllers | Servo system, AC and DC servo system |

Facts

Introduction and importance of control system, open loop system, closed loop system, time varying and in varing systems.

Content: Theory

Chapter	Name of the Topic	Hours	Marks
01	**Overview of Control system** i) System- definition & practical example. Control system – definition and practical example. Open loop & closed loop systems – definition, block diagram, practical example, and Comparison ii) Laplace transform – Significance in control system Linear time varying and time in varying systems – definition, developing differential equations of R-C and R-L-C electric circuits. iii) Transfer function – definition, derivation of transfer function for close loop control system. iv) Order of a system – definition, 0, 1, 2 order system standard equation, practical examples. v) Block diagram representation of a system- need, reduction rules, problems.	08	18
02	**Dynamic Analysis of a system** i) Dynamic analysis of measurement systems- definition, time domain and frequency domain analysis. ii) Time domain analysis – Transient and steady state response, steady state error. iii) Standard test inputs - step, ramp, parabolic& impulse. Need of them, significance, and corresponding Laplace representation iv) Poles & zeros – definition. v) Analysis of first order control system for unit step input; concept of time constant vi) Analysis of second order control system for unit step input; concept, definition & effect of damping; vii) time response specifications (no derivations) ; problems on time response specifications	10	18
03	**Stability & frequency response analysis** i) s-plane – Introduction ii) stability - stable, unstable, critically stable & conditionally stable system; relative stability; Root locations in S-plane for stable and unstable systems iii) Routh's stability criterion-different cases & conditions (statement method); problems (Time response analysis) iv) Introduction, advantages & disadvantages of frequency response analysis; frequency response specifications	08	16
04	**Control actions & process controllers** i) Process control system – block diagram , elements ii) Role of controllers in process industry; concept of sequencing & modulating controllers; iii) Control actions: discontinuous & continuous modes; iv) on off controllers: neutral zone v) proportional controllers (offset, proportional band) integral & derivative controllers;	08	20

	vi) composite controllers; PI, PD, PID controllers vii)Control actions of electronic controllers with circuits & equations (with op amp)		

05	**Servo Systems**
	  i) Servo system –definition, block diagram,
	  ii) AC & DC servo systems- comparison, practical example, schematic diagram , concept and principle
	  iii) Servo components:
	    a) Potentiometer as error detector
	    b) Synchro as error detector
	    c) Rotary encoder
	    d) Stepper motor- variable reluctance type, comparison of stepper motor with DC servo motor
	    e) DC servo motor- characteristic, difference from a normal DC motor, comparison between armature controlled and field controlled DC servo motors(with TF)
	    f) AC servo motor-difference from a normal 2 phase induction motor, characteristic of AC Servo meter (no TF)
		09	20

06	**Robotics**
	  i) Robotics- definition, concept.
	  ii) functional diagram of robotics, DOF, End effectors
	  iii) Application, advantages and classification of robotics.
		05	08

	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:
  1. Reading
  2. Sourcing of Web sites

Motor Skill:
  1. Testing
  2. Measurement

List of Practical:
  1. DC position control system
  2. AC position control system
  3. Characteristics of potentiometer as error detector
  4. Characteristics of synchro as error detector
  5. Step response of first order R-C circuit
  6. Step response of R-L-C second order circuit
  7. Temperature controller with on-off controller
  8. Temperature controller with PI controller
  9. Temperature controller with PID controller

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	M. Gopal	Digital Control System	Tata McGraw-Hill
02	J.J.Nagrath & M. Gopal	Control system Engg.	--
03	M.Gopal	Control System	Tata McGraw-Hill
04	K. Ogata	Modern control Engg.	--
05	Kumar	Control systems	Tata McGraw-Hill
06	C. D. Johnson	Process control instrumentation Technology	--

Course Name : Electronics Engineering Group

Course Code : ET/EN/EX/EJ/ED/EI/DE

Semester   : Sixth for ET/EJ/EN/EX/DE and Seventh for ED/EI

Subject Title : Advance Communication Systems

Subject Code : 12271

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	25#	25@	150

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:

An improvement and development in the technology have occurred with tremendous rapidity in parallel with its increasingly wide scale deployment Telecommunication n/w based on Radar, Satellite, Microwave and optical fiber technology have become a major information transmission system to improve the transmission & ideality, to increase the data rate so that more information could be sent or to increase the transmission distance between relay stations.
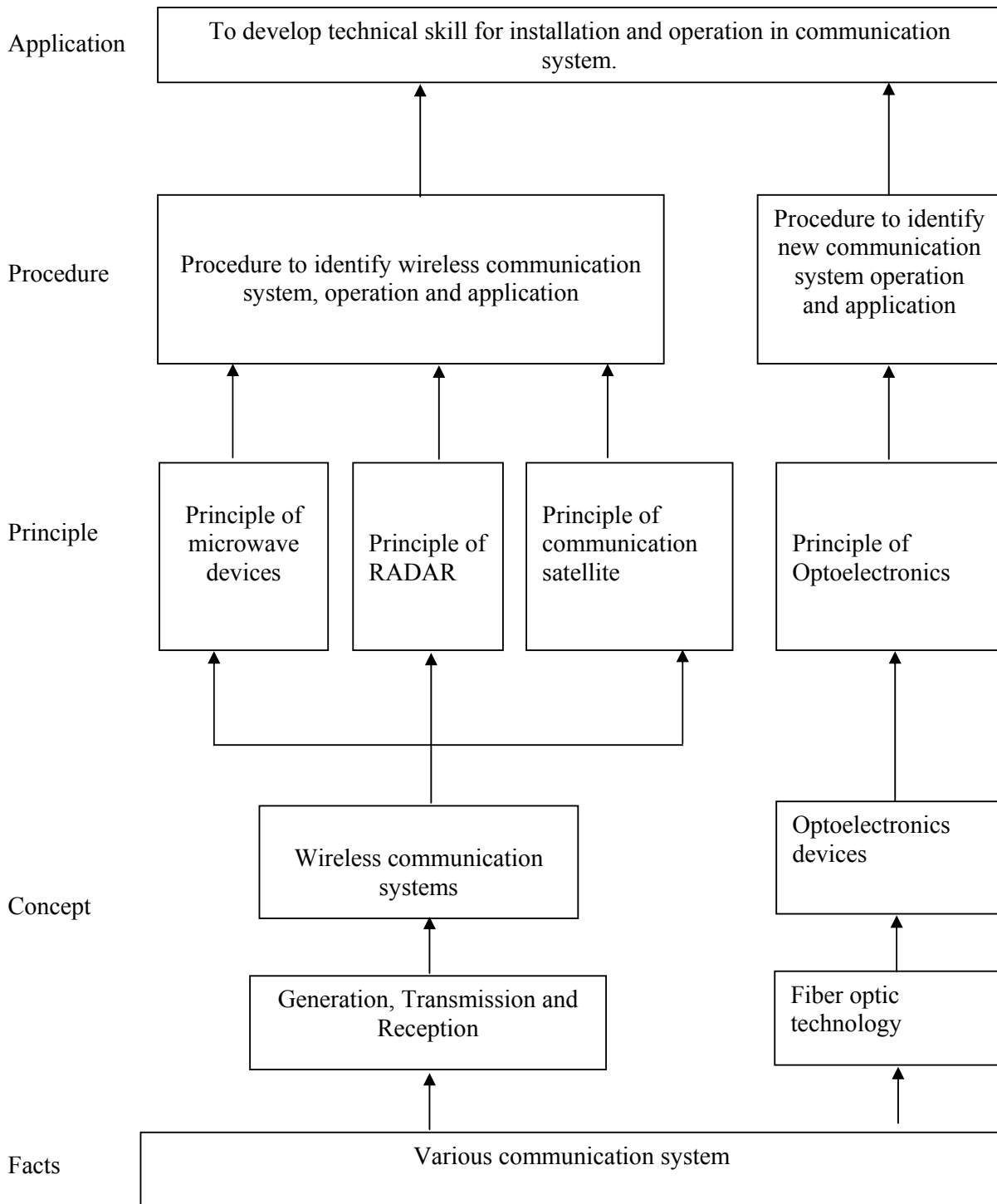
As a result & accelerating rate of growth of communication technology in research and industry students who are preparing themselves for and electronics engineers who are working in these area are faced with the need to understand the theoretical and experimental design and analysis

Objectives:
Students will be able to:
1. Recognize different communication system.
2. Learn the Concept of electromagnetic wave.
3. Identify Microwave spectrum (frequency).
4. Identify different wave guide components.
5. State the Properties of different Tee.
6. State the Concept of duplexer.
7. Know the principle of light transmission through optic fiber.
8. Know Splicing technique.

Learning Structure:

Application	To develop technical skill for installation and operation in communication system.

Procedure	Procedure to identify wireless communication system, operation and application	Procedure to identify new communication system operation and application

Principle	Principle of microwave devices	Principle of RADAR	Principle of communication satellite	Principle of Optoelectronics

Concept	Wireless communication systems	Optoelectronics devices
	Generation, Transmission and Reception	Fiber optic technology

Facts	Various communication system

Contents: Theory

Chapter	Name of the Topic	Hours	Marks

01	**Wave Guide**
	1.1 Microwave Region and Band Designations
	1.2 Introduction to TEM/TE/TM/HE wave destination.
	1.3 Comparison of wave guide with two wire transmission line.
	1.4 Propagation of waves in rectangular wave guide only.
	     (Introduction to wave guide only)
	1.5 TE & TM Modes in rectangular wave guide with field
	     pattern. Concept of dominant mode.
	1.6 Definition and interpretation of cut off frequency of a
	     waveguide, guide wave length, phase velocity, group
	     velocity (Simple Numerical)
		04	12

02	**Microwave Components**
	2.1 Construction , working Principles & Applications of :
	     Multicavity klystron amplifier, Reflex Klystron amplifier,
	     Travelling wave tube, Magnetron,
	2.2 Construction working principle & Application, PIN Diode &
	     Gunn Diode
	2.3 Construction, Working principle & application of H-plane
	     Tee, E-Plane Tee, E-H Plane TEE, Multihole directional
	     coupler, wave guide, bends, corners, Twists, circulator,
	     Isolator.
		10	20

03	**A. Radar Theory**
	3.1 Fundamentals: Basic concept of Radar,
	3.2 Radar Range equation, factors influencing maximum range
	3.3 Block diagram of an elementary pulsed Radar, Duplexer
	     concept, Antenna & Scanning (Antenna Scanning &
	     Tracking), display methods.
	3.4 Principle of MTI Radar, Block diagram and explain the
	     operation of MTI radar
	3.5 Concept of continuous Wave Radar (Modulated & Un-
	     Modulated), Doppler effect.
	     Advantages, Disadvantage and application of CWR.
	3.6 Radar Beacons
		06	16

03	**B. Satellite Communication**
	3.1 Block diagram of elements of a satellite Communication
	     system.
	3.2 Orbital pattern of Satellite (Elliptical orbit, Parabolic orbit
	     and geo stationary orbit).
	3.3 Advantages of geo stationary satellite.
	3.4 Satellite links (uplink, down link, cross link), look angle,
	     angle of elevation, azimuth angles, Uplink and downlink
	     frequency bands used in satellite Communication, foot print
	     and station keeping
	3.5 Block diagram of Satellite earth stationary.
	3.6 Block diagram of satellite subsystems
	     Functions of a satellite.
	          i. Power subsystem (only concept), Solar ECLIPSE
	          ii. Telemetry, tracking & Command
		06	12

	iii. Attitude & Orbit Control System. Communication Channel subsystem (Block diagram of typical transponder)		
04	**Fiber Optic Communication** 4.1 Light Wave Spectrum 4.2 History of Fiber Optic. 4.3 Advantage & disadvantages of Fiber optic communication. 4.4 Application of FOC in Industrial, Defense, Commercial Field. 4.5 Block Diagram of Fiber Optic Communication.	08	16
05	**Fiber Optic Communication & Ray Theory** 5.1 Construction of Fiber Optic Cable. 5.2 Fiber Characteristics & Classification. 5.3 Source & It's Limitations, Construction & working Principle of LED, LASER. 5.4 Detector, Limitation, Construction & working principle, Photo Diode. 5.5 Spicing Techniques. 5.6 Definition & Concept of Reflection, dispersion, diffraction, absorption & scattering with the help of light theory 5.7 Definition of Snell's Law, Numerical Aperture\ Acceptance angle, acceptance cone, Critical Angle(Numericals)	10	16
06	**Losses in Fiber Optic** 6.1 Attenuation, dispersion-intermodel, intramodel, bend loss- micro macro scattering losses- Linear. Non Linear. Absorption (Numericals) 6.2 Link Budget, Power Budget (Numericals) 6.3 Block Diagram & working of OTDR	04	08
	Total	**48**	**100**

Practical:
Intellectual Skills:
1. Reading
2. Sourcing of Web sites

Motor Skill:
1. Testing
2. Measurement

List of Practical:
1. Verify the characteristics of Reflex Klystron.
2. Verification of characteristics E Plane Tec.
3. Verification of characteristics r of Isolator.
4. Verification of characteristics of Circulator.
5. Indirect measurement of frequency using cavity resonator.
6. Measure the coupling factor of MHD Coupler.
7. Calculate the N.A for given FOC.
8. Calculate the bend Loss in given FOC.
9. Verify the characteristics of LASER.
10. Verify the characteristics of LED.
11. Verify the characteristics of Photo Diode.

12. Attenuation measurement in given FOC.
13. Dispersion measurement in given FOC.
14. Visit Industry to see
    i) Use of OTDR (Demonstration)
    ii) Use of Splicing Technique (Demonstration)

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	Keiser	Optical Fiber Communication	Tata McGraw-Hill International
02	Samuel liao	Microwave Devices and Circuits	Prentice Hall of India
03	A. Selverajan	Optical Fiber Communication	Tata McGraw-Hill
04	Kennedy Davis	Electronic Communication System	Tata McGraw-Hill
05	John Senior	Optical Fiber Communication	Prentice Hall of India
06	David Pozar	Microwave Engineering	John Wiley and Sons
07	Frenzel	Communication Electronics	Tata McGraw-Hill
08	William Schweber	Electronic Communication	Prentice Hall International UK

Course Name : Electronics Engineering Group

Course Code : ET/EJ/EN/EX/DE/IE/IC/IS/EV/MU/ED/EI/IU

Semester   : Sixth for ET/EJ/EN/EX/DE/IS/IC/IE/EV/MU and Seventh for ED/EI/IU

Subject Title : Industrial Projects

Subject Code : 12275

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	04	--	--	--	50#	50@	100

Rationale:

Diploma holder need to be capable of doing self-Study throughout their life as the technology is developing with fast rate. Student will be able to find out various sources of technical information and develop self-study techniques to prepare a project and write a project report.
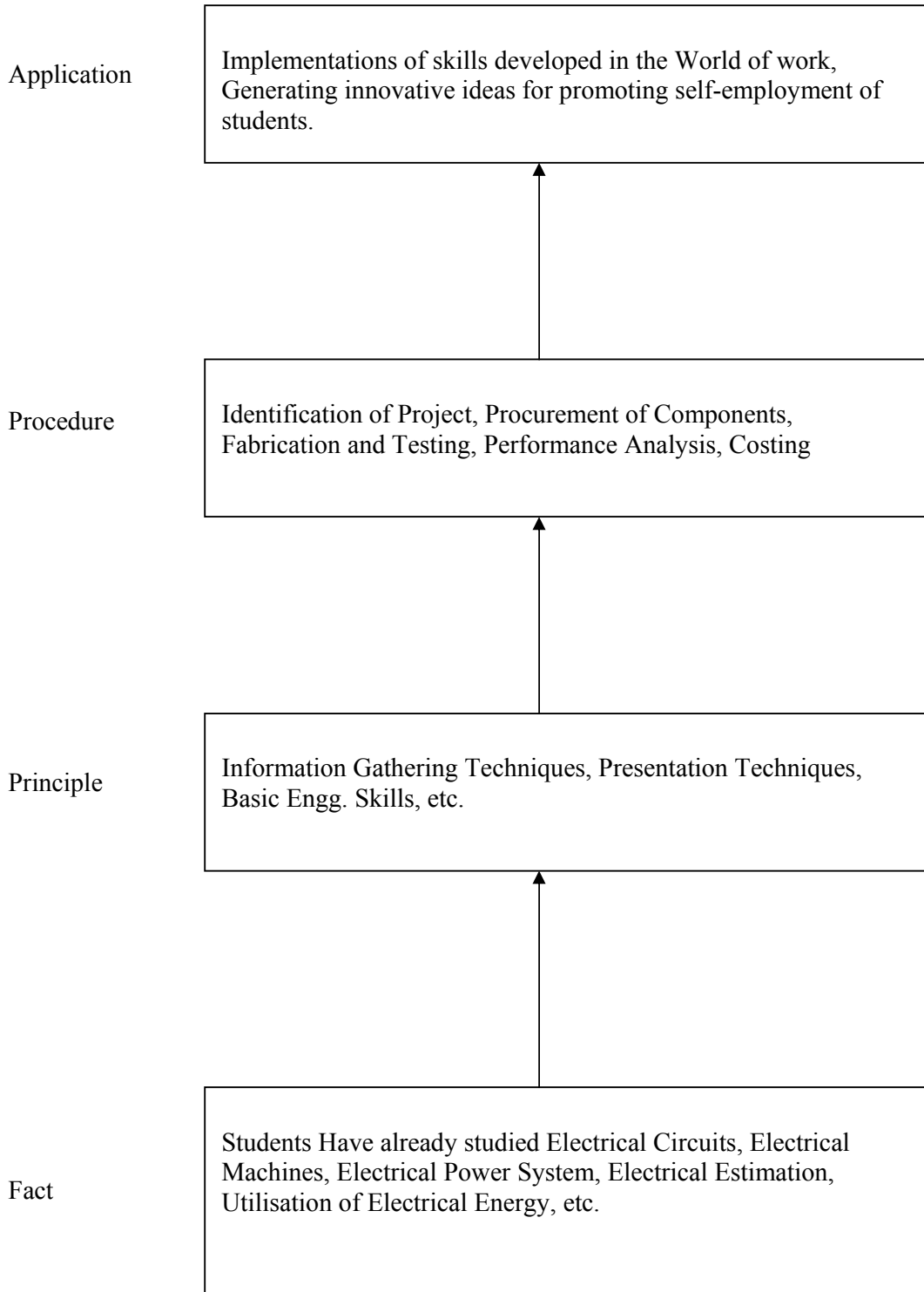
This subject is intended to teach students to understand facts, concepts and techniques of electrical equipments, its repairs, fault finding and testing, estimation of cost and procurement of material, fabrication and manufacturing of various items used in electrical field. This will help the students to acquire skills and attitudes so as to discharge the function of supervisor in industry and can start his own small-scale enterprise.

Objectives:

The students will be able to,

      (1)   Work in Groups, Plan the work, and Coordinate the work.

      (2)   Develop leadership qualities.

      (3)   Analyse the different types of Case studies.

      (4)   Develop Innovative ideas.

      (5)   Develop basic technical Skills by hands on experience.

      (6)   Write project report.

      (7)   Develop skills to use latest technology in Electronics field.

Learning Structure:

Application

Implementations of skills developed in the World of work, Generating innovative ideas for promoting self-employment of students.

↑

Procedure

Identification of Project, Procurement of Components, Fabrication and Testing, Performance Analysis, Costing

↑

Principle

Information Gathering Techniques, Presentation Techniques, Basic Engg. Skills, etc.

↑

Fact

Students Have already studied Electrical Circuits, Electrical Machines, Electrical Power System, Electrical Estimation, Utilisation of Electrical Energy, etc.

Contents:

During fifth semester students will collect information, analyse the information and select the project. They will also prepare the List of the components required, PCB design, Testing Procedure, Design of the Cabinet or Box or Board as the case may be. They will also prepare a synopsis of the project.

So at sixth semester they have to execute the project. A tentative Schedule is proposed below:

Proposed Schedule: Weeks

Procuring components, component testing and
circuit testing   02
PCB making and onboard testing   06
Trouble shooting and cabinet making   04
Documentation   04

References:

Books/Magazines:

Sr. No.	Name of the Magazines
1.	Industrial Automation
2.	Electronics for You
3.	Electronics Projects
4.	Computer World
5.	Chip
6.	Any Journal Related to Electronics/Computer/Information Technology

Website:

Using any search engine, such as http://www.google.co.in/ the relevant information can be searched on the Internet.

Course Name : Electronics Engineering Group

Course Code : ET/EJ/EN/EX/ED/EI

Semester   : Sixth for ET/EJ/EN/EX and Seventh Semester for ED/EI

Subject Title : Professional Practices-VI

Subject Code : 12276

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
--	--	05	--	--	--	--	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.
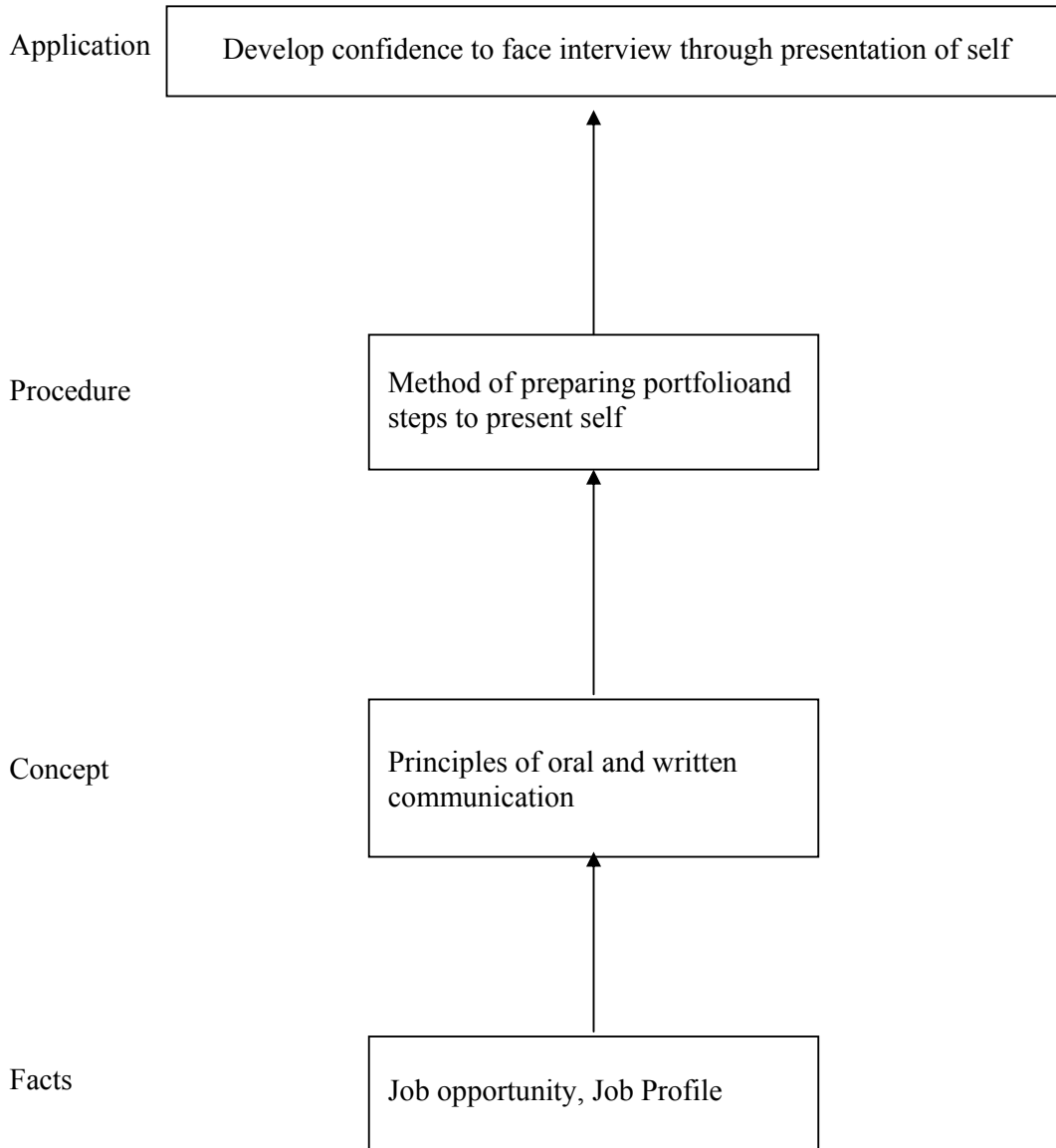
The purpose of introducing professional practices is to provide opportunity to students to undergo activities, which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Objectives:

Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Learning Structure:

Application

Develop confidence to face interview through presentation of self

Procedure

Method of preparing portfolioand steps to present self

Concept

Principles of oral and written communication

Facts

Job opportunity, Job Profile

Activity	Content	Hours

01	**Industrial Visits**
	Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work.
	The industrial visits may be arranged in the following areas :
	  i) Satellite Earth Station.
	  ii) Radar Establishment.
	  iii) MTSO.
	  iv) Any other relevant area.
		21

02	**Lectures by Professional / Industrial Expert to be organized from any of the following areas:**
	  i. Mobile communication.
	  ii. Software debugging.
	  iii. Fussy logic and neural network.
	  iv. Carrier guidance and interviewing techniquies.
	  v. Self-employment.
	  vi. Blue tooth technology.
	  vii. Any other relevant topic
		16

03	**Information Search :** Students should prepare a report as a part of term work how they are searching and collecting the information regarding their final project/ industrial project	12
04	**Seminar** Each student will deliver a seminar on some technical Topic. It could on his project, a topic which will give information about new trends in technology, Topic of a subject which is being taught in the sixth semester. OR Any other topic.	16

05	**Group Discussion :**
	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 members may select the topic group discussions. Some of the suggested topics are
	  i. Advance technology Boon or Curse.
	  ii. Any other topic.
		15

	Total	**80**

Course Name : Electronics Engineering Group.

Course Code : EX/ET/EJ/EN/ED/EI

Semester   : Sixth for ET/EJ/EN/EX and Seventh for ED/EI

Subject Title : Mobile Communication (Elective-I)

Subject Code : 12272

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)**
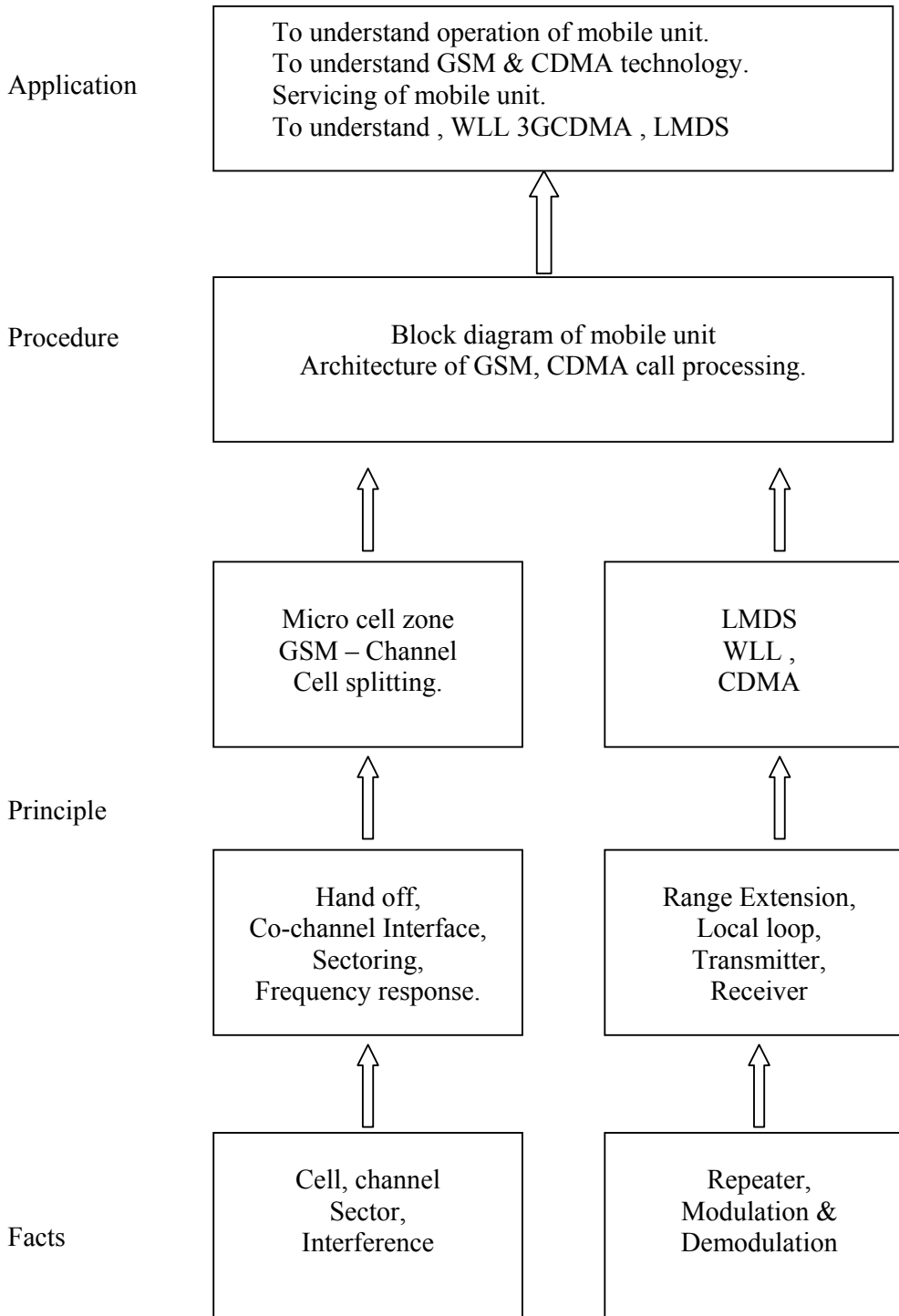
Rationale:

The glorious 21st century marks the mobile radio communication industry by orders of magnitude. The recent exponential growth in cellular mobile communication needs more skilled technicians for operation, maintenance & servicing of mobile cellular system. This subject is classified under technology group and it is based on communication theory, which gives theoretical as well as practical knowledge of different cellular system. It covers digital cellular mobile system. It covers digital cellular mobile system such as GSM, IS – 95 standards, WLL, call processing & basic of mobile communication system.

Objectives:

The student should able to:

1. Compare operation of different mobile communication system
2. Describe cellular concept such as frequency reuse, hand off
3. Describe coverage & capacity in cellular system
4. Draw GSM system architecture
5. Explain call processing in GSM
6. Explain CDMA (IS-95) standards
7. Explain Call processing in CDMA
8. Compare GSM & CDMA
9. Define SS7 services
10. Demonstrate GSM system & CDMA system

Learning Structure:

Application

> To understand operation of mobile unit.
> To understand GSM & CDMA technology.
> Servicing of mobile unit.
> To understand , WLL 3GCDMA , LMDS

↑

Procedure

> Block diagram of mobile unit
> Architecture of GSM, CDMA call processing.

↑   ↑

Principle

> Micro cell zone
> GSM – Channel
> Cell splitting.

> LMDS
> WLL ,
> CDMA

↑   ↑

> Hand off,
> Co-channel Interface,
> Sectoring,
> Frequency response.

> Range Extension,
> Local loop,
> Transmitter,
> Receiver

↑   ↑

Facts

> Cell, channel
> Sector,
> Interference

> Repeater,
> Modulation &
> Demodulation

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
1	**Introduction to wireless communication system** 1.1 Evolution of mobile radio communication 1.2 Mobile radio system around the world. (Such as AMPS, N- AMPS, IS-95, GSM) 1.3 Related definition base station, control channel, forward channel etc. Examples of wireless communication system such as paging system, cordless telephone system, cellular telephone system , how cellular telephone call is made	04	06
2	**Mobile unit** 2.1 Block Diagram and operation of mobile unit 2.2 Block Diagram & Explanation frequency synthesizer 2.3 Block diagram and operation of transmitter, receiver, logic unit, control unit & handset	06	12

3	**The cellular concept**.
	3.1 Introduction to cellular concept.
	    3.1.1 Introduction to basic cellular system.
	    3.1.2 Frequency reuse.
	      3.1.3 Hand off, Type of hand off, hard hand off, soft hand off, delayed and queued hand off
	3.2 Interference & system capacity.
	3.2.1 Co channel interference & system capacity.
	3.2.2 Channel planning for wireless system.
	3.2.3 Adjacent channel Interference.
	3.2.4 Power control for reducing interference (Closed loop, Open loop)
	3.3 Improving coverage and capacity in cellular system.
	3.3.1 Cell splitting.
	3.3.2 Sectoring.
	3.3.3 Repeater for range extension.
	3.3.4 Micro cell zone concept
		12	12
			
			08
			
			08

4	**Digital cellular mobile systems**. 4.1 G.S.M system architecture. 4.1.1 G.S.M services & features. 4.1.2 G.S.M radio subsystems. 4.1.3 G.S.M channel types. 4.1.4 Message & call processing in GSM 4.1.5 Privacy & security in GSM. 4.2 Signal system no.7 (ss7)—performance services. 4.3 CDMA digital cellular standard IS-95. 4.3.1 IS.95 frequency & channel specification.	20	12 04

	4.3.2 IS.95 channel structure. 4.3.3 Forward & Reverse channel modulation process. 4.3.4 IS-95 system architecture. 4.3.5 IS-95 CDMA calls Processing. 4.3.6 Security & identification in IS-95 CDMA 4.3.7 Features of IS-95.		20

5	**5. Modern wireless communication system**
	5.1 3GW-CDMA (UMTS) (Universal mobile
	       Telecommunication system.)
	5.2 3G CDMA 2000
	5.3 3G- TD-SCDMA (synchronous)
	       5.4 Wireless local loop & LMDS (local multipoint
	       distribution)
	5.5 IMT 2000
		06	18

	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skill:
     1. Identification of different components and their use
     2. Interpretation
     3. Report writing

Motor Skills:
     1. To follow testing procedure
     2. Accuracy in Observations

List of Practical: (ANY TEN)
1. Perform installation of mobile phone.
2. Observe Input / Output signal of different sections
3. Read the content of SIM card.
4. To understand & perform charging of handset.
5. Perform testing procedure.
6. Testing of mobile handset.
7. Find out different add- on accessories for cell phones (battery, charger, hands free data cable)
8. Identify different sections & component of mobile unit such as (Ringer section, dialer section, receiver section etc.
9. Demonstration of handoff, frequency response, cell splitting.
10. Prepare report on different facilities provided by cellular company (visit)
11. Prepare report on cellophane operator companies and their plan & traffic. (Visit)
12. Find out the specifications of different handsets provides by different companies.
13. Power supply requirement, battery technology, display, phone memory, answered called memory charging time, Facilities: - STD, ISD & LIP)
14. Prepare report on GSM technology, its network, GSM capability & data Services.
15. Study & prepare report on cell site , distance coverage , antennas used & other components.
16. Industrial visit to mobile company –GSM (Airtel , BPL)
17. Industrial visit to CDMA mobile station (TATA Indicom , Reliance)
18. Prepare report on features, services provided by different companies.

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
01	T.S. Rappaport	Wireless Communication Principles & Practice	Pearson Education
02	William Lee	Mobile Cellular Tele communication	Tata McGraw Hill
03	Asoke Talukder Roopa Yavagal	Mobile Computing	Tata McGraw Hill
04	Raj Pandya	Mobile & Personal communication services& system	Prentice Hall

Course Name : Electronics Engineering Group

Course Code : ET/EJ/EN/EX/DE/ED/EI

Semester : Sixth for ET/EJ/EN/EX/DE and Seventh for ED/EI

Subject Title : VLSI Design (Elective-I)

Subject Code : 12273

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)**
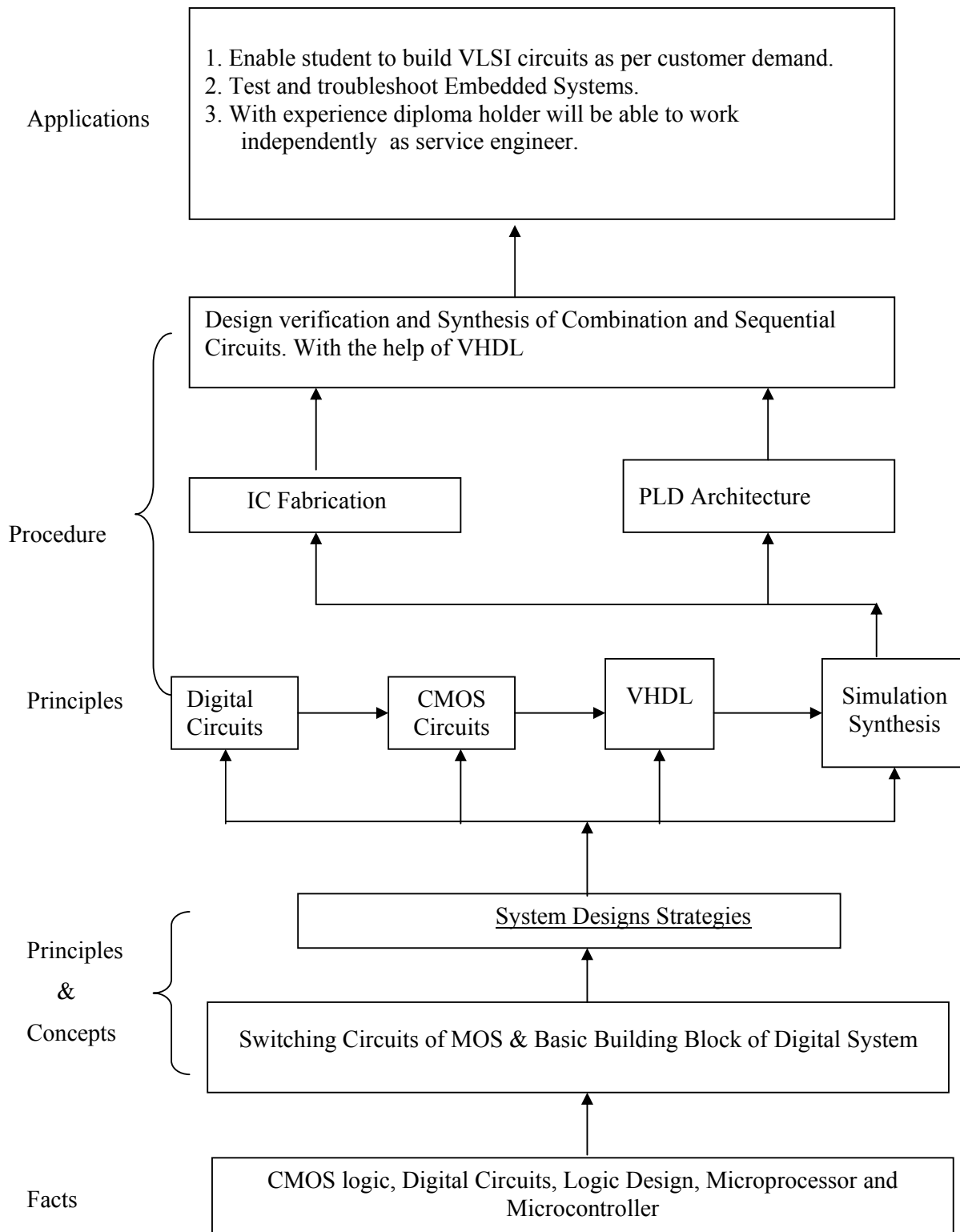
Rationale:

The influence of integrated-circuit technology in the past few years on our society has been pervasive, in area ranging from consumer products to business management to manufacturing control. The driving force behind this pervasiveness is that the functional capability of modern integrated circuitry has increased in scope and complexity exponentially with time over the past 20 years. The designers of modern integrated circuitry have continually endeavored to provide more computational speed with less dissipated electrical power and less circuit board area, while maintaining a low failure rate and an aggressive cost. The complexity and speed is finding ready application for VLSI systems in digital processing. Although silicon MOS-based circuitry will meet most requirements in such systems .The student can acquire knowledge in the design skill of combinational and sequential circuit with the help of VHDL and CMOS Logic circuit processing operation, student can use this knowledge as technician, supervisor and programmer in different sections of industry

Objectives: The students will be able to:

1. Understand fundamental issues of VLSI technology and to appreciate the limitations imposed by the processing technology on the VLSI circuit designer.
2. Understand system design strategies and their implementation via automated techniques and high level design language.
3. Understand the principles of design verification and testing.

4. Appreciate how the preceding objectives are drawn together in CMOS subsystems design.

Learning Structure:

Applications
- 1. Enable student to build VLSI circuits as per customer demand.
- 2. Test and troubleshoot Embedded Systems.
- 3. With experience diploma holder will be able to work independently as service engineer.

Procedure — Design verification and Synthesis of Combination and Sequential Circuits. With the help of VHDL

IC Fabrication   PLD Architecture

Principles — Digital Circuits → CMOS Circuits → VHDL → Simulation Synthesis

Principles & Concepts — System Designs Strategies

Switching Circuits of MOS & Basic Building Block of Digital System

Facts — CMOS logic, Digital Circuits, Logic Design, Microprocessor and Microcontroller

Contents: Theory

Chapter	Name of the Topic	Hours	Marks

01	**VLSI CONCEPT AND TECHNLOGY**
	1.1 Very Large Scale Integration (VLSI) Technology
	1.1.1 Classification of IC Technology- SSI, MSI, LSI, VLSI, ULSI.
	1.1.2 MOSFET's current equation in Linear & Saturation Mode
	1.1.3 Threshold voltage- Definition, Derivation of Threshold voltage(Numericals)
	1.1.4 Body effect & effect of body effect on Threshold voltage.
	1.1.5 Short channel effect
	    a) Channel length modulation
	    b) Hot electron effect
	    c) Mobility variation effect
		06	08

	1.2 VLSI Concepts 1.2.1 Resistance & capacitance estimation of MOSFET 1.2.2 C-V (capacitance-voltage) characteristics of MOS capacitor 1.2.3 Principle of MOS scaling, types of scaling, functional limitation of scaling 1.2.4 Wafer Processing with C-Z method 1.2.5 Definition & Application of Mask generation, Oxidation, Diffusion, Ion Implantation, Metallization, Photolithography in MOSFET 1.2.6 Basic process steps of n-MOS 1.2.7 Basic process steps of CMOS (n Well, p Well & Twin Tube) 1.2.8 Latch up in CMOS and its prevention	08	20
02	**MOS Inverters** 2.1 Aspect ratio and Inverter ratio 2.2 n-MOS inverter with resistive load 2.3 n-MOS inverter with EMD load 2.4 n-MOS inverter with DMD load 2.5 CMOS inverter. 2.6 Logic Gates using n-MOS & CMOS.(Only circuit diagram & operation) 2.7 Realization of any Boolean equation using n-MOS & CMOS	04	12
03	**Finite state machines (FSM)** 3.1 Moore and Mealey machines: Implementation of circuits using Moore and Mealey machines.	06	12
04	**Architecture of ASIC and PLD** 4.1 CPLD -Xilinx and Atmel series architecture, Details of internal block diagram 4.2 Introduction to FPGA like Xilinx (FPGA), SPARTAN 3 series and Atmel	06	12
05	**Hardware Description Language (HDL)** 5.1 Features of Verilog-Entity, Architecture, Configuration, Package, Bus, Driver, Attributes Process 5.2 Behavioral Modeling, Sequential Processing, Data Types, Configurations.	06	12

06	**Simulation, Testing and Synthesis using VHDL** 6.1 Simulation Issues 6.2 Testing Issues 6.3 Synthesis Issues	06	12
07	***Hardware Modeling examples (operation & block Testing)*** 7.1 Different styles of modeling 7.2 Modeling simple elements 7.3 Modeling conditional operators 7.4 Modeling combinational logic 7.5 Modeling regular structure 7.6 Modeling synchronous logic	06	12
	Total	**48**	**100**

Practical:

Skills to be developed:

Intellectual Skills:

1. Program Design, Verification, Testing and Synthesis skills

Motor Skills:

1. FPGA Selection, system level Diagnosis,

List of Practical:

1.   Design ,verify, test, Synthesize basic gates using VHDL (Any Two)
2.   Design ,verify, test, Synthesize synchronous counter using FPGA
3.   Design ,verify, test, Synthesize Scrolling of data on seven segment display using FPGA
4.   Interface ADC-DAC using FPGA
5.   Generation of Ramp using DAC using FPGA
6.   Temperature sensing using ADC-DAC using FPGA
7.   Stepper motor controller using FPGA
8.   8:1 multiplexer using FPGA
9.   2:4 Decoder using FPGA
10. 8:3 Encoder using FPGA

List of Practice Oriented Projects (Any One):

11.   4 bit ALU using FPGA
12.   LCD controller using FPGA
13.   Lift controller using FPGA

List of Equipments:

Hardware using FPGA's of the Spartan-II & Vertex series from Xilinx or Atmel series

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publication
01	Eugene D. Fabricius	Introduction To Vlsi Design	Mcgraw-Hill
02	Neil H. E. Weste Kamran Eshraghian	Principals Of Cmos Vlsi Design	Pearson Education
03	Douglas A. Pucknell, Kamran Eshraghian	Basic Vlsi Design	Prentice Hall Of India
04	Douglas Perry	Vhdl	Mcgraw-Hill
05	Xilinx	Xilinx Manual	Www.Xilinx.Com
06	John F. Wakerly	Digital Design	Prentice Hall Of India

2. Websites: http://www.xilinx.com

http://www.atmel.com

3. Magazines: 1. VLSI Society of India, Texas Instruments (India) Pvt. Ltd, C V Raman Nagar, Bangalore 560093

2. E E Times: www.vlsi-india.net

3. I. E. E.E.: VLSI Designers Interface

Course Name : Electronics Engineering Group

Course Code : ET/EJ/EN/EX/ED/EI

Semester   : Sixth for ET/EJ/EN/EX and Seventh for ED/EI

Subject Title : Embedded Systems (Elective-II)

Subject Code : 12269

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	25#	25@	150

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)**
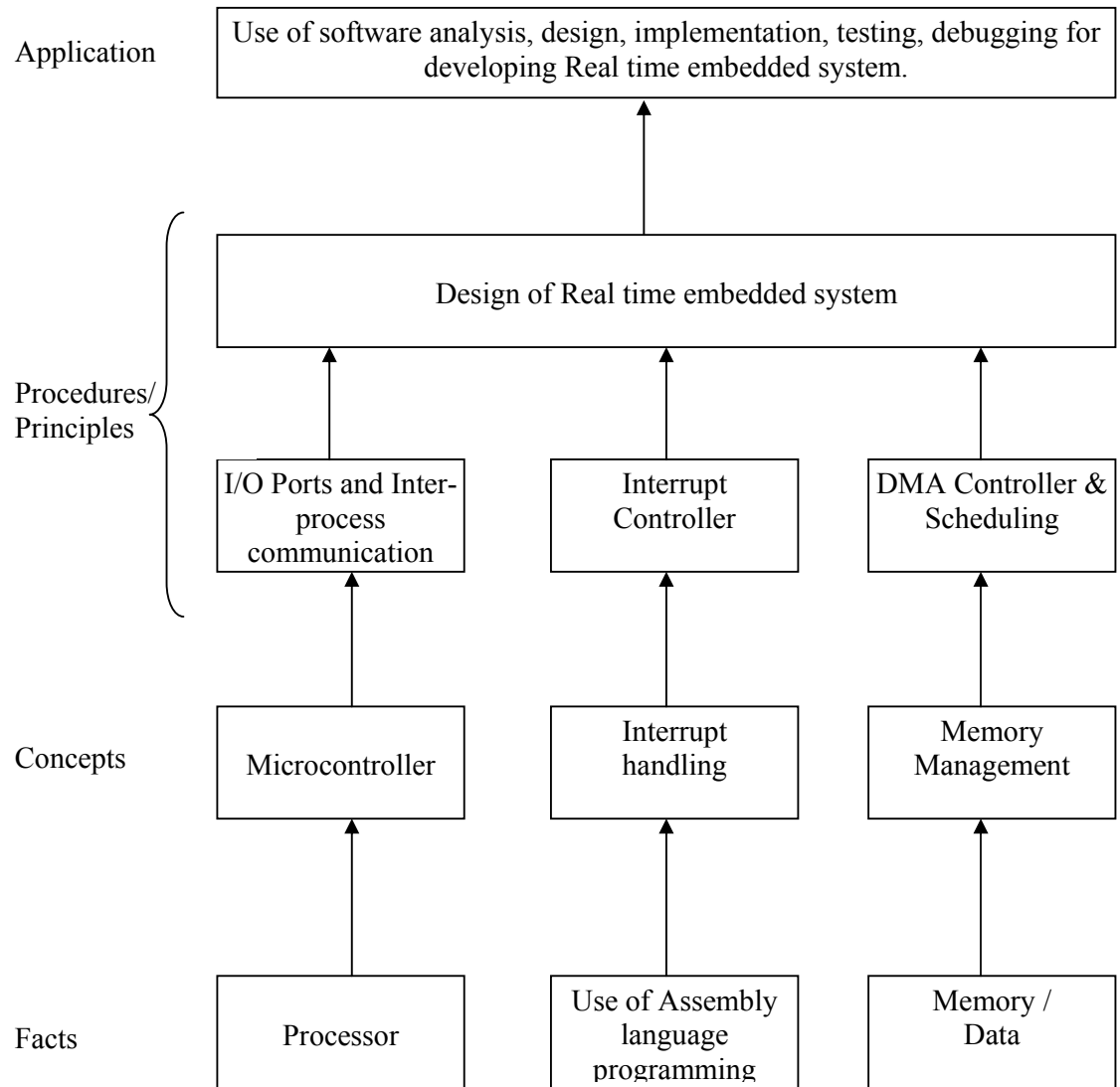
Rationale:

The study of embedded systems is essential part of Computer Science. It deals with computer hardware with software embedded in it. This subject will enable student to develop logical thinking and use of "Firmware". It is practical oriented subject having theoretical prerequisites of Microprocessor, Digital Techniques, Data Structures and Computer Architecture. Students will be able to develop Real Time Systems, Device drivers, use interrupt service mechanism, program timing and counting devices and develop embedded C-Programs for Microcontroller.

Objectives:

The student will be able to:

  1. Access embedded systems hardware units like processor, I/O device, On-chip and Off-chip device, Power supply etc.
  2. Interface various devices using ports.
  3. Write embedded program.
  4. Develop programmable interrupt controller.
  5. Perform software analysis, design, implementation, testing, debugging for embedded systems.

Learning Structure:

Application

> Use of software analysis, design, implementation, testing, debugging for developing Real time embedded system.

Procedures/
Principles

> Design of Real time embedded system

I/O Ports and Inter-process communication	Interrupt Controller	DMA Controller & Scheduling

Concepts

Microcontroller	Interrupt handling	Memory Management

Facts

Processor	Use of Assembly language programming	Memory / Data

Contents: Theory

Chapter	Name of the Topic	Hours	Marks
01	**8051 I/O Ports & Interrupts** 1.1 8051 Parallel I/O Ports 1.2 Interrupt handling & programming: concept of synchronous & asynchronous interrupts, ISR, programming external hardware interrupt & Timer interrupt. Timer Mode 1 and Mode 2	10	20
02	**Introduction to Communication Protocol** 2.1 Serial Communication – Study of SBUF, SMOD, SCON, PCON registers & programming for serial communication. 2.2 Serial protocols: I2C, CAN, 2.3 Introduction to ARM7-TDMI; Architecture of Arm7 TDMI Processor. 2.5 Advanced Serial and Parallel High Speed Bus	12	20
03	**Embedded System** 3.1 Introduction, different Hardware Units, advantages like Reliability, efficiency and cost, Applications. 3.2 Software & Hardware development tools , IDE, Compiler, Debugger, Simulator, Emulator, In circuit Emulator(ICE),Target Board, Device Programmer 3.3 Embedded software development cycle; Software Embedded in System	06	16
04	**Device Driver & Interfacing Applications** 4.1 Concept of Device Driver 4.2 Interfacing of seven segment display & LCD display Interfacing diagram & pin out of LCD 4.3 Interfacing of Key board, ADC & DAC- interfacing diagram & programming. 4.4 Interfacing of stepper motor- interfacing diagram & programming.	18	30
05	**RTOS & Interprocess Communication** 5.1 Concepts of RTOS 5.2 Requirement, Need, Specification of RTOS in Embedded systems 5.3 Multitasking 5.4 Task synchronization & Mutual Exclusion 5.5 Starvation, Deadlock, Multiple process 5.6 Interprocess Communication	12	14
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual skills:

1. Use of programming language constructs in program implementation.
2. To be able to apply different logics to solve given problem.
3. To be able to write program using different implementations for the same problem
4. Study different types of errors as syntax semantic, fatal, linker & logical
5. Debugging of programs
6. Understanding different steps to develop program such as
   - Problem definition

- ▪ Analysis
- ▪ Design of logic
- ▪ Coding
- ▪ Testing
- ▪ Maintenance (Modifications, error corrections, making changes etc.)

Motor skills:

1. Proper handling of Computer System.

List of Practical

       Students undertaking project based on Microcontroller should perform any 8 practical from the list given.

       Students not undertaking Microcontroller based project should perform 9 practical in which practical number 10 & 11(Stepper Motor interfacing & ADC Interfacing) are compulsory.

1. Development and execution of the program for sending data on port lines.
2. Development and execution of the program for arithmetic operation and time delay.
3. Development and execution of the program for input and output operation.
4. Development and execution of the program for interface LEDs to particular port.
5. Development and execution of the program to generate a square wave on port.
6. Development and execution of the program for logical operators and data conversion.
7. Development and execution of the program PWM waveform generation.
8. Development and execution of the program to display "MSBTE" message on LCD (16x2).
9. To write 8051 C program to send "WELCOME" on serial port continuously.
10. Interface Stepper Motor to Microcontroller 8051 and development and execution of the program to run stepper motor.
11. Interface ADC to Microcontroller 8051 and development and execution of the program to display digital equivalent of analog input
12. Interface DAC to Microcontroller 8051 and development and execution of the program to generate specified voltage.

Learning Resources:
Books:

Sr. No.	Author Title Publisher	Title	Publisher
1	Raj Kamal	Embedded Systems	Tata McGraw Hill
2	Muhammad Ali Mazidi, Janice Gillispie Mazidi	The 8051 Microcontroller And Embedded Systems	PHI
3	Ajay V Deshmukh	Microcontrollers (Theory And Applications)	Tata McGraw Hill
4	Kenneth J. Ayala	The 8051 Microcontroller	PRI
5	Frank Vahid, Toney Givargis	Embedded System Design: A unified Hardware/Software Introduction	John Wiley
6	David E. Simon	An Embedded Software Primer	Pearson Education

Course Name : Electronics Engineering Group

Course Code : EJ/ET/EX/EN/DE/ED/EI

Semester   : Sixth for ET/EJ/EN/EX/DE and Seventh for ED/EI

Subject Title : Telematics (Elective-II)

Subject Code : 12274

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	25#	25@	150

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)**

Rational:

In the telecommunication field still the landline telecommunication users are in huge amount because of clear and cheap service, so it becomes very essential to learn the different landline services, operations, and maintenance of telephone system.
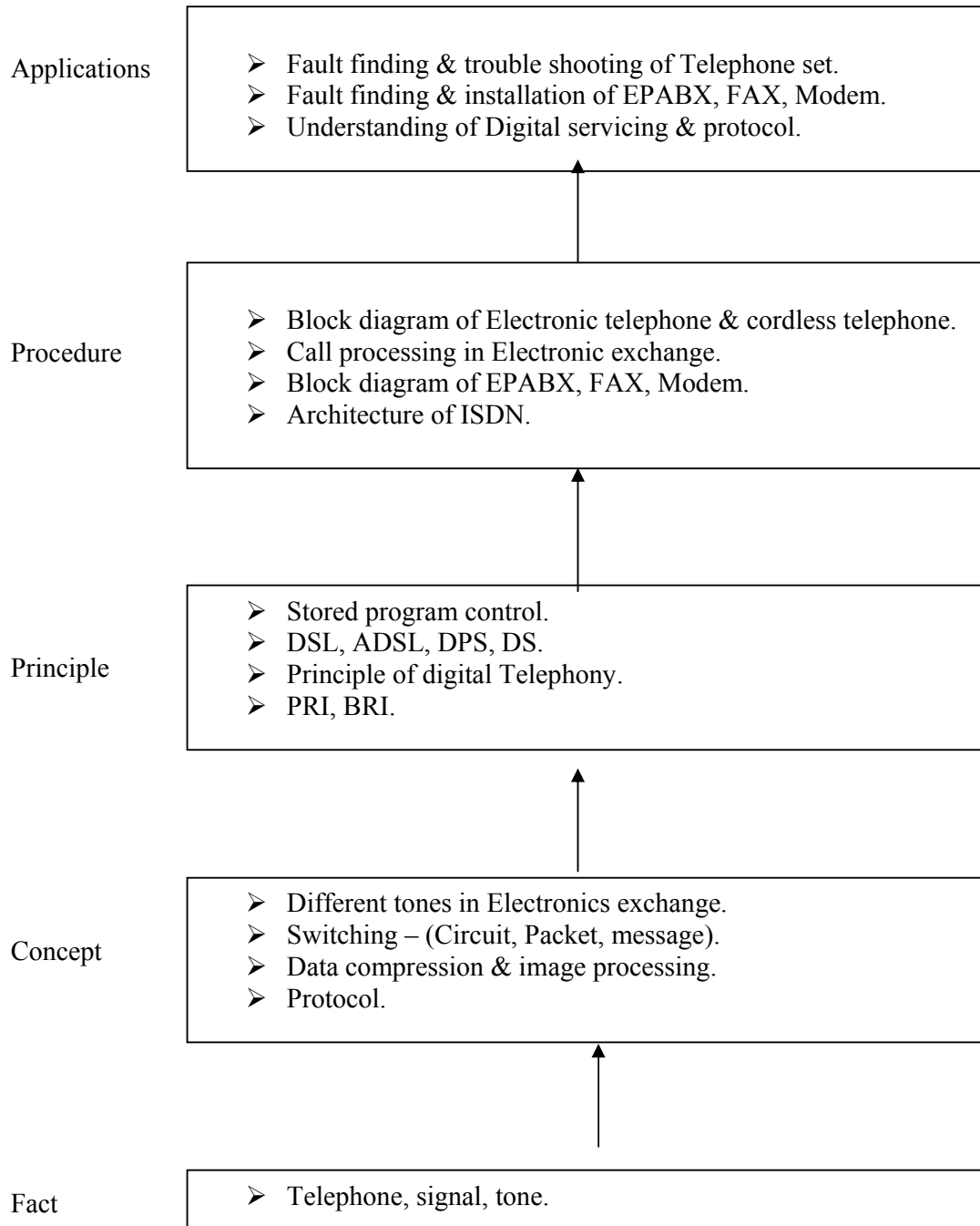
This subject is a technology subject which expert the student for fault finding, servicing & maintaining the telephone instrument and EPABX system.

This subject covers the telephone instrument, switching, EPABX, cordless telephone, Fax, modem & ISDN.

Objectives:

The student will be able to:

1. Identify different sections of telephone receiver.
2. Identify different tones used in telephone exchange.
3. Describe operation of cordless telephone.
4. Explain different digital switching system.
5. Explain analog and digital services.
6. Explain Principle and services provided by ISDN.
7. Install EPABX system.
8. Explain the operation of FAX and modem.

Learning Structure:

Applications
> - Fault finding & trouble shooting of Telephone set.
> - Fault finding & installation of EPABX, FAX, Modem.
> - Understanding of Digital servicing & protocol.

Procedure
> - Block diagram of Electronic telephone & cordless telephone.
> - Call processing in Electronic exchange.
> - Block diagram of EPABX, FAX, Modem.
> - Architecture of ISDN.

Principle
> - Stored program control.
> - DSL, ADSL, DPS, DS.
> - Principle of digital Telephony.
> - PRI, BRI.

Concept
> - Different tones in Electronics exchange.
> - Switching – (Circuit, Packet, message).
> - Data compression & image processing.
> - Protocol.

Fact
> - Telephone, signal, tone.

Contents: Theory

Chapter	Name of the Topic	Hours	Marks

01	**Telephone Instrument and signals**
	1.1 Introduction.
	1.2 Telephone receiver
	    1.2.1. Block diagram & operation of electronic telephone.
	1.3 Tones used in telephone exchange dial tones, busy tone, ring tone, number unobtainable tone.
	1.4 Touch tone (DTMF)
	1.5 Block diagram of cordless telephone system
	    1.5.1 Frequency allocation.
		04	12

02	**Digital Switching System.** 2.1 Introduction 2.2 Classification of switching system 2.3 Telecommunication network – trunks, subscriber lines, 2.4 Basic of switching system.- Inlets, outlets symmetric network, folded network, blocking network, non blocking network 2.4.1 Elements of Switching system 2.5 SPC (Stored program control) 2.6 Centralize SPC 2.7 Distributed SPC 2.8 Enhanced services 2.9 Telephone Network 2.9.1 Subscribers loop system – MDF,MF, FP, BF,DP,DC,DW 2.9.2 Switching Hierarchy routing 2.9.3 Numbering plan- Telephone number.	08	20

03	**Analog, Digital Services and Applications of Telecommunication**.(only informative treatment)
	3.1 Analog services – Switched, leased, local call service, Toll call services, 800 services, WATs, 900 services.
	3.2 Digital services- switched / 56, Digital data service (DDS), Digital signal services (DS).
	3.3 Digital subscriber line (DSL) – ADSL.
	3.4 Business applications of telecommunication
	    3.4.1 Automated teller machines(ATM)
	    3.4.2 Videoconferencing
	    3.4.3 Banking, Shopping
	    3.4.4 Telecommuting
	    3.4.5 Distance Learning, Telemedicine
		08	08

04	**ISDN.** 4.1 Motivation for ISDN 4.2 Services provide by ISDN. 4.3 X. 400 family of standards 4.4 Architecture of ISDN. 4.5 ISDN rate access interface	08	28

	4.5.1 Primary rate access (PRI) interface.
	    4.5.2 Basic rate access (BRI) interface
	4.6 Message format for ISDN
	4.7 ISDN address structure
	4.8 Broad band ISDN.
	4.9 Introduction to FAX
	4.10 Working principle of FAX.
	4.11 Image processing.
	4.12 Data compression
	4.13 Block diagram & operation of FAX machine.
	4.15 Introduction to Modem.
	4.16 Working principle of Modem.
	4.17 Types of Modem- Synchronous, A Synchronous, half
	      duplex & full duplex.
	4.18 Block schematic of Modem.
	4.19 ADSL & cable Modem		

05	Telephone Instrument (DTMF) 5.1 Tone Type 5.2 MF 5.3 Wireless Telephone 5.4 ISDN Installation 5.5 ISDN Procedure 5.6 ISDN telephone 5.7 Conferencing 5.8 Internet	04	08

06	EPABX (Electronic private automatic business exchange).
	5.1 Block diagram
	5.2 Signal Processing (working)
	      5.2.1 Analog CMOS cross point switch.
	      5.2.2 Digital TDM / PCM switch.
	      5.2.3 Installation procedure for EPABX.
		08	12

07	EPABX 7.1 Installing Procedure 7.2 Programming on Console, on terminal, on computer 7.3 Maintenance technique 7.4 Voice Over IP Phone 7.5 Wiring Diagram	08	12
	Total	**48**	**100**

Practical:
Skills to be developed:

Intellectual Skills:
1.   Reading
2.   Sourcing of Web sites

Motor Skill:
1.   Testing
2.   Measurement

List of Practical:

1. Testing and installation of fixed telephone

2. Testing and installation of cordless telephone

3. Visit to Telephone exchange and prepare report.

4. Draw the layout of given EPABX system.

5. Installation and testing of EPABX system.

6. Preparation and installation of wiring layout using MDF, CT boxed box.

7. Installation of FAX machine.

8. Installation of MODEM.

Learning Resources:
Books:

Sr. No.	Author	Title	Publisher
01	T. Vishwanathan	Telecommunication switching systems and networks	Prentice Hall of India
02	Louis E. Frenzel	Communication Electronics	Tata McGraw-Hill
03	Behrouz A. Forouzan	Data Communication working	Tata McGraw-Hill
04	N.N Biswas	Principle of Telephony	--
05	H. Carr and C. Snyder	Management of Telecommunication	Tata McGraw-Hill