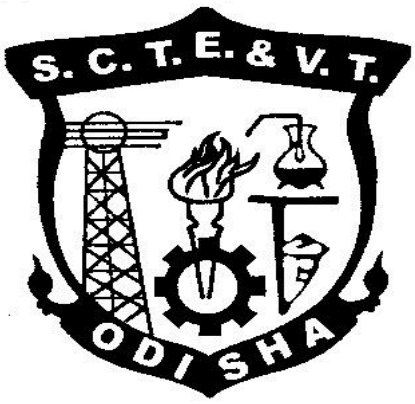
CURRICULLUM OF 5th SEMESTER

For

DIPLOMA IN Electronics & Tele-Communication

ENGINEERING

(Effective FROM 2020-21 Sessions)



STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 5th Semester (Electronics & TeleCommunication) (wef. 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4		-	20	80	3	100
Th.2		VLSI & EMBEDDED SYSTEM	4		-	20	80	3	100
Th.3		ANALOG & DIGITAL COMMUNICATION	5		-	20	80	3	100
Th.4		WAVE PROPAGATION & BROADBAND COMMUNICATION ENGINEERING	4			20	80	3	100
Th.5		POWER ELECTRONICS & PLC*	4			20	80	3	100
		Total	21			100	400	-	500
		Practical							
Pr.1		ANALOG & DIGITAL COMMUNICATION LAB	-	-	3	25	25	3	50
Pr.2		VLSI & EMBEDDED SYSTEM LAB	-	-	3	25	25	3	50
Pr.3		WAVE PROPAGATION & COMMUNICATION ENGINEERING LAB			3	25	25	3	50
Pr.4		POWER ELECTRONICS LAB	-	-	3	25	25	3	50
Pr.5		PROJECT Phase- I		-	4	50	-	-	50
		Student Centred Activities(SCA)			2				
		Total	-	-	*18*	*150*	*100*	-	*250*
		Grand Total	**21**		**18**	**250**	**500**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical. Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/ SWAYAM etc. Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject.
Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship
   - Characteristics, Qualities and Types of entrepreneur, Functions
   - Barriers in entrepreneurship
   - Entrepreneurs vrs. Manager
   - Forms of Business Ownership: Sole proprietorship, partnership forms and others
   - Types of Industries, Concept of Start-ups
   - Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
   - Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

4. **Management Principles**
- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

5. **Functional Areas of Management**

a) Production management
- Functions, Activities
- Productivity
- Quality control
- Production Planning and control

b) Inventory Management
- Need for Inventory management
- Models/Techniques of Inventory management

c) Financial Management
- Functions of Financial management
- Management of Working capital
- Costing (only concept)
- Break even Analysis
- Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

d) Marketing Management
- Concept of Marketing and Marketing Management
- Marketing Techniques (only concepts)
- Concept of 4P s (Price, Place, Product, Promotion)

e) Human Resource Management
- Functions of Personnel Management
- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

a) Leadership
- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation
- Definition and characteristics
- Importance of motivation
- Factors affecting motivation
- Theories of motivation (Maslow)

- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**

- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
b) Features of Factories Act 1948 with Amendment (only salient points)
c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**

- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

Th.2 VLSI & EMBEDDED SYSTEM

Theory	: 4 Periods per week	I.A.	: 20 Marks
Total Periods	: 60 Periods	Term End Exam	: 80 Marks
Examination	: 3 Hours	TOTAL MARKS	: 100 Marks

Chapter wise Distribution of periods with Total periods

Sl.No.	Topics	Periods
1.	Introduction to VLSI & MOS Transistor	12
2.	Fabrication of MOSFET	10
3.	MOS Inverter	09
4.	Static Combinational, Sequential, Dynamics logic circuits& Memories	15
5.	System Design method & Synthesis	04
6.	Introduction to Embedded Systems	10
	TOTAL	60

Rationale:

Due to rapid advances in integration technology, VLSI is one of the most widely used technologies for microchip processors, integrated circuits (IC) and component designing. This circuits are used everywhere, real applications include microprocessors in a personal computer or workstation, chips in a graphic card, digital camera or camcorder, chips in a cell phone or a portable computing device, and embedded processors in an automobile etc. It was initially designed to support hundreds of thousands of transistor gates on a microchip. This includes features of Microprocessors and its Standards. This design is to help the idea about Logic design including testing & simulation. Processors applied today are in embedded systems, and are no longer visible to the customer as 'computers' in the ordinarysense. New processors and methods of processing, sensors, actuators, communications and infrastructures are 'enablers' for this very pervasive computing. But an embedded system is a dedicated computer system designed for one or two specific functions & controller that sits within a larger system in order to perform a dedicated function. They are used in a host of modern devices, including household machines such as microwaves, toasters and washing machines. At present Arduino micro controller will execute all operations in a sequential fashion whereas an FPGA is a field programmable gate array which will execute all your operations in parallel fashion. Further *Raspberry Pi* on the other hand is a reconfigurable chip which you can use to make any chip(digital) that you want and FPGA get this power using loads of configurable blocks containing resources like LUTs, MUX, DSPs, RAM etc. and connecting them together.

Objective:

After completion of this course the students will be able to:

1. Understand concept of the VLSI design.
2. Understand device level implementation of digital gates.
3. Understand the combinational circuit design and optimizing of the gate
4. Design a combinational circuit for any custom made application
5. Explain the building blocks for the combinational circuit
6. Understand the VHDL code and circuit design process.
7. Develop a VHDL code for any combinational circuit
8. Answer the VHDL primitives and the importance of VHDL code in a digital circuit
9. Understand the functionality of various flip flops
10. Design of a sequential circuit for any custom made application
11. Understand concept of MOS, Transistor & Invertors.
12. Understand concept of the system design methods.
13. Learn about the concept of Embedded System & Different Technology.
14. Understand concept of the application of Embedded System.

Detailed Contents:

Unit-1: Introduction to VLSI & MOS Transistor

1.1 Historical perspective- Introduction
1.2 Classification of CMOS digital circuit types
1.3 Introduction to MOS Transistor& Basic operation of MOSFET.
1.4 Structure and operation of MOSFET (n-MOS enhancement type) & COMS
1.5 MOSFET V-I characteristics,
1.6 Working of MOSFET capacitances.
1.7 Modelling of MOS Transistors including Basic concept the SPICE level-1 models, the level-2 and level-3 model.
1.8 Flow Circuit design procedures
1.9 VLSI Design Flow & Y chart
1.10 Design Hierarchy
1.11 VLSI design styles-FPGA, Gate Array Design, Standard cells based, Full custom

Unit-2: Fabrication of MOSFET

2.1 Simplified process sequence for fabrication
2.2 Basic steps in Fabrication processes Flow
2.3 Fabrication process of nMOS Transistor
2.4 CMOS n-well Fabrication Process Flow
2.5 MOS Fabrication process by n-well on p-substrate
2.6 CMOS Fabrication process by P-well on n-substrate
2.7 Layout Design rules
2.8 Stick Diagrams of CMOS inverter

Unit-3: MOS Inverter

3.1 Basic nMOS inverters,
3.2 Working of Resistive-load Inverter
3.3 Inverter with n-Type MOSFET Load – Enhancement Load, Depletion n-MOS inverter
3.4 CMOS inverter – circuit operation and characteristics and interconnect effects: Delay time definitions
3.5 CMOS Inventor design with delay constraints – Two sample mask lay out for p-type substrate.

Unit-4: Static Combinational, Sequential, Dynamics logic circuits & Memories

4.1 Define Static Combinational logic ,working of Static CMOS logic circuits (Two-input NAND Gate)
4.2 CMOS logic circuits (NAND2 Gate)
4.3 CMOS Transmission Gates(Pass gate)
4.4 Complex Logic Circuits - Basics
4.5 Classification of Logic circuits based on their temporal behaviour
4.6 SR Flip latch Circuit,
4.7 Clocked SR latch only.
4.8 CMOS D latch.
4.9 Basic principles of Dynamic Pass Transistor Circuits
4.10 Dynamic RAM, SRAM,
4.11 Flash memory

Unit-5: System Design method & synthesis

5.1 Design Language (SPL & HDL)& HDL & EDA tools & VHDL and packages Xlinx
5.2 Design strategies & concept of FPGA with standard cell based design
5.3 VHDL for design synthesis using CPLD or FPGA
5.4 Raspberry Pi - Basic idea

Unit-6: Introduction to Embedded Systems

6.1 Embedded Systems Overview,list of embedded systems,characteristics ,example – A Digital Camera

6.2 Embedded Systems Technologies--Technology – Definition
-Technology for Embedded Systems
-Processor Technology
-IC Technology

6.3 Design Technology-Processor Technology,General Purpose Processors – Software, Basic Architecture of Single Purpose Processors – Hardware

6.4 Application – Specific Processors,Microcontrollers,Digital Signal Processors(DSP)

6.5 IC Technology- Full Custom / VLSI,Semi-Custom ASIC (Gate Array & Standard Cell), PLD (Programmable Logic Device)

6.6 Basic idea of Arduino micro controller

Coverage of Syllabus upto Internal Exams

Chapter 1,2,3,4

Books Recommended:

1. COMS Digital integrated Circuits –Analysis & Design –Sung Mo-Kang &YussufLeblebici, TMH.
2. VLSI Design AND EDA Tools by A. Sarkar,S.De,Chandran Kumar Sarkar –SCITECH (Reference)
3. Embedded System Design –Frank Vahid& Tony Givargis-WILEY India.
4. VLSI Design by Sakthiver. R – S chand. (Reference)
5. VHDL Programing by Example by Douglas L. Perry-TMH

Th.3 - ANALOG & DIGITAL COMMUNICATION

Theory	: 5 Periods per week	I.A.	: 20 Marks
Total Periods	: 75 Periods	Term End Exam	: 80 Marks
Examination	: 3 Hours	TOTAL MARKS	: 100 Marks

Chapter wise Distribution of periods with Total periods

Sl.No.	Topics	Periods
1.	ELEMENTS OF COMMUNICATION SYSTEMS	10
2.	AMPLITUDE (LINEAR) MODULATION SYSTEM	15
3.	ANGLE MODULATION SYSTEMS	10
4.	AM & FM TRANSMITTER & RECEIVER	08
5.	ANALOG TO DIGITAL CONVERSION & PULSE MODULATION SYSTEM	17
6.	DIGITALMODULATION TECHNIQUES	15
	TOTAL	75

Rationale:

This subjects deals with different types of Analog & Digital Electronics Communication Systems includes basic processes, principles & methods of different Systems including Transmitters & Receivers for conveying messages/exchange information at a distance. When the communication needs to be established over a distance, then the analog signals are sent through wire, using different techniques for effective transmission. The conventional methods of communication used analog signals for long distance communications, which suffer from many losses such as distortion, interference, and other losses including security breach. In order to overcome these problems, the signals are digitized using different techniques. The digitized signals allow the communication to be more clear and accurate without loss. The challenges in digital transmission was to deal with the increased bandwidth requirement of digital signals. Analog Communication is a data transmitting technique in a format that utilizes continuous signals to transmit data including voice, image, video, electrons etc. An analog signal is a variable signal continuous in both time and amplitude which is generally carried by use of modulation. Digital communications is any exchange of data that transmits the data in a digital form. Communications done over the Internet is a form of digital communication. A digital communication system is designed to transport a message from an information source through a transmission medium (i.e., channel) to an information sink. The goal is to accomplish this task such that the information is efficiently transmitted with a certain degree of reliability.

Objective:

After completion of this course the students will be able to:

1. Understand the concept of modulation and classify modulation.
2. Discuss modulation & balanced modulators & Methods of generating SSB signal & vestigial side band signal.
3. Learn about the Frequency Division Multiplexing.
4. Learn about the AM & FM demodulators & AM & FM Radio transmitter & receiver
5. Learn about the Frequency modulation & expression for frequency-modulated signal.
6. Discuss the generation and detection of PAM, PWM & PPM system.
7. Learn about quantization of signal & quantization error
8. Study about generation & demodulation of PCM system & T carrier system.
9. Study about the concept of Time Division Multiplexing
10. Learn about the generation & demodulation of Delta modulation & Adoptive Delta modulation.
11. Discuss the generation and detection of binary ASKS, FSK, PSK, QPSK etc.
12. Learn about the working of Spread Spectrum Modulation Techniques.

Detailed Contents:

Unit-1: Elements of Communication Systems.

1.1 Communication Process- Concept of Elements of Communication System & its Block diagram
1.2 Source of information & Communication Channels.
1.3 Classification of Communication systems (Line & Wireless or Radio)
1.4 Modulation Process, Need of modulation and classify modulation process
1.5 Analog and Digital Signals & its conversion.
1.6 Basic concept of Signals & Signals classification (Analog and Digital)
1.7 Bandwidth limitation

Unit-2: Amplitude (linear) Modulation System

2.1 Amplitude modulation & derive the expression for amplitude modulation signal, power relation in AM wave & find Modulation Index.
2.2 Generation of Amplitude Modulation(AM)- Linear level AM modulation only
2.3 Demodulation of AM waves (liner diode detector, square law detector & PLL)
2.4 Explain SSB signal and DSBSC signal
2.5 Methods of generating & detection SSB-SC signal (Indirect method only)
2.6 Methods of generation DSB-SC signal (Ring Modulator) and detection of DSB-SC signal (Synchronous detection)
2.7 Concept of Balanced modulators
2.8 Vestigial Side Band Modulation

Unit-3: Angle Modulation Systems.

3.1 Concept of Angle modulation & its types (PM & FM)
3.2 Basic principle of Frequency Modulation & Frequency Spectrum of FM Signal.
3.3 Expression for Frequency Modulated Signal & Modulation Index and sideband of FM signal
3.4 Explain Phase modulation & difference of FM & PM)- working principle with Block Diagram
3.5 Compare between AM and FM modulation (Advantages & Disadvantages)
3.6 Methods of FM Generation (Indirect (Armstrong) method only) working principle with Block Diagram
3.7 Methods of FM Demodulator or detector (Forster-Seely & Ratio detector)- working principle with Block Diagram

Unit-4: AM & FM TRANSMITTER & RECEIVER

4.1 Classification of Radio Receivers
4.2 Define the terms Selectivity, Sensitivity, Fidelity and Noise Figure
4.3 AM transmitter - working principle with Block Diagram
4.4 Concept of Frequency conversion, RF amplifier & IF amplifier ,Tuning, S/N ratio
4.5 Working of super heterodyne radio receiver with Block diagram
4.6 Working of FM Transmitter & Receiver with Block Diagram.

Unit-5: ANALOG TO DIGITAL CONVERSION & PULSE MODULATION SYSTEM.

5.1 Concept of Sampling Theorem , Nyquist rate & Aliasing
5.2 Sampling Techniques (Instantaneous, Natural, Flat Top)
5.3 Analog Pulse Modulation - Generation and detection of PAM, PWM & PPM system with the help of Block diagram & comparison of all above.

5.4 Concept of Quantization of signal & Quantization error.

5.5 Generation & Demodulation of PCM system with Block diagram & its applications.

5.6 Companding in PCM & Vocoder

5.7 Time Division Multiplexing & explain the operation with circuit diagram.

5.8 Generation & demodulation of Delta modulation with Block diagram.

5.9 Generation & demodulation of DPCM with Block diagram.

5.10 Comparison between PCM, DM , ADM & DPCM

Unit-6: DIGITALMODULATION TECHNIQUES.

6.1 Concept of Multiplexing (FDM & TDM)- (Basic concept , Transmitter & Receiver) & Digital modulation formats.

6.2 Advantages of digital communication system over Analog system

6.3 Digital modulation techniques & types.

6.4 Generation and Detection of binary ASK, FSK, PSK, QPSK, QAM, MSK, GMSK.

6.5 Working of T1-Carrier system.

6.6 Spread Spectrum & its applications

6.7 Working operation of Spread Spectrum Modulation Techniques (DS-SS & FH-SS).

6.8 Define bit, Baud, symbol & channel capacity formula.(Shannon Theorems)

6.9 Application of Different Modulation Schemes.

6.10 Types of Modem & its Application

Coverage of Syllabus up to Internal Exams (I.A.)

Chapter 1,2,3,4

Books Recommended

1. Communication Systems (Analog & Didital) by Sanjay Sharma-KATSON

2. Communication System by V. Chandrasekhar-OXFORD Publication

3. Principle of Communication by Lovis E.frenzel.-TMG (Reference)

4. Advanced Communication by Thomasi.-PHI

5. Electronics Communication by G. Kennedy- MGH (Reference)

Th.4 WAVE PROPAGATION & BROADBAND COMMUNICATION ENGINEERING

Theory	: 4 Periods per week	I.A.	: 20 Marks
Total Periods	: 60 Periods	Term End Exam	: 80 Marks
Examination	: 3 Hours	TOTAL MARKS	:100 Marks

Chapter wise Distribution of periods with Total periods

Sl.No.	Topics	Periods
1.	WAVE PROPAGATION & ANTENNA	12
2.	TRANSMISSION LINES	10
3.	TELEVISION ENGINEERING	13
4.	MICROWAVE ENGINEERING	15
5.	BROADBAND COMMUNICATION	10
	TOTAL	60

Rationale:

Wave propagation is any of the ways in which waves travel with respect to the direction of the oscillation relative to the propagation direction, we can distinguish between longitudinal wave and transverse waves. For electromagnetic waves, propagation may occur in a vacuum as well as in a material medium. This course is designed to impact knowledge of Communication Engineering based on wave & Broadband communication. This course includes idea of Electromagnetic waves, Broadcast engineering is the field of electrical engineering, and now to some extent computer engineering and information technology, which deals with radio and television broadcasting. Audio engineering and RF engineering are also essential parts of broadcast engineering, being their own subsets of electrical engineering.Broadcast engineering involves both the studio end and the transmitteras well as remote broadcasts. Broadband communications is usually considered to be any technology with transmission rates above the fastest speed available over a telephone line. Broadband transmission systems typically provide channels for data transmissions in different directions and by many different users. Every station has a broadcast engineer, though one may now serve an entire station group in a city, or be a contract engineer who essentially free-lances his or her services to several stations This course is aimed at providing study of basic principle of Audio, Video, & TV System and its components including microphone, Loudspeaker. The recent developments in TV Technology has also in corporate

Objective:

After completion of this course the students will be able to:

1. Understand the concept of EM Wave and its effects of environment.
2. Understand the principles of working of antennas
3. Understand the theory of Propagation
4. Explain the concept of Wave propagation and antenna.
5. Explain the propagation of signal through transmission lines.
6. Explain the transmission of waves through rectangular wave-guide.
7. Discuss the losses, SWR & Impedance matching of transmission line.
8. Explain the fundamental principle of TV transmission and reception.
9. Explain the principle of working of TV camera. (CCTV)
10. Explain the principle of colour TV system.
11. Discuss the principle of Digital TV.
12. Discuss the principle of HDTV.

Detailed Contents:

Unit-1: WAVE PROPAGATION & ANTENNA

1.1 Effects of environments such as reflection, refraction, interference, diffraction, absorption and attenuation (Definition only)

1.2 Classification based on Modes of Propagation-Ground wave, Ionosphere ,Sky wave propagation, Space wave propagation

1.3 Definition – critical frequency, max. useable frequency, skip distance, fading, Duct propagation & Troposphere scatter propagation actual height and virtual height
1.4 Radiation mechanism of an antenna-Maxwell equation.
1.5 Definition - Antenna gains, Directive gain, Directivity, effective aperture, polarization, input impedance, efficiency, Radiator resistance, Bandwidth, Beam width, Radiation pattern
1.6 Antenna -types of antenna: Mono pole and dipole antenna and omni directional antenna
1.7 Operation of following antenna with advantage & applications.
a) Directional high frequency antenna : , Yagi & Rohmbus only
b) UHF &Microwave antenna.: Dish antenna (with parabolic reflector) & Horn antenna
1.8 Basic Concepts of Smart Antennas- Concept and benefits of smart antennas

Unit-2: TRANSMISSION LINES.

2.1 Fundamentals of transmission line.
2.2 Equivalent circuit of transmission line & RF equivalent circuit
2.3 Characteristics impedance, methods of calculations & simple numerical.
2.4 Losses in transmission line.
2.5 Standing wave – SWR, VSWR, Reflection coefficient, simple numerical.
2.6 Quarter wave & half wavelength line
2.7 Impedance matching & Stubs – single & double
2.8 Primary & secondary constant of X-mission line.

Unit-3: **TELEVISION ENGINEERING.**

3.1 Define-Aspect ratio, Rectangular Switching. Flicker, Horizontal Resolution, Video bandwidth, Interlaced scanning, Composite video signal, Synchronization pulses
3.2 TV Transmitter – Block diagram & function of each block.
3.3 Monochrome TV Receiver -Block diagram & function of each block.
3.4 Colour TV signals (Luminance Signal & Chrominance Signal,(I & Q,U & V Signals).
3.5 Types of Televisions by Technology- cathode-ray tube TVs, Plasma Display Panels, Digital Light Processing (DLP),Liquid Crystal Display (LCD),Organic Light-Emitting Diode (OLED) Display, Quantum Light-Emitting Diode (QLED) – **only Comparison based on application**
3.6 Discuss the principle of operation - LCD display, Large Screen Display.
3.7 CATV systems & Types & networks
3.8 Digital TV Technology-Digital TV Signals, Transmission of digital TV signals & Digital TV receiver Video programme processor unit.

Unit-4: MICROWAVE ENGINEERING.

4.1 Define Microwave Wave Guides.
4.2 Operation of rectangular wave gives and its advantage.
4.3 Propagation of EM wave through wave guide with TE & TM modes.
4.4 Circular wave guide.
4.5 Operational Cavity resonator.
4.6 Working of Directional coupler, Isolators & Circulator.
4.7 Microwave tubes-Principle of operational of two Cavity Klystron.
4.8 Principle of Operations of Travelling Wave Tubes
4.9 Principle of Operations of Cyclotron
4.10 Principle of Operations of Tunnel Diode & Gunn diode

Unit-5: Broadband communication

5.1 Broadband communication system-Fundamental of Components and Network architecture
5.2 Cable broadband data network- architecture, importance & future of broadband telecommunication internet based network.
5.3 SONET(Synchronous Optical Network)-Signal frame components topologies advantages applications, and disadvantages
5.4 ISDN - ISDN Devices interfaces, services, Architecture, applications,
5.5 BISDN -interfaces & Terminals, protocol architecture applications

Coverage of Syllabus upto Internal Exams

Chapter 1,2,3,4

Books Recommended:

1. Electronics Communication by G. Kennedy- MGH
2. Television & Video Engineering by A.M.Dhake, Tata McGraw Hill.
3. Broadband Communication System by AKUJUOBI & SADIKU (PHI)
4. Antennas and wave Propogation by John D Kraus,Ronald J Marhefka, Ahmad S Khan,TMG
5. Microwave & Radio Engg. By M.Kulkani-Ummesh Publication.
6. Microwave Engineering by Monojil Mitra – Dhanpat Rai& Co
7. Broadband Communication by Balaji Kumar (Reference)
8. Introduction to Broadband Communication Sysyem by Chapman & Hall (Reference)
9. Microwave Engineering by G.S.N. Raju,IKI (Reference)

TH.5 POWER ELECTRONICS AND PLC

(Common to Electrical and ETC)

Name of the Course: Diploma in Electrical Engineering			
Course code:	Th.5	Semester:	5th
Total Period:	60 Periods	Examination:	3 Hrs
Theory periods:	4 P / Week	Internal Assessment:	20
Tutorial:	-	End Semester Examination:	80
Maximum marks:	100		

A. Rationale:

The development of high power semiconductor devices has facilitated electronic control techniques for electrical power control in a simple, economic and efficient manner. Thus a new area of power electronics has now emerged which replaced the old and bulky method of power control through the use of small electronic devices. Power electronics application has occupied an indispensible position in industrial applications like heating, welding, uninterrupted power supply, battery charging etc. Industrial drives, lighting control are most efficiently controlled by power electronics devices to achieve optimum performance. The objective of this paper is to familiar students with the principles and operations of Power electronics devices in Industrial applications with drives control.

B. Objectives:

After completion of this subject the student will be able to:

1. Understand construction, working principle & application of various power electronics devices.
2. Know different gate triggering circuits and commutation methods.
3. Understand working principle of phase controlled rectifier.
4. Know the types and working principle of inverter.
5. Understand working principle and voltage control of chopper.
6. Understand frequency variation using Cyclo-converter.
7. Understand control principle of AC & DC industrial drive.
8. Know different application of SCR / Thyristor.
9. Concept in PLC & its Programming

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Understand The Construction And Working Of Power Electronic Devices	18
2.	Understand The Working Of Converters, Ac Regulators And Choppers.	12
3.	Understand The Inverters And Cyclo-Converters	08
4.	Understand Applications Of Power Electronic Circuits	10
5.	PLC And Its Applications	12
	Total	**60**

D. COURSE CONTENT:

1. UNDERSTAND THE CONSTRUCTION AND WORKING OF POWER ELECTRONIC DEVICES

1.1 Construction, Operation, V-I characteristics & application of power diode, SCR, DIAC,TRIAC, Power MOSFET,GTO &IGBT
1.2 Two transistor analogy of SCR.
1.3 Gate characteristics of SCR.
1.4 Switching characteristic of SCR during turn on and turn off.
1.5 Turn on methods of SCR.
1.6 Turn off methods of SCR (Line commutation and Forced commutation)
  1.6.1 Load Commutation
  1.6.2 Resonant pulse commutation
1.7 Voltage and Current ratings of SCR.
1.8 Protection of SCR
  1.8.1 Over voltage protection

1.8.2 Over current protection
1.8.3 Gate protection

1.9 Firing Circuits
1.9.1 General layout diagram of firing circuit
1.9.2 R firing circuits
1.9.3 R-C firing circuit
1.9.4 UJT pulse trigger circuit
1.9.5 Synchronous triggering (Ramp Triggering)

1.10 Design of Snubber Circuits

2. UNDERSTAND THE WORKING OF CONVERTERS, AC REGULATORS AND CHOPPERS.

2.1 Controlled rectifiers Techniques(Phase Angle, Extinction Angle control), Single quadrant semi converter, two quadrant full converter and dual Converter
2.2 Working of single-phase half wave controlled converter with Resistive and R-L loads.
2.3 Understand need of freewheeling diode.
2.4 Working of single phase fully controlled converter with resistive and R- L loads.
2.5 Working of three-phase half wave controlled converter with Resistive load
2.6 Working of three phase fully controlled converter with resistive load.
2.7 Working of single phase AC regulator.
2.8 Working principle of step up & step down chopper.
2.9 Control modes of chopper
2.10 Operation of chopper in all four quadrants.

3. UNDERSTAND THE INVERTERS AND CYCLO-CONVERTERS

3.1 Classify inverters.
3.2 Explain the working of series inverter.
3.3 Explain the working of parallel inverter
3.4 Explain the working of single-phase bridge inverter.
3.5 Explain the basic principle of Cyclo-converter.
3.6 Explain the working of single-phase step up & step down Cyclo-converter.
3.7 Applications of Cyclo-converter.

4. UNDERSTAND APPLICATIONS OF POWER ELECTRONIC CIRCUITS

4.1 List applications of power electronic circuits.
4.2 List the factors affecting the speed of DC Motors.
4.3 Speed control for DC Shunt motor using converter.
4.4 Speed control for DC Shunt motor using chopper.
4.5 List the factors affecting speed of the AC Motors.
4.6 Speed control of Induction Motor by using AC voltage regulator.
4.7 Speed control of induction motor by using converters and inverters (V/F control).
4.8 Working of UPS with block diagram.
4.9 Battery charger circuit using SCR with the help of a diagram.
4.10 Basic Switched mode power supply (SMPS) - explain its working & applications

5. PLC AND ITS APPLICATIONS

5.1 Introduction of Programmable Logic Controller(PLC)
5.2 Advantages of PLC
5.3 Different parts of PLC by drawing the Block diagram and purpose of each part of PLC.
5.4 Applications of PLC
5.5 Ladder diagram
5.6 Description of contacts and coils in the following states
i)Normally open ii) Normally closed iii) Energized output iv)latched Output v) branching
5.7 Ladder diagrams for i) AND gate ii) OR gate and iii) NOT gate.
5.8 Ladder diagrams for combination circuits using NAND,NOR, AND, OR and NOT
5.9 Timers-i)T ON ii) T OFF and iii)Retentive timer
5.10 Counters-CTU, CTD
5.11 Ladder diagrams using Timers and counters
5.12 PLC Instruction set
5.13 Ladder diagrams for following
(i) DOL starter and STAR-DELTA starter (ii) Stair case lighting (iii) Traffic light Control (iv) Temperature Controller

5.14 Special control systems- Basics DCS & SCADA systems

5.15 Computer Control–Data Acquisition, Direct Digital Control System (Basics only)

Syllabus coverage up to Internal assessment

Chapters: 1 and 2.

Learning Resources:			
Sl.No	***Title of the Book***	***Name of Authors***	***Name of the Publisher***
1.	*Power Electronics*	*Dr. P. S. Bhimbhra*	*Khanna Publisher*
2.	*Modern Power Electronics and AC Drives*	*B.K.Bose*	*PHI Publisher*
3.	*Power Electronics*	*M. D. Singh and K.B Khanchandani*	*TMH*
4.	*Power Electronics*	*M H Rashid*	PHI Publisher
5.	*Power Electronics*	*P C Sen*	*TMH*
6.	*Power Electronics*	*N Mohan*	*Willey (India)*
7.	*Programmable logic Controllers*	*Frank D. Petruzela*	TMH
8.	*Programme logic controller*	*Dr.M.Mitra&Dr.S.Sengupta*	*Penram*

Pr. 1 ANALOG & DIGITAL COMMUNICATION LAB

Practical	: 3 Periods per week	Sessional	: 25 Marks
Total Periods	: 45 Periods	Term End Exam	: 25 Marks
Examination	: 3 Hours	TOTAL MARKS	: 50 Marks

Rationale:

This Laboratory Is the based on Communication System based on Analog& Digital System. The students will able to test and observe various communication equipment including Transmitter & Receiver and other different types of digitised equipment. The lab system enables students to apply many experiments and activities covers various topics in the Analog & Digital and communications systems of different types which gain the various skill in day today life.

Objective:

After completion of this course the students will be able to:

1. Learn Concept of AM transmitter & Receiver.
2. Learn Concept of FM Transmitter & Receiver.
3. Learn Concept of Digital (PCM/ASK/FSK/PSK)
4. Learn about super heterodyne Radio Receiver

List of practical:

A. HANDS ON EXERCISE (*Any TWO*)

1. Simulate the AM Modulation and demodulation using the simulation tool like PSPICE/ multisim/orcad/tina
2. Simulate the FM Modulation using the simulation tool like PSPICE/multisim/orcad/tina
3. Simulate ASK Modulation and demodulation using the simulation tool like PSPICE/ multisim/orcad/tina.
4. Simulate FSK Modulation and demodulation using the simulation tool like PSPICE/ multisim/orcad/tina
5. Simulate PSK Modulation and demodulation using the simulation tool like PSPICE/ multisim/orcad/tina

B. HANDS ON EXERCISE (*Any Ten including Sl no 13*)

1. Construct the circuit in AM transmitter & Detector Trainer Board/Kit and observe the waveform at different test point & Determine percentage of Modulation Index of AM.
2. Construct the circuit in FM transmitter & Detector Trainer Board/Kit & observe the waveform at different section.
3. Construct the circuit in sampling theorem Trainer Board/Kit & observe the waveform at different section.
4. Construct the circuit in PCM transmitter & receiver Trainer Board/Kit & observe the waveform at Different section.
5. Construct the circuit in ASK modulator & demodulator Trainer Board/Kit & observe the waveform at different section.
6. Construct the circuit in FSK modulator & demodulator Trainer Board/Kit & observe the waveform at different section.
7. Construct the circuit in PSK modulator & demodulator Trainer Board/Kit & observe the waveform at different section.
8. Construct the circuit in Delta modulator & demodulator Trainer Board/Kit & observe the waveform at different section.
9. Construct the circuit in Super heterodyne radio receiver &observe the waveform at different section& do the alignment (Self Study)
10. Construct /Study the principle of Stereophonic System (Self Study)
11. Construct the circuit in to determine the output of a TDM signal. .
12. Construct the circuit in MODEM Trainer Board/Kit and observe the waveform at different section
13. **Mini project**: The students will collect the detail specification and Catalogue of all equipment used and submit at end of session. Perform a transmitter & receiver using array modulation system.

Pr 2. VLSI & EMBEDDED SYSTEM LAB

Practical : 3 Periods per week — Sessional: 25 Marks
Total Periods : 45 Periods — Term End Exam :25 Marks
Examination : 3 Hours — TOTAL MARKS :50 Marks

Rationale:

This Laboratory enable the students gather knowledge in VLSI Lab. This includes the Combinational Circuit Design, Programmable Logic Devices, Verilog Modelling of Combinational Circuits, RTL Coding Guidelines, Writing a Test Bench, System Design Using ASM Chart and using Sequential Circuits, Micro programmed Design, Design Flow of VLSI Circuits, Modelsim Simulation Tool, Synthesis Tool, Xilink Place and Route Tool, System Design Examples Using FPGA Board/Kit , introduction to Embedded System and its interfacing. Also includes EMBEDDED SYSTEM with *HANDS ON EXERCISE* on Interface a Stepper motor and control the speed of rotation by implementing RTOS delay functions, Interface bugger sound, Traffic light Systems and RTOS chips..

Objective:

After completion of this Lab the students will be able to:

1. Understand VDHL/Verilog code for different application.
2. Implement FPGA/CPLD kit.
3. VHDL Program & implement of FPGA kit
4. Generate music using PC Hardware
5. Ability to design CMOS logic circuits.
6. Simulate circuits within a EMBEDDED SYSTEM tool

List of Practicals:

A. VLSI: HANDS ON EXERCISE (Any Eight)

1. Develop a VHDL test bench code for testing following and implement on FPGA kit
   a. Addition
   b. Subtraction
   c. Multiplication
   d. Division.
2. Develop a VHDL test bench code for testing following and implement on FPGA kit
   a. 8 Bit Digital output using LEDs.
   b. 8 Bit Digital inputs using.
3. Develop a VHDL test bench code for testing 4 x 4 matrix keypad interface.
   a. Write a VHDL Code forRelay interface
   b. Buzzer Interface
4. Develop a VHDL test bench code for testing 7 segment LED display interface.
5. Develop a VHDL test bench code for testing Stepper motor interface.
6. Develop a VHDL test bench code for testing Traffic light control.
7. Develop a VHDL test bench code for testing 4 bit binary counter and study all using simulation software.
8. Develop a VHDL test bench code for testing LCD display to display a text message.
9. Develop a VHDL test bench code for testing any one of the simple gate Simulate the test bench code in the HDL software.
10. Develop a VHDL test bench code for testing for generator PW M signals for DC Motor control.
11. Develop a VHDL test bench code & implement of FPGA kit for MUX & DEMUX.
12. Develop a VHDL test bench code & implement of FPGA kit for Encoder, Decoder & Shift Register.
13. Design and develop a seven segment decoder in VHDL. Design and develop a 4 bit BCD counter, the output of the counter is given to seven segment decoder. A seven segment display is connected to the output of the decoder. The display shows 0,1, 2.. 9 for every one second
14. Development of small Project using Verilog i.e. Generate music using PC Hardware.

(Phases of step- Specification, Design (VHDL/Verilog), Simulation, Synthesis, Place & Route, Maps to FPGAs)

B. VLSI Design using VHDL (Any TWO)

1. layout of CMOs NAND or NOR gate
2. Design & implementation of Half Adder & Full adder
3. Design & implementation of Latch circuit
4. Design & implementation of SR Flip Flop
5. Design & implementation of D Flop
6. Design of Memory Circuit

C. EMBEDDED SYSTEM: HANDS ON EXERCISE (Any Two) .

1. To Study and Implement Multitasking. Write a Simple Program with Two Separate LED Blinking Tasks.
2. Interface a Stepper motor and control the speed of rotation by implementing RTOS delay functions.
3. Interface bugger sound
4. Interface Traffic light Systems
5. Interface RTOS chips & conduct few experiments

Books Recommended:

1. VHDL Primer by J.Bhasker.
2. VHDL by Douglas Perry.

Pr.3 : WAVE PROPAGATION & COMMUNICATION ENGINEERING LAB

Practical	: 3 Periods per week	Sessional	:25 Marks
Total Periods	: 45 Periods	Term End Exam	:25 Marks
Examination	: 3 Hours	TOTAL MARKS	:50 Marks

Rationale:

On Completion of this Lab. the student get knowledge of Microwave Engineering such as Microwave components tubes & semiconductor devices. This also include transmission line trainer & antenna trainer.This Lab. has been designed for basic principle of Audio, Video & TV Engineering which includes the study of Colour TV receiver, CC TV & different section including fault finding. To introduce the concepts of analogue communication systems. 2. To equip students with various issues related to analogue communication such as modulation, demodulation, transmitters and receivers and noise performance.

Objective:

After completion of this Lab the students will be able to:

1. Know Microwave Trainer and its working principles.
2. Transmission Line Trainer and its working principles.
3. Wave Propagation Trainer and its working principles .
4. Antenna trainer and its working principles
5. Study the different section of colour TV and its working principles.
6. Study the section of CC TV and its working principles
7. Concept of Audio recording

List of Practical: (Any 10 including sl no-13 & Sl no – 14 mandatory for field visit)

1. Study the Antenna Trainer for different type of Antenna & find its gain.
2. Draw the radiation pattern & find the characteristics of antenna(Yagi,Horn,,Rombus,Dipole)
3. Draw the waveform of different lobe of different Antennas using antenna trainer
4. Find the Standing Wave ratio (Open & Short Circuit) & different losses in Transmission line
5. To study different types of Microwave components.
6. Measure VSWR of different types of load (Matched, Open, Shorted)using Microwave test bench.
7. Measurement of microwave power using power meter
8. Set up & installation of Dish TV .
9. Study the SMPS section and find out load & line regulation.
10. Study the basic common faults in LED TV.
11. Connect the cable TV ,HD TV & CCTV using Digital camera & Colour TV monitor & observe the output.
12. Study basic principle of Flat screen picture tubes, LCD /LED.
13. **Mini Project** on above to Assembly Mono chrome/Colour TV set and detect its fault at different section. Connection of LCD/LED TV /HD TV with LCD/Computer and concept of HDMI &VGA cable (installation of Smart TV)- **any one**
14. Study & visit the Microwave Station/ TV Transmitter/Radio Transmitter & prepare a Project Report.

Pr 4. POWER ELECTRONICS LAB

Practical	: 3 Periods per week	Sessional	:25 Marks
Total Periods	: 45 Periods	Term End Exam	:25 Marks
Examination	: 3 Hours	TOTAL MARKS	:50 Marks

Rationale:

Power Electronics lab have to give broad base knowledge of practical in the fields like Power Electronics and industrial application in various fields. Power Electronics is the technology behind switching power supplies, power converters, power inverters, motor drives, and motor soft starters & encompasses the topics like Power Semiconductor devices, SCR control Mechanism, Controlled rectifier, Chopper, Inverter & Cyclo convertor etc. On complication of this Lab. the students will familiar with power electronics devices, different triggering circuit and application of SCR and other industrial application. Increasing interconnection of these renewable sources and storage, require advanced control of power systems. Power electronics will be a significant area, changing the character of renewable energies in power generation. The concept of Mini project will lead the student's innovative ideas.

Objective:

After completion of this course the students will be able to:

1. Learn about the characteristics and applications of SCR, DIAC and TRIAC.
2. Understand circuits and equipment used for control of temperature, level and illumination.
3. Understand the working principles of speed control of motors and voltage regulation.
4. Learn about the working of relays and timers.
5. Construct lamp dimmer circuit using TRIAC.
6. Construct Phase Half wave Converter using R load & RL load
7. Construct Single Phase Full wave Converter using R load & RL load.
8. Construct Chopper Circuit at constant frequency with different duty cycle
9. Construct Single Phase Series Inverter
10. Study & trace the output wave form of a single phase AC voltage controller using TRIAC
11. Construct Proximity switch, Burglar alarm, Fire Alarm
12. Study of UPS and observe the waveform of various section
13. Study of servo type voltage AC stabilizer
14. Design of innovative power ETC circuits etc.

List of Practicals:

(*Perform any 10 Experiment including Sl no-16 & si no 17 Mini Project)*

1. Plot V-I characteristics of devices & trace the output waveform
   a) SCR b) DIAC c) TRIAC d) GTO f) MOSFET
2. Construct the circuits using Trainer Board/Kit of the followings
   a) R-C triggering circuits using SCR & trace the output waveform at different test points.
   b) UJT Triggering & trace the output waveform at different test points.
   c) UJT relaxation oscillator circuits
3. Construct lamp dimmer using TRIAC using Trainer Board/Kit & trace the output waveform using Trainer Board/Kit
4. Construct the Single Phase Half wave Converter using Trainer Board/Kit for R load & RL load & trace the output waveform at different test points.
5. Construct the Single Phase Full wave Converter for R load & RL load using Trainer Board/Kit & trace the output waveform at different test points.
6. Construct the Chopper Circuit using Trainer Board/Kit at constant frequency with different duty cycle & trace the output waveform at different test points.
7. Study the Single Phase Series Inverter & trace the output waveform at different test points.

8. Construct & trace the output wave form of a single phase AC voltage controller using TRIAC with Trainer Board/Kit
9. To construct and study(any one)
    a) Proximity switch b)Burglar alarm c) Fire Alarm
10. Study of UPS and observe the waveform of various section (ON, OFF & Line interactive)
11. Study of servo type voltage AC stabilizer(Self study)
12. Construct of Battery Charger circuit & trace the output waveform at different tests points.
13. Study of SMPS circuit & trace the output waveform at different tests points.
14. Study of 1 phase Cyclo-converter and trace the output waveform at different test points.
15. Construct and test an IC based buck converter using PWM
16. Simulate the Sl No 1-8 (Any 3) using the simulation tool like PSPICE/ multisim/orcad/tina.
15. **Mini Project**: To collect data of catalogues and specification sheet of all the equipment &components used for performing experiment and submit the project as above with innovative ideas.(i.e. Solar inverter, Blue tooth Light control Circuit, Industrial Fire control, Home automation or any innovative ideas etc) –**Any one**

Books Recommended:

1. SCR manual-GE company
2. Power electronics-RS Ramshaw
3. Thyristors and their applications- M Rammoorthy
4. Industrial Electronics Test lab manual – Paul B Zbar

N.B.- Few Experiments are self-study based and students will acquire knowledge from Digital Library

Instructional e-manual supplied by manufacturers

Develop programming concepts of students reference Websites:

Demo lectures with power point presentations using LCD projector should be arranged to.

Pr 5. PROJECT WORK (Phase-I)

Name of the Course: Diploma in ETC			
Course code:		Semester	5th
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	50
		TOTAL Marks	50

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Electronics and Communication Engg. and practices in real life situations, so as to participate and manage a large Electronics & Communication engineering projects in future.

Entire Project shall spread over 5th and 6th Semester. Part of the Project covered in 5th Semester shall be named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop Electronics applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in software/hardware design.
- To develop the skill of writing Project Report

General Guidelines

The individual students have different aptitudes and strengths and also areas of interest. Project work, therefore, should match the strengths and interest of the students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5th semester). Students should be allotted a problem of interest to him/her as a project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. Preferably there should not be more than 5 students, if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

Following are the broad suggestive areas of project work

- ✓ Industrial Instrumentation Related
- ✓ Software Engineering and Software Development.
- ✓ Computer Graphics and Animation.
- ✓ Improving existing systems / equipment.

- ✓ Home Automation using IoT.
- ✓ Robotic Arm.
- ✓ Sensor Guided Robotics.
- ✓ Smart Energy Meter
- ✓ Home Automation System.
- ✓ Weather Monitoring System using IoT
- ✓ Solar and Smart Energy System
- ✓ IoT using Raspberry Pi for Weather Monitoring
- ✓ Wearable Health Monitoring Glove
- ✓ Embedded System Projects using 8051
- ✓ Load Control System Using DTMF
- ✓ Automatic Solar Radiation Tracker for Maximum Solar Energy
- ✓ Automatic Room Light Controller using IR Sensors
- ✓ Access control using RFID
- ✓ Biometric Authentication System
- ✓ Any other related area found worth.

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

Project Phase-I and Phase-II

The Project work duration shall cover 2 semesters(5^{th} and 6^{th} sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5^{th} sem under Project Phase-I. The students may be allowed to study literature, and then define the Problem/objective of the Project. Requirements specification, material selection and Design of the system have to be complete in Phase-I. Fabrication may also begin in this phase. Project Milestones are to be set so that progress can be tracked . In Phase-II Coding, Fabrication, Simulation, Testing, Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-I in 5th semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

List of Equipment (for group of 30)

Power Electronics Lab

1. DC Regulated power supply 0-100V, 2A/5A -10 nos
2. High Voltage Power Supply 0-250V, 1A /5A -2 nos
3. Signal Generator 1MHz -4 nos
4. Dual trace CRO 25MHz / 30MHz -5 nos
5. Digital Multi meter - -10 nos
6. DC Voltmeter (Analog/Digital) Different Ranges -15 nos
7. DC Ammeter (Analog/Digital) Different Ranges -15 nos
8. Computers with UPS for simulation Experiments -2 nos
9. Software - **PSPICE/ multisim / orcad / tina - 10 user/15 user/30 user**
10. Trainer Board/Kit containing SCR /DIAC/TRIAC /GTO /MOSFET etc
11. Trainer Board/Kit of the followings
    a) R-C triggering circuits using SCR
    b) UJT Triggering
    c) UJT relaxation oscillator circuits
12. Trainer Board/Kit for lamp dimmer using TRIAC using
13. Trainer Board/Kit for Single Phase Half wave Converter with R load & RL load
14. Trainer Board/Kit for Single Phase Full wave Converter with R load & RL load
15. Trainer Board/Kit for Chopper Circuit
16. Single Phase Series Inverter Trainer Board
17. Trainer Board/Kit for single phase AC voltage controller using TRIAC
18. Trainer Board/Kit for study of UPS interactive)
16. Trainer Board/Kit for servo type voltage AC stabilizer
19. Trainer Board/Kit for Construct of Battery Charger circuit
20. Trainer Board/Kit for SMPS circuit
21. Trainer Board/Kit for Study of 1 phase Cyclo-converter
22. CRO Digital Storage type ,2 channel,25MHz/40Mhz/higher -01nos
23. Power scope CRO, 2 channel,25MHz/40Mhz/higher -01nos
24. Function Generator 0.2Hz to 2Mhz -02nos
25. Tools & Components as per required

NB- All Trainer kits minimum as per requirements

ANALOG & DIGITAL COMMUNICATION LAB

1. Regulated Power supply 0-30v - 5nos
2. Dual trace CRO 30/50 M hz - 2 nos
3. Signal generator Square wave, sine wave, triangle wave, TTL pulse, positive and negative ramp, pulse and skewed sine wave, AM, and sweep functions, 0.1 Hz to 11 MHz, up/down range switchable in eight decade steps - -2 nos
4. Computers with UPS for simulation Experiments -2 nos
5. Software - PSPICE/ multisim / orcad / tina - 10 user/15 user/30 user
6. Trainer Board/Kit for AM transmitter & Detector
7. Trainer Board/Kit for FM transmitter & Detector
8. Trainer Board/Kit for sampling theorem
9. Trainer Board/Kit for PCM transmitter & receiver
10. Trainer Board/Kit for ASK modulator & demodulator

11. Trainer Board/Kit for FSK modulator & demodulator
12. Trainer Board/Kit for PSK modulator & demodulator
13. Trainer Board/Kit for Delta modulator & demodulator
14. AM Super heterodyne radio receiver Trainer kit
15. Trainer Board/Kit for Study the principle of Stereophonic System
16. Trainer Board/Kit for determine the output of a TDM signal
17. Trainer Board/Kit for MODEM Trainer
18. CRO Digital Storage type ,2 channel,25MHz/40Mhz to 250 Mhz or higher
19. Function Generator 0.2Hz to 2Mhz
20. Audio out put Meter
21. Digital Multi meter - -10 nos
22. DC Voltmeter (Analog/Digital) Different Ranges -15 nos
23. DC Ammeter (Analog/Digital) Different Ranges -15 nos
24. Computers with UPS for simulation Experiments -2 nos
25. Frequency Counter (2Hz – 2Ghz) - 2 nos
26. LCD/LED TV

NB- All Trainer kits minimum as per requirements

VLSI & EMBEDDED SYSTEM LAB

1. VDHL Simulator Software.
2. Synthesis Software.
3. FPGA / CPLD training Kit.
4. Experiment Board/Kit s in which programmed FPGA / CPLD can be used.
5. Embed kit (arm processor and its operating system)
6. Raspberry Pi application software
7. Arduino micro controller software
8. FPGA KIT with at least 10 switches for input, 8 LEDs for output, a 7 segment display, debounced push switch (2 Nos) for manual clock input and external clock source – 10Nos
9. ARM7 TDMI Kit – 10 nos with interface boards for the above experiments
   The Chip set may be TMS470, LPC2138, LPC2148, or STR7 etc
10. Interfaces: RTC, ADC, LCD, Seven segment display, LEDS and Switches.

NOTE:
1. Gate level or behavioural level or structural model can be used for all experiments.
2. Manual for the FPGA Kit and interface kit can be given to students for the $5^{th}/6^{th}$ sem.

NB- All Trainer kits minimum as per requirements

VLSI & EMBEDDED SYSTEM LAB

In addition to Pr2 lab(ADC) the additional trainer Kit required

1. Wave propagation Trainer
2. Trainer Board/Kit for Antenna Trainer with different type of Antenna with all assoceries
3. Transmission line Trainer with all assoceries
4. Microwave Work Bench(Klyston/Gunn based) with all assoceries
5. Dish TV with all assoceries

6. SMPS Trainer Kit with all assoceries
7. LED TV Trainer Kit with all assoceries .
8. Cable TV /HD TV /CCTV using Digital camera training kit with all assoceries .
9. Picture tubes, LCD /LED . with all assoceries

NB- All Trainer kits minimum as per requirements

WAVE PROPAGATION & COMMUNICATION ENGINEERING LAB

In addition to Pr2 lab(ADC) the additional trainer Kit required

1. Wave propagation Trainer
2. Trainer Board/Kit for Antenna Trainer with different type of Antenna with all assoceries
3. Transmission line Trainer with all accessories
4. Microwave Work Bench(Klyston/Gunn based) with all accessories
5. Dish TV with all accessories
6. SMPS Trainer Kit with all accessories
7. LED TV Trainer Kit with all accessories .
8. Cable TV /HD TV /CCTV using Digital camera training kit with all accessories .
9. Picture tubes, LCD /LED . with all accessories

NB- All Trainer kits minimum as per requirements