

- (A) **COURSE TITLE & CODE** : T.V. Transmission & Reception, EC - 5 01
 (B) **LEVEL** : Five
 (C) **BRANCH/ DISCIPLINE** : Electronics & Communication Engineering
 (D) **RATIONALE** :

Video transmission is Applied Technology course. This course will develop the understanding of monochrome and colour transmission. This understanding is essential for applied technology course-TV reception. Students will learn different parameters of composite video signal, chroma signal, generation methods, modulation techniques, transmission techniques and television signal propagation. T.V. reception is an Applied Technology course. This course will develop testing and troubleshooting skills for different stages in monochrome & colour T.V. receivers. Students will also learn adjustment and alignment procedures required for different stages in monochrome and colour TV receivers. This course will develop component level troubleshooting skills, which will also be useful for troubleshooting video display units.

(E) TEACHING AND EXAMINATION SCHEME:

Sl. No.	Course Code	Name of Course	Teaching Scheme					Examination Scheme				Total Marks
			Pre-requisite	L	T	P	C	Theory		Practical		
								ET	PA	ET	PA	
1.	EC-501	T.V. Transmission and Reception		4	-	2	6	75	25	50	25	175

(F) DETAILED COURSE CONTENTS:

Chapter – 1 Television Fundamentals

- Geometric form and aspect ratio, viewing distance, Brightness Gradation – Brightness, contrast colour characteristics, Luminance, Hue and Saturation
- Image continuity, flicker.
- Scanning – Progressive Scanning.
- Horizontal Scanning, Vertical Scanning
- Number of Scanning lines, Interlaced Scanning – Scanning Sequence, Scanning period
- Picture Resolution, Vertical Resolution, Horizontal Resolution
- Kell factor, Video Band width calculations
- Mixing of colours – Additive, subtractive mixing, primary and secondary colours.

Chapter – 2 Television Cameras

- Function
- Types of Camera
- Principles of Operation
 - Photoelectric effect, image-storing principle, electron scanning beam, video signal generation by photoconduction & photoemission.
 - Vidicon camera tube – construction and working.
 - Silicon diode array vidicon – construction and working.
 - Camera optics, focal length, lens turret, zoom lens.
 - Monochrome T.V. camera system.
 - Gamma correction in camera system.
 - Colour T.V. camera system.
 - Grass man's Law & Generation of Luminance Signal.

Chapter – 3 Composite Video Signal

- Video signal dimensions, DC component of video signal , pedestal height, blanking pulse.
- Horizontal sync composition – front porch, line sync, back porch.
- Vertical sync composition – Pre & Post equalizing pulses and serrated sync pulses.
- Waveform of CVS for one line.

Chapter – 4 T.V. Signal Transmission & Propagation

- Need for modulation.
- Amplitude Modulation of CVS signal.
- Frequency Modulation of sound Signal.
- Picture signal transmission.
- Positive and negative modulation.
- Vestigial sideband transmission.
- Sound signal transmission.
- Channel bandwidth.
- Television standards – CCIRB.

Chapter – 5 Monochrome T.V. Transmitters

- Block diagram and working.
- Television broadcast channels.
- T.V. Transmission antennas
- Line of sight propagation.
- T.V. relay station – block diagram and principle of working.

Chapter – 6 Colour Theory

- RGB as primary colours of transmission.
- Colour difference signal.
- Elimination of (G-Y) signal.
- Bandwidth of colour difference signal.
- Chroma modulation systems – NTSC, PAL, SECAM Comparison.
- Frequency Interleaving techniques.
- Factors influencing choice of colour sub carrier.

- NTSC weighted colour vectors I & Q.
- Quadrature Amplitude Modulation in NTSC system.
- NTSC colour resultant.
- Limitations of NTSC system.

Chapter – 7 PAL System

- “PAL V”-switching, elimination of differential phase error.
- Selection of PAL colour sub carrier.
- PAL weighted colour vectors u & v.
- PAL – QAM, PAL colour resultant vector.
- Waveforms & phasor diagram for min. and complementary colours.
- Bandwidth of transmitted PAL colour resultant.
- Suppressed colour subcarrier transmission.
- Effect of suppressed subcarrier on chroma demodulation.
- Colour Burst signal, swinging colour burst
- Colour composite video signal (CCVS)

Chapter – 8 Colour T.V. Transmitters

- PAL encoder – Block diagram, working waveform analysis
- PAL colour T.V. Transmitter – Block diagram, working.

Chapter – 9 Block diagram of TV Receivers

- Block diagram of monochrome T.V. receiver.
- Block diagram of PAL decoder.
- Block diagram of colour TV receiver.

(G) SPECIFICATION TABLE OF DISTRIBUTION OF MARKS & HOURS:

Chapter No.	Name of Chapter	Hours	Marks			
			K	C	A	Total Marks
1	Television Fundamentals	6	5	-	-	5
2	Television Cameras	8	5	-	3	8
3	Composite Video Signal	4	3	2	-	5
4	T.V. Signal Transmission & Propagation	8	5	3	2	10
5	Monochrome T.V. Transmitters	4	3	2	-	5
6	Colour Theory	8	6	4	-	10
7	PAL System	8	5	3	2	10
8	Colour T.V. Transmitters	10	6	2	4	12
9	Block diagram of TV Receivers	8	4	6	-	10
	Total	64				75

(H) IMPLEMENTATION STRATEGIES

- In this course, only physical explanations of different concepts are expected. Detailed mathematical derivations and analysis is not expected.
- In generation of AM, only one circuit diagram is expected. That is high-level Modulation. [Collector modulation class C amplifier.]

- In SSB topic suppression of unwanted side band methods, only filter method is expected.
- In case of AM mathematical derivation is expected.
- In case of FM /PM mathematical derivation is not expected.
- For better understanding of radio receivers, assembly alignment and troubleshooting a visit to a radio receiver assembly unit should be arranged.
- Since the circuit diagrams RF amplifier, converter and IF amplifiers stages are similar to AM radio receivers discussed in chapter 6, they need not be discussed in the class again.
- Different specifications of radio receivers should be discussed referring to commercial receivers in the market.
- Faults are to be created in different stages in one practical period of two hours. Students should be asked to detect minimum three faults.
- Minimum five practical experiences should be covered on troubleshooting to include 15 different types of faults.

(I) LEARNING RESOURCES SUGGESTED TO BE USED

1. Textbooks mentioned in the references.
2. Laboratory manuals
3. Some electronics engineering journals, magazines.
4. Video programmes and CBT's.

(J) SUGGESTED LIST OF EXPERIENCES – (Marks –50)

Practical Experiences

- a) Performance of Transistorised AM modulator
- b) Performance of Balanced modulator.
- c) Performance of Frequency Modulation circuit
- d) Determination of fidelity, sensitivity & selectivity of AM receiver.
- e) Alignment of AM receiver using CRO & standard signal generator.

(K) SUGGESTED REFERENCES

S. No.	Title	Author/ Publisher/Edition/Year
1.	Electronic communication systems.	George Kennedy, McGraw-Hill Ltd., Singapore, Latest
2.	Electronic communication	Dennis Roddy & John Coolen, Prentice Hall of India Pvt. Ltd. New Delhi, 4 th , 1995
3.	Communication Systems	D. D. Ahirrao & N. S. Jadhav, EVEREST Publication Pune, 1 st , 1998
4.	Telecommunications Principles circuits and systems	S.Rambhadran, Khanna Publishers, New Delhi, Latest

- (A) **COURSE TITLE AND CODE** : **PRICIPLES OF DIGITAL COMMUNICATION (ECE-503)**
- (B) **LEVEL** : **FIVE**
- (C) **BRANCH/DISCIPLINE** : **ELECTRONICS & COMMUNICATION ENGINEERING**
- (D) **RATIONALE** :

Presently, majority of the telecommunication is in digital form. So students must have a good working knowledge of fundamentals of pulse and data communication. This subject intends to familiarize the students with information theory, measurement of information rates & capacities. The subject will help the student to understand concept of various pulse modulation systems and methods of generating and decoding each of the pulse modulation system and correction methods, principles of Modems and ISDN.

(E) **TEACHING AND EXAMINATION SCHEME:**

Sl. No.	Course Code	Name of Course	Teaching Scheme					Examination Scheme				Total Marks
			Pre-requisite	L	T	P	C	Theory		Practical		
								ET	PA	ET	PA	
1.	ECE-503	Principles of Digital Communications		3	-	2	5	75	25	50	25	175

(F) **DETAILED COURSE CONTENTS:**

Chapter – 1 Information Theory

- Concept of information in digital telecommunication
- Channel capacity – Definition, Hartley’s laws Shannon- Hartley theorem, channel capacity equation, channel noise and its effect
- Brief overview of coding systems
- Multilevel Systems, Comparison with binary coding system, communication efficiency

Chapter – 2 Pulse Communication

- Pulse modulation - comparison with CW modulation, advantages, sampling theory, Sampling theorem & its importance, Classification of pulse modulation
- Analog Pulse modulation: Pulse Amplitude modulation (PAM), Pulse width modulation (PWM), Pulse Position Modulation (PPM) and

their comparison

- Digital pulse modulation: Pulse code modulation (PCM), principles of PCM
- Quantisation, Quantisation error. Block diagram of 8 channel PCM-TDM system transmitter, companding. Demodulation of PCM. Block diagram of PCM receiver. Delta modulation, working principle. DPCM, ADM, LPC systems
- Application of pulse communications a) Telegraphy b) Telemetry. (General system description)

Chapter – 3 Digital Modulation Methods

- ASK ,Frequency shift keying (FSK). Definition, Description, Waveforms, FSK modulator using 555. Block diagram of FSK transmitter, FSK receiver (PLL type), advantages, application
- Phase shift Keying (PSK)
- QPSK (quadrature phase shift keying), Description and study of Block diagram
- QAM (quadrature amplitude modulation), Description and study of Block diagram

Chapter – 4 Channel Multiplexing

- Need of multiplexing of communication channels multiplexers & demultiplexers
- Time Division multiplexing (TDM)-Definition, block diagram of a typical TDM system, wave forms, time division de-multiplexing
- Frequency Division multiplexing (FDM) . Definition, group formation - pre group. Basic group formation, Block diagram of 12 channel Basic group, Super group, Block Diagram of Super group, Master group, Standard frequency allocations & Bandwidth consideration in each of these groups. Pilot carrier frequencies. General block diagram of FDM transmitter & Receiver
- Comparison of TDM & FDM
- Concept of CDMA

Chapter – 5 Modems

- Introduction to MODEMS
- Classifications, modes of operation, interconnection and data transmission speed of MODEM
- MODEM Interfacing - RS- 232 interface
- Communication standards X.25, X.400

Chapter – 6 Digital Telephone Exchange

- Features of digital telephone exchange
- Block diagram of digital telephone exchange,
- DTMF dialing, different tones
- ISDN – working principle, block diagram. ISDN-B

(G) SPECIFICATION TABLE OF DISTRIBUTION OF MARKS & HOURS:

Chapter No.	Name of Chapter	Hours	Marks			
			K	C	A	Total Marks
1.	Information Theory	4	5	3	-	8
2.	Pulse Communication	8	6	4	3	13
3.	Digital Modulation Methods	10	6	4	5	15
4.	Channel Multiplexing	10	7	4	4	15
5.	MODEMS	8	5	5	2	12
6.	Digital Telephone Exchange	8	5	3	4	12
	Total	48				75

(H) IMPLEMENTATION STRATEGIES:

The implementation strategy to teach this course should be a good mix of the various teaching methods like lecture, question answer, assignment and lab. work. More drill and practice of numericals will be useful. Home and classroom assignments would prove more useful to develop the analytical skills.

(I) LEARNING RESOURCES SUGGESTED TO BE USED:

5. Textbooks mentioned in the references.
6. Video programmes.
7. Periodicals like electronic and communication engg. magazines, journals etc.
8. OHP transparencies

(J) SUGGESTED LIST OF EXPERIENCES/TUTORIALS – (Marks –50):

- a) Transmission & Reception of PAM Signals
- b) Transmission & Reception of PWM Signals.
- c) Transmission & Reception of PPM Signals
- d) Transmission & Reception of PCM Signals
- e) Transmission & Reception of ADM Signals
- f) Frequency shift keyed modulation & demodulation.
- g) Transmission & reception of signals using TDM.
- h) MODEM Testing
- i) Field visit to telephone exchange.

(K) REFERENCE BOOKS:

S. No.	Title	Author/ Publisher/Edition/Year
1	Electronic Communication Systems	George Kennedy, Benard Davis, Tata McGraw-Hill, New Delhi, 4 th , 1999
2	Electronic Communication	Roddy Coolen, Prentice Hall of India, New Delhi, 3 rd , 2000
3	Principles of communication Systems	Taub Schilling, McGraw-Hill, International, New York, 3 rd , 1986
4	Principles of Communication	N.M. Biswas, Media Promoters, Latest
5	Telecommunication principles Circuit & Systems.	Mr. S. Rama Bhaskar, Khanna Publication, New Delhi, Latest
6	Digital Communication.	Mr. Simon Haykin, McGraw-Hill, International, New York, Latest
7	Communication Systems	N.S. Jahav, D.D Ahirrao, Everest Publication, Pune, 1 st , 1998

- (A) **COURSE TITLE AND CODE** : **AUDIO & VIDEO ENGINEERING
(ECE-504)**
- (B) **LEVEL** : **FIVE**
- (C) **BRANCH/DISCIPLINE** : **ELECTRONICS & COMMUNICATION
ENGINEERING**

(D) **RATIONALE** :

This course in the applied technology group is intended to develop competencies in the students to work with state-of-the-art audio and video equipment. Student will be able to install, test and troubleshoot simple faults in audio and video equipment.

(E) **TEACHING AND EXAMINATION SCHEME:**

Sl. No.	Course Code	Name of Course	Teaching Scheme					Examination Scheme				Total Marks
			Pre-requisite	L	T	P	C	Theory		Practical		
								ET	PA	ET	PA	
1.	EC-504	Audio & Video Engineering		3	-	2	5	75	25	50	25	175

(F) **DETAILED COURSE CONTENTS:**

Chapter – 1 Video Signal Recorders & Camcorder

- Basic block diagram of Video Signal Processing during recording and playback
- Block diagram of V.C.R. system
- V.C.R. mechanism
- U-matic Video Recorders – Block diagram and working principle
- Block diagram and working of Video Camcorder

Chapter – 2 High Definition TV

- Concept of definition / resolution of T.V.
- Basic principle used in Digital T.V.
- How definition is enhanced in EDTV & HDTV
- Merit of Digital TV / HDTV
- MAC techniques
- Interactive T.V. – concept and operation

Chapter – 3 Projection TV Systems

- Concept of projection T.V. to get large screen, block diagram of projection T.V. and its working
- Digital LCD projection TV – block diagram and working
- Remote mouse

Chapter – 4 Compact Discs

- Concept of compact disc recording classification, Audio C.D.

encoding, Focus and tracking in C.D.

- EFM and tracking in C.D.
- Block diagram of CD player
- VCD player – block diagram & working Audio CD player to Video CD player conversion
- Video cassette to CD conversion – Block schematic
- LD player – Block diagram & working
- Typical faults in audio CD player
- Comparison between VCR and VCD

Chapter – 5 Closed Circuit Tv Systems

- Need, Areas of applications
- Different methods of feeding
- Video signal to CCTV system
- Components of CCTV system – Video camera, cable , monitors, VDA, connectors

Chapter – 6 Video Production & Post Production Equipment

- Different equipments used in production studio
- Typical layout of production studio
- Video editing techniques – PIP, Freez, Zoom, Wipe, dissolve
- Editing equipments used in editing room

Chapter – 7 Video Display Unit

- Classification of V.D.U.
- Specifications of V.D.U.
- Block diagram and working of Mono / Colour SVGA multi-sync Video Display Unit
- Block diagram of LCD monitor
- Low radiation screen, Energy saver circuit
- Simple faults in Video Display Unit

(G) SPECIFICATION TABLE OF DISTRIBUTION OF MARKS & HOURS

Chapter No.	Name of Chapter	Hours	Marks			
			K	C	A	Total Marks
1.	Video Signal Recorders & Camcorder	7	5	2	2	12
2.	High Definition TV	6	4	2	2	10
3.	Projection TV System	8	4	4	2	10
4.	Compact Discs	8	6	4	2	12
5.	Closed Circuit TV System	8	4	4	4	12
6.	Video Production & Post Production Equipment	5	2	4	2	9
7.	Video Display Unit	6	2	4	4	10
	Total	48				75

(H) IMPLEMENTATION STRATEGIES:

The implementation strategy to teach this course should be a good mix of the various teaching methods like lecture, question answer, assignment and lab. work. More drill and practice of numericals will be useful. Home and classroom assignments would prove more useful to develop the analytical skills.

(I) LEARNING RESOURCES SUGGESTED TO BE USED:

9. Textbooks mentioned in the references.
10. TV programmes.
11. Periodicals like magazines, journals etc.
12. OHP transparencies

(J) SUGGESTED LIST OF EXPERIENCES/TUTORIALS – (Marks –50):

Practical Experiences

- a) Operation of VCR controls.
- b) Mechanism operation of V.C.R.
- c) Locating different stages of V.C.R.
- d) Simple faults in V.C.R.
- e) Field visits / seminars on HDTV
- f) Field visit / seminar on Projection T.V. / Digital T.V.
- g) Locating different sections in CD player.
- h) Simple faults in CD player.
- i) Converting Audio CD player to VCD player.
- j) Installation of CCTV system.
- k) Visit to production studio and post production video editing unit.
- l) Locate different sections of VDU
- m) Adjustment / Alignment of V.D.U.
- n) Debugging in VDU

(K) REFERENCE BOOKS:

S.No.	Title	Author, Publisher/Edition/Year
1	Modern Television practice	R.R. Gulati, New Age International (P) Ltd. New Delhi, 3 rd , 1999
2	Monochrome and colour Television	R.R. Gulati, Wiley Eastern Ltd. New Delhi, Latest
3	Basic TV and Video system	Bernad Grobe, Mc-Graw Hill International, New York, Latest
4	Colour T.V. and Video Technology	Maini, PHI Publications. New Delhi, 1 st , 1996
5	Complete Guide To Laser Video Disc Player.	John D. Lenk, PHI Publications. New Delhi, 2 nd , 1995
6	Modern -All About Monitors	Lotia, Nair, BPB publication, New Delhi, 2 nd , 1999
7	Video Cassette Recorders.	K.D.Desai, Jeevandeep Prakashan, Mumbai, Latest

- (A) **COURSE TITLE AND CODE** : **COMPUTER AIDED DESIGN & DRAWING OF ELECTRONIC CIRCUITS (ECE-505)**
- (B) **LEVEL** : **FIVE**
- (C) **BRANCH/DISCIPLINE** : **ELECTRONICS & COMMUNICATION ENGINEERING**
- (D) **RATIONALE** :

This course classified under Applied Technology group and intends to help the student to use the knowledge of CAD for preparing working drawings of electrical installation projects, preparing estimates and tender documents for installation projects. He/she will also be able to draw and design new scheme for various medium size projects.

(E) **TEACHING AND EXAMINATION SCHEME:**

Sl. No.	Course Code	Name of Course	Teaching Scheme					Examination Scheme				Total Marks
			Pre-requisite	L	T	P	C	Theory		Practical		
								ET	PA	ET	PA	
1.	EC-505	Computer –Aided Design & Drawing of Electronic Circuits		2	1	2	5	50	25	50	50	175

(F) **DETAILED COURSE CONTENTS:**

Chapter – 1 Drawing using computer software

- Components of AutoCAD 2000 window: Such as Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify toolbar, cursor cross hair, Command window, status bar, drawing area, UCS icon
- 1.4 AutoCAD coordinate systems: Cartesian, Polar
- Setting drawing units, Limits, Grid, Snap, Saving the file. Opening an existing drawing file
- Draw basic entities like LINE, CIRCLE, ARC, POLYGON, ELLIPSE, RECTANGLE, PLINE
- Methods of Specifying points:
 - Typing absolute coordinates
 - Typing Relative Cartesian coordinates

-
- Typing Relative Polar coordinates
 - Using Object Snap like (ENDPOINT, MIDPOINT,
 - INTERSECTION, ENTER POINT, QUADRANT POINT, NEAREST PERPENDICULAR, APPARENT INTERSECTION, FROM OSNAP)
 - Using Point Filters (Like .x, .y)
 - Using 'cal expression'

Chapter – 2 Editing & Dimensioning

- Selecting objects: Selection set with its options like Pick box, Window, Crossing, Previous, Last drawn, Add, Remove
- Editing commands like: ERASE, COPY, ARRAY, MIRROR, OFFSET, TRIM, MOVE, ROTATE, EXTEND, BREAK, CHAMFER, FILLET, LENGTHEN
- Display commands like: Zoom All, Zoom Previous, Zoom Extents, Zoom Window, Zoom Real Time, Zoom Dynamic, Zoom Pan
- Dimensioning: Types of dimensioning: Linear- Horizontal, Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions
- Dim scale variable. Editing dimensions
- Text: Single line Text, Multiline text. Text Styles: Selecting font, size, alignment etc

Chapter – 3 Working in three dimensional space using AutoCAD

- Right hand rule; Specifying coordinates using x, y, z co-ordinates, using x, y, z filters; Entering cylindrical co-ordinates; Entering spherical co-ordinates
- Defining user co-ordinate system; World Co-ordinate system; UCSICON command with its option. User co-ordinate system (UCS)
- Defining user co-ordinate system; using UCS command with its options such as NEW- Z axis, 3 point, object, face, view, x, y, z, move, orthographic, previous, restore, save, del, apply, world

Chapter – 4 Design and Drawing of Electrical Installation of Residential complexes and Industrial Complexes

Chapter – 5 Design and Drawing of Electrical Installation Scheme of Commercial Complexes

Chapter – 6 Design and Drawing of Electrical Installation Scheme of Factory Unit in an Industrial Complex.

- Electrical machines & earthing installations
- Distribution network installation
- Electrical installation of substation and distribution network and P.F. improvements and batteries
- Design and Drawing of Electrical Installation Scheme of Factory Unit in an Industrial Complex

(G) SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION

Legends: K=Knowledge level, C= Comprehension Level, A=Application level

Chapter No.	Chapter Title	Term work Hours	Term work marks
1.	Drawing using AutoCAD	1	2
2.	Editing & Dimensioning	2	2
3.	Working in three dimensional space using AutoCAD	2	3
4.	Design and Drawing of Electrical Installation of Residential Unit in an Industrial Complex.	3	11
5.	Design and Drawing of Electrical Installation Scheme of Commercial Unit	4	12
6.	Design and Drawing of Electrical Installation Scheme of Factory Unit in an Industrial Complex.	4	20
	Total	16	50

NOTE: For the entire course, 16hrs of tutorial has been allotted to be used effectively to justify the need of the students and importance of the specific topics.

(H) SUGGESTED IMPLEMENTATION STRATEGIES:

With the background of level 2 course of engineering drawing, this course has to be started first by teaching CAD software (or otherwise) directly on the computer with a little bit of theoretical introduction. For developing computer aided design, the student has to plan on with paper and pencil first which then will have to be done using computer. Therefore, enough of computer time will have to be provided to the students. A number of classroom exercises and home assignments have to be given so that the students master the drawing of electrical installation on computer.

(I) SUGGESTED LEARNING RESOURCES TO BE USED:

13. Textbooks mentioned in the references
14. Laboratory manuals

(J) SUGGESTED LIST OF EXPERIENCES (Marks –50):

- a) Design and draw the electrical installation scheme for an residential unit
- b) Design and draw the electrical installation scheme for an commercial unit
- c) Design and draw the electrical installation scheme for an factory unit including substation unit
- d) Design and draw the electrical installation scheme of industrial complex

(K) SUGGESTED REFERENCES:

S. No.	Title	Author/ Publisher/Edition/Year
1	Electrical wiring, estimating and costing	Arora B.D.,R.B. Publications, New Delhi, 1993
2	AutoCAD 2000	Frey David; BPB Publications, New Delhi, 2000
3	Using AutoCAD 2000	House, Ron Prentice Hall, New Delhi, 2000
4	AutoCAD14For Engineering Drawing Made Easy.	Nageswara, Rao P.; Tata McGraw Hill, New Delhi, 2000
5	Mastering AutoCAD	Omura.,George; Tata McGraw Hill, New Delhi, 2000
6	Operation and maintenance of electrical equipment. Vol I & II	Rao B.V.S., Media Promoters & Publishers, Bombay, 2 nd , 1992
7	Electrical substation engineering and practice	Rao S., Khanna Publishers, New Delhi, 3rd , 1999
8	Substation design and equipment	Satnam P.S., Gupta P.V.,Dhanpat Rai Publications, Delhi, 1999
9	AutoCAD 2000	Tickoo, Sham; Galgotia Publications, New Delhi, 2000
10	Electrical wiring estimating and costing	Uppal S.L., Khanna Publishers New Delhi, 1994
11	An Introduction to AutoCAD2000	Yarwood , A. Longman, New Delhi, 2000

- (A) **COURSE TITLE AND CODE** : **TESTING & MAINTAINANCE OF ELECTRONIC EQUIPMENTS (ECE-506)**
- (B) **LEVEL** : **FIVE**
- (C) **BRANCH/DISCIPLINE** : **ELECTRONICS & COMMUNICATION ENGINEERING**
- (D) **RATIONALE** :

Many of the times the electronics and communication engineering diploma holder has to supervise the guide the testing and maintenance of various types of discipline related equipment in the industry. This course is intended to enable the student understand the concepts and the principles of the testing and maintenance, so that the student is enabled to acquire the basic skills of testing and maintenance

(E) TEACHING AND EXAMINATION SCHEME:

Sl. No.	Course Code	Name of Course	Teaching Scheme					Examination Scheme				Total Marks
			Pre-requisite	L	T	P	C	Theory		Practical		
								ET	PA	ET	PA	
1.	EC-506	Testing & Maintenance of Electronic Equipment		-	2	4	6	-	-	50	50	100

(F) DETAILED COURSE CONTENTS:

Chapter – 1 Troubleshooting Audio Systems

- Mono & Hi-Fi amplifier system
- P. A. System
- Audio Cassette Player

Chapter – 2 Troubleshooting Radio Receivers

- Trouble shooting methods of typical faults of AM & FM receiver: Preliminary Tests – Mains chord test, Power supply test, current drain test; observation test; Signal Substitution test; Voltage Analysis test; Resistance Analysis method; Waveform Analysis method
- Study of commercial receiver circuit diagram

Chapter – 3 Switch Mode Power Supply (SMPS)

- Introduction to SMPS
- Block diagram of SMPS as DC-to-DC converter
- Forward SMPS, Reverse SMPS and push-pull SMPS - Block

schematic diagram

- Line synchronous, non-line synchronous SMPS used in colour TV Receiver
- Concept of Floating Ground

Chapter – 4 Troubleshooting In T.V. Receivers

- Faults in different stages of T.V. receivers
- Different symptoms, their logical analysis and possible faults
- Alignment of T.V. receiver using colour pattern generator

Chapter – 5 Inverters & UPS

- Working principle of inverter
- Inverter circuits using transistor and SCR – their difference
- Series inverter using SCR
- Parallel inverter using SCR
- Use of pulse width modulation circuit
- Introduction to UPS
- Block diagram of UPS

Chapter – 6 Industrial Applications

- Speed control of D.C. motor using armature voltage control
- Speed control of D.C. motor using SCR chopper circuit
- Speed control of D.C. drive using PLL method
- Speed control of universal motor
- Different types of speed control methods for induction motor such as stator voltage control frequency control
- Power factor control method
- Application in heating control, resistance welding, static circuit breaker and time delay circuits

(G) SPECIFICATION TABLE OF DISTRIBUTION OF MARKS & HOURS:

Chapter No.	Name of Chapter	Term work Hours	Term work marks
1	Troubleshooting Audio Systems	6	10
2	Troubleshooting Radio Receivers	3	4
3	Switch Mode Power Supply	3	4
4	Troubleshooting in T.V. Receivers	6	10
5	Inverters and UPS	6	10
6	Industrial Applications	8	12
	Total	32	50

(H) SUGGESTED IMPLEMENTATION STRATEGIES:

This course is intended to develop the testing and maintenance skills very much required by the industry. Therefore more practical exercises need to be given to the students.

(I) SUGGESTED LEARNING RESOURCES:

15. Textbooks mentioned in the references.
16. Testing & maintenance manuals
17. Service manuals
18. IS Codes
19. Periodicals like magazines, journals etc.

(J) SUGGESTED LIST OF EXPERIENCES/TUTORIALS – (Marks –50):

Practical Experiences

- a) Trouble-Shooting of Hi-Fi Amplifier.
- b) Trouble-Shooting of P.A. Systems.
- c) Trouble-Shooting of Audio Cassette Player.
- d) Trouble shooting in different stages of AM & FM receiver.
- e) Testing of SMPS.
- f) Diagnosis of faults in TV receivers.

(K) SUGGESTED REFERENCES:

S.No.	Title	Author/ Publisher/Edition/Year
1	Operating and service manuals of electronic and communication equipment	From manufacturers and suppliers
2	I.S. Codes	Bureau of Indian 1997Standards, New Delhi,
3	Indian Electricity Rules	Central Law Agency Allahabad
4	Preventing Electrical Fires & Failures	Hattangadi, A.A.; Tata McGraw-Hill, New-Delhi, 2001
5	A complete guide to SMPS for PC	BPB Publication, New Delhi, 1 st 1996
6	Operation And Maintenance of Electrical Equipment, Vol I & II	Rao, B.V.S.; Wheeler Publishing, New Delhi, 2 nd 1994

- (A) **COURSE TITLE AND CODE** : **INDUSTRIAL ELECTRONICS (ECE-507)**
 (B) **LEVEL** : **FIVE**
 (C) **BRANCH/DISCIPLINE** : **ELECTRONICS & COMMUNICATION ENGINEERING**
 (D) **RATIONALE** :

The aim of this course under the ‘specialized course category’ is to develop some level of specialization in students of electrical engineering. Industrial electronics is a course that concerns the applications of electronic principles in situations that are rated at high power level rather than signal level. Many power devices such as DIACs, TRIACs, Thyristors, MOSFETs, Transistors are available for power applications. These semiconductor devices have been used in industrial applications relating to the field of electrical, electronics, instrumentation and control engineering. An effort is made in this course to provide an understanding of the various industrial electronics applications to enable the students to acquire some core competencies/skills.

(E) **TEACHING AND EXAMINATION SCHEME:**

Sl. No.	Course Code	Name of Course	Teaching Scheme					Examination Scheme				Total Marks
			Pre-requisite	L	T	P	C	Theory		Practical		
								ET	PA	ET	PA	
1.	EC-502	Industrial Electronics		4	-	2	6	75	25	50	25	175

(F) **DETAILED COURSE CONTENTS:**

Chapter – 1 Power Electronics Devices

- Introduction to thyristor family
- Construction, working principle, symbol, characteristics and application of SCR, UJT, DIAC, TRIAC, PUT, LASCR, IGBT, GTO

Chapter – 2 Thyristor Commutation and Protection Circuits

- Types of commutation
- Natural commutation
- Forced commutating method
- Series resonance/current commutation
- Voltage commutations
- Auxiliary thyristor for commutation
- External pulse commutation
- Over voltage and over current protection

- dv/dt and di/dt ratings of thyristor
- Use of snubber circuit

Chapter – 3

Choppers & Cyclo-converters

- Types of chopper circuit (A type to E-type)
- Jones chopper circuit
- Morgans chopper circuit
- Operating principle of cyclo-converter
- Types of cyclo-converters
- Single phase to single phase cyclo -inverter
- Single phase to bridge cyclo-converter

Chapter – 4 Inverters and UPS

- Working principle of inverter
- Inverter circuits using transistor and thyristor and their comparison
- Series inverter using thyristor
- Parallel inverter using thyristor
- Use of pulse width modulation (PWM) circuit
- Concept of UPS
- Block diagram of UPS

Chapter – 5 Electric Heating and Welding Systems

- Principle of the resistance, induction and dielectric heating
- Concepts of the resistance, induction, arc metallic & carbon welding.
- Principles of welding
- Principle of TIG and MIG welding

Chapter – 6 Industrial Applications

- Speed control of universal motor
- Generation of ultrasonic waves
- Applications of ultrasonic waves: flaw detection, cutting and machining of hard material by ultrasonic vibrations, soldering and welding by ultrasonics, ultrasonic drying

(G) SUGGESTED SPECIFICATION TABLE OF MARKS & HOURS DISTRIBUTION:

Legends: K=Knowledge level, C= Comprehension Level, A=Application level

Chapter No.	Chapter Title	Hours	Marks			
			K	C	A	Total Marks
1	Power Electronics Devices	8	4	6	-	10
2	Thyristor Commutation and Protection Circuits	10	4	5	2	11
3	Choppers & Cyclo-converter	10	4	6	2	12
4	Inverters and UPS	13	6	4	5	15
5	Electric Heating and Welding System	13	6	4	5	15
6	Industrial Applications	10	4	3	5	12
	Total	64				75

(H) SUGGESTED IMPLEMENTATION STRATEGIES:

When teaching this course, the actual power electronic devices need to be brought to the class and demonstrated to the students. The OHP could be used to magnify the silhouettes of the various components so that the students develop an appreciation of the actual shape of the various components.

(I) SUGGESTED LEARNING RESOURCES:

20. Textbooks mentioned in the references.
21. Lab. Manuals
22. Power Electronics computer software
23. OHP transparencies

(J) SUGGESTED PRACTICAL EXPERIENCES – (Marks –50):

- a) Performance of Thyristor, TRIAC & DIAC
- b) Frequency calculation of pulse in UJT relaxation oscillator
- c) Applications of TRIAC as AC load control
- d) Performance of IGBT & GTO
- e) Relaxation oscillator circuit using PUT
- f) Design of snubber circuit
- g) SCR commutating circuits
- h) Chopper circuit using SCR
- i) Speed control of DC motor using chopper circuits
- j) Parallel inverter using two thyristors
- k) Study of cyclo converter circuit using thyristors
- l) Speed control of universal motor using thyristors -UJT circuit
- m) Computer simulations

(K) SUGGESTED REFERENCES:

S.No.	Title	Author & Publisher/Edition/ Year
1	Thyristor Engineering	Berde, M.S., Khanna Pub. New Delhi, 1990
2	Laboratory Manual on power electronics	Earnest, Joshua, Mathew, Susan S., Walkey, A.S., Soni, Shyamoli, TTTI, Bhopal, 2002
3	Industrial Electronics	Mithal, G.K., Khanna Pub. New Delhi, 1993 or latest
4	Power Electronics	Rashid, M.H., Prentice Hall of India, New Delhi, 1990
5	Power Electronics	Sen P.C., Tata McGraw Hill New Delhi, 1999
6	Power Electronics	Vithayathil, Joseph, McGraw Hill, New York, 1994

