STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA									
TEACHING AND EVALUATION SCHEME FOR 5th Semester Electrical & Electronics Engineering(EEE) (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		Digital Electronics & Microprocessor*	5			20	80	3	100
Th.3		Analog & Digital Communication*	4			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		Power Electronics & PLC Lab			3	25	25	3	50
Pr.2		Digital Electronics & Microprocessor Lab			3	25	50	3	75
Pr.3		Analog & Digital Communication Lab			3	25	25	3	50
Pr.4		Wave Propagation & Communication Engineering Lab			3	25	25	3	50
Pr.5		Project Phase - I			3	25	-	-	25
		Student Centered Activities(SCA)			3				
		Total			*18*	*125*	*125*		*250*
		Grand Total	**21**		**18**	**225**	**525**	**-**	**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									

CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING

(Effective from 2020-21 Sessions)

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

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 DIGITAL ELECTRONICS & MICROPROCESSOR
(Common to Electrical)

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Th.2	Semester	5th
Total Period:	75	Examination	3 Hrs.
Theory periods:	5P / week	Internal Assessment:	20
Tutorial:	---	End Semester Examination:	80
Maximum marks:	100		

A. RATIONALE

The tremendous power and usefulness of digital electronics can be seen from the wide variety of industrial and consumer products, such as automated industrial machinery, computers, microprocessors, pocket calculators, digital watches and clocks, TV games, etc., Which are based on the principles of digital electronics? The years of applications of digital electronics have been increasing every day. In fact, digital systems have invaded all walks of life. This subject will very much helpful for student to understand clearly about the developmental concept of digital devices.

B. OBJECTIVES

On comprehend of the subject, the student will able to

1. Comprehend the systems and codes.
2. Familiar with logic gates.
3. Realize logic expressions using gates.
4. Construct and verify the operation of arithmetic & logic circuits
5. Understand and appreciate the relevance of combinational circuits.
6. Know various logic families & flops.
7. Architecture & different instructions of 8085 microprocessor.
8. Assembly language programs and write programs & functions of the interfacing chips like 8255, 8259, 8259 etc.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1	Basics Of Digital Electronics	15
2	Combinational Logic Circuits	15
3	Sequential Logic Circuits	15
4	8085 Microprocessor	20
5	Interfacing And Support Chips	10
	Total	**75**

D : **COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES**

1. BASICS OF DIGITAL ELECTRONICS

1.1 Binary, Octal, Hexadecimal number systems and compare with Decimal system.
1.2 Binary addition, subtraction, Multiplication and Division.
1.3 1‘s complement and 2‘s complement numbers for a binary number
1.4 Subtraction of binary numbers in 2‘s complement method.
1.5 Use of weighted and Un-weighted codes & write Binary equivalent number for a number in 8421, Excess-3 and Gray Code and vice-versa.
1.6 Importance of parity Bit.
1.7 Logic Gates: AND, OR, NOT, NAND, NOR and EX-OR gates with truth table.
1.8 Realize AND, OR, NOT operations using NAND, NOR gates.
1.9 Different postulates and De-Morgan‘s theorems in Boolean algebra.
1.10 Use Of Boolean Algebra For Simplification Of Logic Expression
1.11 Karnaugh Map For 2,3,4 Variable, Simplification Of SOP And POS Logic Expression Using K-Map.

2. COMBINATIONAL LOGIC CIRCUITS

2.1 Give the concept of combinational logic circuits.
2.2 Half adder circuit and verify its functionality using truth table.
2.3 Realize a Half-adder using NAND gates only and NOR gates only.
2.4 Full adder circuit and explain its operation with truth table.
2.5 Realize full-adder using two Half-adders and an OR – gate and write truth table
2.6 Full subtractor circuit and explain its operation with truth table.
2.7 Operation of 4 X 1 Multiplexers and 1 X 4 demultiplexer
2.8 Working of Binary-Decimal Encoder & 3 X 8 Decoder.
2.9 Working of Two bit magnitude comparator.

3. SEQUENTIAL LOGIC CIRCUITS

3.1 Give the idea of Sequential logic circuits.
3.2 State the necessity of clock and give the concept of level clocking and edge triggering,
3.3 Clocked SR flip flop with preset and clear inputs.
3.5 Construct level clocked JK flip flop using S-R flip-flop and explain with truth table
3.6 Concept of race around condition and study of master slave JK flip flop.
3.7 Give the truth tables of edge triggered D and T flip flops and draw their symbols.
3.8 Applications of flip flops.
3.9 Define modulus of a counter
3.10 4-bit asynchronous counter and its timing diagram.
3.11 Asynchronous decade counter.
3.12 4-bit synchronous counter.
3.13 Distinguish between synchronous and asynchronous counters.
3.14 State the need for a Register and list the four types of registers.
3.15 Working of SISO, SIPO, PISO, PIPO Register with truth table using flip flop.

4. 8085 MICROPROCESSOR

4.1 Introduction to Microprocessors, Microcomputers
4.2 Architecture of Intel 8085A Microprocessor and description of each block.
4.3 Pin diagram and description.
4.4 Stack, Stack pointer & stack top
4.5 Interrupts
4.6 Opcode & Operand,
4.7 Differentiate between one byte, two byte & three byte instruction with example.
4.8 Instruction set of 8085 example
4.9 Addressing mode
4 .10 Fetch Cycle, Machine Cycle, Instruction Cycle, T-State
4.11 Timing Diagram for memory read, memory write, I/O read, I/O write
4.12 Timing Diagram for 8085 instruction
4.13 Counter and time delay.
4. 14 Simple assembly language programming of 8085.

5. INTERFACING AND SUPPORT CHIPS

5.1 Basic Interfacing Concepts, Memory mapping & I/O mapping
5.2 Functional block diagram and description of each block of Programmable peripheral interface Intel 8255 ,
5.3 Application using 8255: Seven segment LED display, Square wave generator, Traffic light Controller

Syllabus coverage up to Internal assessment

Chapters: 1,2 and 3

Learning Resources:			
Sl. No.	**Title of the Book**	**Name of Authors**	**Name of Publisher**
1	Fundamental of Digital Electronics	Ananda Kumar	PHI
2	Digital Electronics – Principal & Application	S. K. Mondal	TMH
3	Digital Electronics	B. R. Gupta & V. Singhal	S. K. Kateria
4	Digital Electronics	P. Raja	SciTech
5	Microprocessor Architecture programming & Application with 8085	R.S Gaonkar	Peneram
6	Fundamentals of Microprocessor & Micro Computers	B.Ram	Dhanpat rai
7	Microprocessor and Inter facing	Sunetra Choudhury & S. P. Chowdhury	Scitech

Th.3 ANALOG & DIGITAL COMMUNICATION

(Common to ETC)

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Th.3	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		

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

(Common to ETC)

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Th.4	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		

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 (Instrumentation and Control) 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)

<u>Syllabus coverage up to Internal assessment</u>

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 POWER ELECTRONICS & PLC LAB

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Pr.1	Semester	5th
Total Period:	45	Examination	3 hrs
Lab. periods:	3 P / week	Term Work	25
Maximum marks:	50	End Semester Examination:	25

A. RATIONALE: The sole objective of the subject is to be familiar with solid state devices used in power system. To perform experiments for determining the characteristics of components and become fit to meet the challenges in practical implementation.

B. OBJECTIVE:

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

1. Determine characteristic of semiconductor devices.
2. Develop ability to design drive circuit for above.
3. Design low voltage power circuit to be used in electronics circuit.

C. LIST OF EXPERIMENTS

(I) Power Electronics

1. Study of switching characteristics of a power transistor.
2. Study of V-I characteristics of SCR.
3. Study of V-I characteristics of TRIAC.
4. Study of V-I characteristics of DIAC.
5. Study of drive circuit for SCR & TRIAC using DIAC.
6. Study of drive circuit for SCR & TRIAC using UJT.
7. To study phase controlled bridge rectifier using resistive load.
8. To study series Inverter.
9. Study of voltage source Inverter.
10. To perform the speed control of DC motor using Chopper.
11. To study single-phase Cyclo-converter

(II) PLC Programming

1. Introduction/Familiarization PLC Trainer & its Installation with PC
   (a) Learn the basics and hardware components of PLC
   (b) Understand configuration of PLC system
   (c) Study various building blocks of PLC
   (d) Determine the No. of digital I/O & Analog I/O
2. Execute the different Ladder Diagrams
   (a) Demonstrate PLC and Ladder diagram-Preparation downloading and running
   (b) Execute Ladder diagrams for different Logical Gates
   (c) Execute Ladder diagrams using timers & counters
3. Execute the Ladder Diagrams with model applications
   (i) DOL starter (ii)Star- Delta starter
4. Execute Ladder diagrams with model applications (i) Stair case lighting (ii) Traffic light controller

Pr.2 DIGITAL ELECTRONICS & MICROPROCESSOR LAB

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Pr.2	Semester	5th
Total Period:	45	Examination	3 hrs
Lab. periods:	3 P / week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A.RATIONALE

In this practical work students knowledge about the Digital systems will be reinforced. They will become capable of developing and implementing Digital Circuits. They will also be able to acquire skills of operating A/D and D/A converters, counters and display system.

B. OBJECTIVE

On completion of the Lab course the student will able to

1. Understand and comprehended the simple the Digital design Circuits.
2. Assembly Language Program using 8085 instruction
3. Application of 8085 using interfacing

C.COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

(I) Digital Electronics

1. Verify truth tables of AND, OR, NOT, NOR, NAND, XOR, XNOR gates.
2. Implement various gates by using universal properties of NAND & NOR gates and verify truth table.
3. Implement half adder and Full adder using logic gates.
4. Implement half subtractor and Full subtractor using logic gates.
5. Implement a 4-bit Binary to Gray code converter.
6. Implement a Single bit digital comparator.
7. Study Multiplexer and demultiplexer.
8. Study of flip-flops.
   i) S-R flip flop ii) J-K flip flop iii) flip flop iv) T flip flop
9. Realize a 4-bit asynchronous UP/Down counter with a control for up/down counting.
10. Realize a 4-bit synchronous UP/Down counter with a control for up/down counting.
11. Implement Mode-10 asynchronous counters.
12. Study shift registers.

(II) Microprocessor

(A) General Programming using 8085A development board

1. a. 1'S Complement. b. 2'S Complement.
2. a. Addition of 8-bit number. b. Subtraction of 8-bit number resulting 8/16 bit number.
3. a. Decimal Addition 8-bit number. b. Decimal Subtraction 8-bit number
3. a. Compare between two numbers. b. Find the largest in an Array
5. Block Transfer.

(B) Interfacing using 8085

1. Traffic light control using 8255.
2. Generation of square wave using 8255

Learning Resources:

Electronics Lab premier by Sacikala - (S. Chand)

Pr.3 ANALOG & DIGITAL COMMUNICATION LAB

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Pr.3	Semester:	5th
Total Period:	45	Examination:	3 hrs
Theory periods:	3 P/week	Term work:	25
Maximum marks:	50	End Semester Examination:	25

A. Rationale:

This Laboratory Is the based on Communication System based on Analog & Digital System. The students will able to test and observe various communication equipments including Transmitter & Receiver. 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.

B. Objectives:

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

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

C. LIST OF PRACTICAL:

1. Study of AM transmitter & Detector and observe the waveform at different test point &. Determine percentage of Modulation Index of AM.
2. Study of FM transmitter & Detector & observe the waveform at different section.
3. Verify Sampling theorem & observe the waveform at different section.
4. Study of PCM transmitter & receiver & observe the waveform at Different section.
5. Study of ASK modulator & demodulator & observe the waveform at different section.
6. Study of FSK modulator & demodulator & observe the waveform at different section.
7. Study of PSK modulator & demodulator & observe the waveform at different section.
8. Study of Delta modulator & demodulator& observe the waveform at different section.
9. Study of Super heterodyne radio receiver &observe the waveform at different section& do the alignment (self Study)
10. Study the principle of Stereophonic System (self Study)
11. Study of MODEM and observe the waveform at different section
12. 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.

Develop programming concepts of students reference Websites: *Demo lectures with power point presentations using LCD projector should be arranged to.*

Pr.4 WAVE PROPAGATION & COMMUNICATION ENGINEERING LAB

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Pr.4	Semester:	5th
Total Period:	45	Examination:	3 hrs
Theory periods:	3 P/week	Term work:	25
Maximum marks:	50	End Semester Examination:	25

A. 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.

B. Objectives:

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

- Know Microwave Trainer.
- Transmission Line Trainer.
- Wave Propagation Trainer.
- Antenna trainer
    - Study the different section of colour TV.
    - Study the section of CC TV
    - Concept of Audio recording

Skills to be developed:

Intellectual Skills:

1. Identification and selection of components.
2. Interpretation of circuits.
3. Understand working of Regulated dc power supply.

Motor skills:

1. Ability to draw the circuits.
2. Ability to measure various parameters.
3. Ability to test the components using multimeter /testing equipment

C. LIST OF PRACTICAL: (Any 11 including sl no-13 & 14)

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 detects 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.5 PROJECT Phase- I

Name of the Course: Diploma in Electrical (Instrumentation and Control) Engineering			
Course code:	Pr.5	Semester	5th
Total Period:	45	Examination	3 hrs
Lab. periods:	3 P / week	Sessional	25
Maximum marks:	25		

A. 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 individual students have different aptitudes and strengths. Project work, therefore, should match the individual strengths of students. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Electrical & Electronics engineering and practices in real life situations, so as to participate and manage a large Electrical & Electronics engineering projects and /or appropriate Hardware with embedded software in future. 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.

B. 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 software packages or 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.
- Field computing and to achieve real life experience in software/hardware design.

C. GENERAL GUIDELINES

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of 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

- ✓ Speed control techniques using thyristor.
- ✓ Battery design & its maintenance.
- ✓ Energy management Techniques.
- ✓ Dynamic models of Electrical machine.
- ✓ Solar based cooker, lamp, water heater etc. & Solar operated vehicles.
- ✓ Remote control operated Electrical devices.
- ✓ Advanced energy meter.
- ✓ Design of Illumination techniques using advanced luminaries etc.
- ✓ Dynamic models of Electrical Machine.
- ✓ PLC & Microprocessor based project.
- ✓ 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 organizations to such an exhibition.

D. PROJECT PHASE-I AND PHASE-II

The Project work duration shall cover two 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, any existing system and then define the Problem/objective of the Project. Requirements specification, Circuit Diagram with brief description and Design of the system have to be complete in Phase-I. Preliminary analysis/modelling/simulation/experiment/feasibility can also begin in this phase. Project Milestones are to be set so that progress can be tracked. In Phase-II Design, Testing, Documentation have to be complete. Project Report have to be 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 schedule. It is preferable to have one presentation at the end of Phase-I to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

EQUIPMENT LIST

1. Power Electronics trainer kit to perform (a) switching characteristics of a power transistor (b) V-I characteristics of SCR, TRIAC, DIAC (c) Drive circuit for SCR & TRIAC using DIAC & UJT (d) phase controlled bridge rectifier using resistive load (e) series Inverter (f) voltage source Inverter (g) speed control of DC motor using Chopper (h) single-phase Cyclo-converter
2. 8085 microprocessor trainer kit
3. Traffic Light controller interfacing module
4. Digital electronics trainer kit
5. PLC trainer kit