West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electronics & Tele-Communication Engineering [ETCE] & Electronics & Communication Engineering [ECE]

Part-II (4th Semester)

Revised 2022

Further suggestion may be submitted to the syllabus committee. List of the coordinators for the branch of Diploma in Electronics & Tele-Communication Engineering is:

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WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME: FULL TIME DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING and ELECTRONICS & COMMUNICATION ENGINEERING

DURATION OF COURSE: 6 SEMESTERS

SEMESTER: FOURTH

BRANCH: ELECTRONICS & TELECOMMUNICATION ENGINEERING and ELECTRONICS & COMMUNICATION ENGINEERING

SR. NO.	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME						
						THEORETICAL				PRACTICAL		Total Marks
			L	TU	PR	TA	CT	Total	ESE			
1.	Microcontroller and Applications	3	3	-	-	20	20	40	60	-	-	100
2.	Consumer Electronics	3	3	-	-	20	20	40	60	-	-	100
3.	Linear Integrated Circuits	4	3	1	-	20	20	40	60	-	-	100
4.	Electronic Measurements and Instrumentation	3	3	-	-	20	20	40	60	-	-	100
5.	Digital and Microwave Communication Systems	3	3	-	-	20	20	40	60	-	-	100
6.	Microcontroller and Applications Lab	1	-	-	2					60	40	100
7.	Consumer Electronics Lab	1	-	-	2					60	40	100
8.	Linear Integrated Circuits Lab	1	-	-	2					60	40	100
9.	Electronic Measurements and Instrumentation Lab	1	-	-	2					60	40	100
10.	Digital and Microwave Communication Systems Lab	1	-	-	2					60	40	100
	Total	21	15	1	10	100	100	200	300	300	200	1000

- **STUDENT CONTACT HOURS PER WEEK: 26+2 = 28 hours (2hours for Library)**
- **ACADEMIC CONTACT WEEKS PER SEMESTER: 17weeks (Teaching-15weeks + Internal Exam-2weeks)**
- **THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH**
- **ABBREVIATIONS: L-Lecture, PR-Practical, IA-Internal Assessment, CT-Class Test, ESE- End Semester Exam**
- **IA (Internal Assessment for Theoretical) = 40marks: CT = 20 Marks, Attendance = 10 marks and Quizzes / Assignment / Student Activity = 10 marks.**
- **Minimum qualifying marks for both Theoretical and Sessional subjects (for internal assessment and external assessment separately) are 40%.**
- **IA (Internal Assessment for Practical) = 60 marks: 50 marks for continuous evaluation and 10 marks for Class attendance.**

- Program Elective Subject - Linear Integrated Circuits

Name of the course: Microcontroller and Applications	
Course Code: ETCE/DMICA/S4	Semester: Fourth
Duration: One Semester(Teaching-15 Weeks + Internal Exam-2 weeks)	Maximum Marks:100 Marks
Teaching Scheme:	**Examination Scheme**
Theory:3contact hours/ week	Class Test(Internal Examination):20 Marks
Practical:3contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity=10 marks
	End Semester Examination: 60 Marks
Credit:4(TH:3+PR:1)	Practical:100 Marks

Course Outcomes:

On completion of the course students will be able to:

- Develop the knowledge of further study on advanced Microcontroller
- Implement Timer logic, serial transmission and interrupt handling through programming.
- Prepare them for work in Microcontroller based automated systems
- Increase their skill to prepare Microcontroller based mini project.

Content(Name of the topic)		Periods
Group – A		
Unit1	**Introduction and Basics of 8051 Microcontroller**	**08**
	1.1 Harvard and Von-neuman Architecture, Introduction of Microprocessor and Microcontroller, Comparison between Microprocessor and Microcontroller. 1.2 Details Architecture of 8051 along with its Memory organization and Boolean processor 1.3 Intel MCS51 family features (8951, 8952, 8031, 8751)	
Unit2	**Instruction set and programming with 8051**	**14**
	2.1 8051 instruction set, addressing modes 2.2 Assembly Language programming (ALP), I/O Programming 2.3 Program on interrupt handling, programming counters / timers, Simple program on serial communication 2.4 Software Development cycle- editor, assembler, cross compiler, linker, locator, compiler 2.5 Assembler Directives: ORG, DB, EQU, END, CODE, DATA.	
Group – B		
Unit 3	**External Interfaces with 8051 using C programming**	**14**
	3.1 Memory interfacing (Program and Data memory) and Timers/Counters programming 3.2 I/O interfacing – keyboard, LCD, LED, 7 segment display, stepper motor 3.3 Real world interface - ADC, DAC, SENSORS, Communication interface [RS 232], Interrupt programming	
Group – C		
Unit 4	**Applications of 8051 Microcontroller**	**05**

	4.1 Square wave generation using port pins of 8051, Square and triangular waveform generation using DAC, Water level controller, Temperature controller using ADC 4.2 Stepper motor control for clockwise, anticlockwise rotation, Traffic light controller	
Unit 5	**ARM processor core based microcontrollers**	**04**
	5.1 Need for RISC Processor-ARM processor fundamentals, Basics of ARM core based controller [LPC214X], and simple applications on it.	
	No. of classes required for conducting Internal Assessment examination	**06**
	Total	**51**

Sl. No.	**Suggested List of Laboratory Experiments**
1	To develop programming using ASM and C, and implementation in flash 8051 microcontroller
2	To develop programming with Arithmetic logic instructions [Assembly] (8051 microcontroller)
3	To develop programming of sorting an array [Assembly] (8051 microcontroller)
4	To develop programming using Ports [Assembly and C] (8051 microcontroller)
5	To develop programming for Delay generation using Timer [Assembly and C] (8051 microcontroller)
6	To develop a programming for interrupt handling [Assembly and C] (8051 microcontroller)
7	To develop programming for implementation of standard UART communication (using hyper terminal) [Assembly and C] (8051 microcontroller)
8	To develop programming for interfacing with LCD Display. [Assembly and C] (8051 microcontroller)
9	To develop programming for interfacing with Keypad [Assembly and C] (8051 microcontroller)
10	To develop programming for interfacing ADC/DAC [Assembly and C] (8051 microcontroller)
11	To develop programming for interfacing with stepper motor. [Assembly and C] (8051 microcontroller)
12	To develop Pulse Width Modulation Programming in ARM Microcontroller using simulator.
13	To develop GPIO programming in ARM microcontroller. [C Programming]
14	To develop Timers programming in ARM Microcontroller. [C Programming]

References:

Sl No.	**Title of Book**	**Author**	**Publication**
1.	The 8051 Micro Controller and Embedded Systems	Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely	PHI Pearson Education, 5th Indian reprint
2.	Microprocessor and Microcontrollers	Krishna Kant	Eastern Company Edition, Prentice Hall of India, New Delhi
3.	Microprocessor & Microcontroller Architecture: Programming & Interfacing using 8085,8086,8051	Soumitra Kumar Mandal	McGraw Hill Edu,
4.	Microcontrollers: Architecture implementation and Programming	Tabak Daniel, Hintz Kenneth j	Tata McGraw Hill, 2007
5.	ARM Developer's Guide.UM10139 LPC214X User manual – Rev.4	Andrew N.Sloss, Dominic Symes, Chris Wright	User manual – Rev.4
6.	Microprocessors and interfacing:	Douglas V. Hall	Tata McGraw Hill, 2editon, 2007

	programming and hardware		
7.	"Microcontroller – Fundamentals and Applications with Pic	Valder – Perez	Yeesdee Publishers, Tayler & Francis
8.	Microprocessors and Microcontrollers	N. Senthil Kumar, M. Saravanan, S Jeevananthan	Oxford University Press

Suggested Scheme of Question Paper for End Semester Examination: [Duration 3 hours]

A: Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A1	**1&2**	**06**	**10**	**10x01=10**
A2	**3**	**05**		
A3	**4&5**	**04**		
	Total:	**15**	**10**	**10**
B: Fill-in the Blank Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B1	**1&2**	**06**	**10**	**10x01=10**
B2	**3**	**05**		
B3	**4 & 5**	**04**		
	Total:	**15**	**10**	**10**
C: Short Answer Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
C1	**1&2**	**06**	**10**	**10x01=10**
C2	**3**	**05**		
C3	**4 & 5**	**04**		
	Total:	**15**	**10**	**10**
			Sub-Total[A+B+C]:	**30**
D: Subjective Type Questions (Carrying 2 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
D1	**1&2**	**04**	**06**	**06x02=12**
D2	**3**	**03**		
D3	**4 & 5**	**03**		
	Total:	**10**	**06**	**12**
E: Subjective Type Questions (Carrying 6 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
E1	**1&2**	**04**	**03**	**06x03=18**
E2	**3**	**02**		
E3	**4 & 5**	**02**		
	Total:	**08**	**03**	**18**
			Sub-Total[D+E]:	**30**
			Total[A+B+C+D+E]:	**60**

Name of the course: Consumer Electronics	
Course Code: ETCE/DCNE/S4	**Semester: Fourth**
Duration: One Semester (Teaching–15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3 contact hrs./week	Class Test (Internal Examination): 20 Marks
Practical: 2 contact hours/week	Attendance=10 marks and Quizzes /Assignment /Student Activity =10 marks
	End Semester Examination: 60 Marks
Credit: 4(TH:3+PR:1)	Practical: 100 Marks
Rationale:	

Need of Consumer Electronics based appliances are essential in our daily life. This requires large number of technically skilled persons in the relevant industries. Looking towards to present need and to fulfill future demand the knowledge of consumer products/appliances are necessary for our diploma students.

This course will introduce students about working principles of consumer electronics-based appliances like microphones, loudspeakers, TVs, photocopier, microwave Oven, washing machine, air conditioners, refrigerators, digital camera and cam coders to develop their skills for troubleshooting in a systematic way. This will help them to develop their own production house as well as to start up their own enterprises.

Course Outcomes:

After completion of the course students will be able to:

- Record the characteristics of microphones and loudspeakers.
- Create home theatre sound system and surrounded sound system in both analog and digital domain.
- Troubleshoot different colour TV receivers.
- Select different TV receivers based on their interface criteria.
- Maintain different consumer electronic appliances.

Content (Name of the topic)		Periods
Group – A		
Unit 1	**Audio Fundamentals and Devices**	**07**
	1.1 Basic Characteristics of sound signals; audio level metering; acoustic measuring in decibel level 1.2 Characteristics of microphones, Principle of operations, constructions, Advantages and disadvantages, Applications of: Moving Coil Microphone, Wireless Microphone etc. 1.3 Characteristics of Loudspeakers, Principle of operations, constructions, Advantages and disadvantages, Applications of Direct and Indirect type loudspeaker, Types of Baffles; Multi-way Speakers (Woofer, Tweeter); Cross-over network 1.4 Sound recording principles and types: Optical and Digital recording	
Unit 2	**Audio Systems**	**05**
	2.1 Monophonic and stereophonic sound systems. Home Theatre sound system, surround sound system 2.2 Public address system: Its Block diagram and its applications 2.3 Digital Console Block diagram; working principle and applications. 2.4 FM tuner, ICs used in FM tuner TDA 7021T.	
Unit 3	**Television Systems**	**12**
	3.1 Monochrome TV Standards: Aspect Ratio, Flicker, Interlace Scanning, Resolution, Tonal gradation. 3.2 Composite Video Signal; Horizontal and Vertical Scanning. 3.3 Fundamental concepts of RGB colour systems and Colour theory (additive and subtractive colour mixing); Hue, Luminance; Saturation; Chrominance 3.4 Colour TV camera (CCD), Colour TV Standards	
Unit 4	**Television Receivers and Video Systems**	**10**

	4.1 Colour TV signals (I, Q, U, V); Working principle of PAL-D colour TV coder and decoder 4.2 Digital Televisions: - LCD, LED, PLASMA, HDTV, 3-D TV, projection TV 4.3 Block diagram of DTH receiver 4.4 Overview of different types of Interfaces: Video interface, Digital Video, SDI, HDMI Multimedia Interface, Digital Video Interface, Flash Drive, concept of Bluetooth and its applications	
Unit 5	**Home/Office Appliances**	**11**
	5.1 Operating principles, Diagrams and Controller: Photocopier; Microwave Oven; Washing machine; Air conditioners and Refrigerators; Digital camera and Cam coders.	
	No. of classes required for conducting Internal Assessment examination	**06**
	Total	**51**

Sl No.	Suggested List of Laboratory Experiments
1.	Test the performance of speaker
2.	Measure voltage level to sketch composite video signal at different stages of TV receiver.
3.	Study the internal layout of black and white TV receiver.
4.	Study the internal layout of colour television
5.	Fault finding in given Colour TV: i) No color ii) Red Colour only iii) Blue color only iv) Green color only v) Magenta color only vi) Cyan only vii) Yellow only viii) No raster, No Sound.
6.	Test various sections of LED TV receivers.
7.	Installation of DTH trainer.
8.	Demonstration of Photocopier.
9.	Demonstration of Microwave Oven.
10.	Demonstration of Washing machine.
11.	Demonstration of Refrigerator.
12.	Demonstration of Digital Camera.

References:

Sl No.	Name of the Author	Title of the Book	Name of the Publishers
1.	Consumer Electronics	Bali S.P.	Pearson Education India,2010, latest
2.	Audio video systems: principle practices & troubleshooting	Bali R and Bali S.P	Khanna Book Publishing Co. (P) Ltd.,2010 Delhi, India, latest edition.
3.	Modern Television practices	Gulati R.R.	New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition
4.	Audio video systems	Gupta R.G.	Tata McGraw Hill, New Delhi, India
5.	Mastering Digital Television	Whitaker Jerry &Benson Blair	McGraw-Hill Professional, 2010, latest edition
6.	Standard handbook of Audio engineering	Whitaker Jerry & Benson Blair	McGraw-Hill Professional, 2010, latest edition

Suggested Scheme of Question Paper for End Semester Examination: [Duration 3 hours]

A: Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A1	**1,2& 3**	**08**		
A2	**4&5**	**07**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
B: Fill-in the Blank Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B1	**1,2& 3**	**08**		
B2	**4&5**	**07**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
C: Short Answer Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
C1	**1,2& 3**	**08**		
C2	**4&5**	**07**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
			Sub-Total[A+B+C]:	**30**
D: Subjective Type Questions (Carrying 2 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
D1	**1,2& 3**	**05**		
D2	**4&5**	**05**	**06**	**06x02=12**
	Total:	**10**	**06**	**12**
E: Subjective Type Questions (Carrying 6 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
E1	**1,2& 3**	**05**		
E2	**4&5**	**04**	**03**	**06x03=18**
	Total:	**09**	**03**	**18**
			Sub-Total[D+E]:	**30**
			Total[A+B+C+D+E]:	**60**

Name of the course: Linear Integrated Circuits	
Course Code: ETCE/DLIC/S4	**Semester: Fourth**
Duration: One Semester (Teaching– 15 weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3 contact hrs./week+ Tutorial: 1 contact hours/week	Class Test (Internal Examination): 20 Marks
Practical: 2 contact hours/week	Attendance=10 marks and Quizzes /Assignment /Student Activity =10 marks
	End Semester Examination:60Marks
Credit: 5(TH:4+PR:1)	Practical: 100 Marks

Course Outcomes:

After completion of the course, students will be able to

- Analyze the operating principle of operational amplifier and design its various linear and non-linear application circuits.
- Distinguish IC and Discrete components, explain manufacturing process of IC and analyze how monolithic components are being developed.
- Gain knowledge about applications of few specific ICs – Function Generator, Multivibrator, Voltage to Frequency Converter, Analog Multiplier, PLL etc.

Content (Name of the topic)		Periods
Group – A		
Unit 1	**Operational Amplifier**	**15(Th)+5(Tu)**
	1.1 Circuit operation of differential amplifier – single & double ended 1.2 INTRODUCTION TO OPERATIONAL AMPLIFIER: Common mode rejection ratio – Bias current – Offset voltage and current – Slew rate and Frequency response – Open loop and closed loop gain – Input and output impedance - Concept of virtual ground, Inverting and non-inverting mode and their gain calculation (Sign Changer, Scale Changer, Phase Shift Circuits) 1.3 APPLICATIONS OF OPAMP: Voltage Follower, V-to-I and I-to-V converters, Instrumentation amplifier, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, 1.4 Low-pass, high-pass and band-pass Butterworth filters. 1.5 Oscillators using OPAMP - a) Hartley, b) Colpitt, c) Wein-bridge, d) Phase Shift, e) Crystal.	
Unit 2	**Waveform generators and special function ICs**	**12(Th)+4(Tu)**
	2.1 Sine-wave generators, Triangular wave generator, Saw-tooth wave generator, ICL8038 Function generator 2.2 Multivibrators - Operation of monostable, astable and bistable multivibrator with waveforms, Timer IC 555- internal block diagram and pin function, construction of different multivibrators with IC-555 2.2 IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator Monolithic switching regulator, Switched capacitor filter IC MF100 2.4 Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.	
Unit 3	**IC Fabrication and Circuit Configuration for Linear IC**	**10(Th)+4(Tu)**
	3.1 Advantages of ICs over discrete elements 3.2 TYPES OF ICS: Linear and Digital – Monolithic and Hybrid 3.3 Manufacturing process of monolithic ICs- Construction of monolithic bipolar transistor – Monolithic diodes – Integrated Resistors, Monolithic Capacitors – Inductors 3.4 Fabrication of NMOS, PMOS & CMOS 3.5 Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References	
Unit 4	**Analog Multiplier and PLL**	**8(Th)+2(Tu)**
	4.1 Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, 4.2 Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565.	
	No. of classes required for conducting Internal Assessment examination	**6(Th)+2(Tu)**
	Total	**51(Th)+17(Tu)**

Sl No.	Suggested List of Laboratory Experiments
1	To determine the following characteristics of op-amp**:** — a) input offset voltage, b) slew rate, c) non-inverting gain, d) inverting gain.
2	To study the following applications of op-amp using IC741**:** — a) clipper, b) clamper, c) Schmitt trigger, d) voltage follower
3	To study the operation of low-pass, high-pass and band-pass Butterworth filters.
4	To study the operation of Oscillators (any two) using OPAMP - a) Hartley, b) Colpitt, c) Wein-bridge, d) Phase Shift, e) Crystal.
5	To generate Sine-wave, Triangular wave and Saw-tooth wave using ICL8038 Function generator
6	To study the application of IC555 timer connected as**:** a) astable multivibrator, b) monostable multivibrator.
7	To study the operation of IC 723 Voltage Regulator
8	To study the operation of Current mirror
9	To study the operation of a) Frequency to Voltage converter and b) Voltage to Frequency converter
10	To study the operation of analog multiplier ICs and their applications
11	To study the operation of Voltage controlled oscillator

References:

Sl. No.	Name of the Author	Title of the Book	Name of the Publisher
1.	Boylestad & Nashalsky	Electronic Devices and Circuits	Pearsons Eduction
2.	David A. Bell	Electronic Devices and Circuits	Oxford University Press
3.	Design with operational amplifiers and analog integrated circuits, 3rd Edition	Sergio Franco	Tata McGraw-Hill
4.	Linear Integrated Circuits,	D.Roy Choudhry, Shail Jain	New Age International Pvt. Ltd
5.	System design using Integrated Circuits	B.S.Sonde	New Age Pub
6.	Analysis and Design of Analog Integrated Circuits	Gray and Meyer	Wiley International
7.	OP-AMP and Linear ICs	Ramakant A.Gayakwad	Prentice Hall / Pearson Education
8.	Operational Amplifier and Linear Integrated Circuits	K Lal Kishore	Pearson Education
9.	Anil K. Maini	Electronics Devices and circuits	Wiley
10	Chattopadhyay & Rakhshit	Basic Electronic & Linear Circuits	New Age International
11	Ramesh Babu	Electronic Devices & Circuits	Scitech
12	Shredhra Smith	Microelectronics	Oxford University Press
13	S. Salivanan,Umesh Kumar, Vallavaraj	Electronic Devices and Circuits	Tata McGraw-Hill
14.	Malvino	Electronic Principles	Tata McGraw-Hill
15	Milman & Halkias	Integrated Electronics	Tata McGraw-Hill
16	Ganesh Babu	Linear Integrated Circuits	SCITECH
17	Bhargava	Basic Electronic & Linear Circuits	Tata McGraw-Hill
18	Rashid	Microelectronics	Wiley

Suggested Scheme of Question Paper for End Semester Examination: [Duration 3 hours]

A: Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A1	**1&2**	**09**		
A2	**3&4**	**06**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
B: Fill-in the Blank Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B1	**1&2**	**09**		
B2	**3&4**	**06**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
C: Short Answer Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
C1	**1&2**	**09**		
C2	**3&4**	**06**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
			Sub-Total[A+B+C]:	**30**
D: Subjective Type Questions (Carrying 2 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
D1	**1&2**	**06**		
D2	**3&4**	**04**	**06**	**06x02=12**
	Total:	**10**	**06**	**12**
E: Subjective Type Questions (Carrying 6 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
E1	**1&2**	**05**		
E2	**3&4**	**04**	**03**	**06x03=18**
	Total:	**09**	**03**	**18**
			Sub-Total[D+E]:	**30**
			Total[A+B+C+D+E]:	**60**

Name of the course: Electronic Measurements and Instrumentation	
Course Code: ETCE/DEMN/S4	Semester: Fourth
Duration: One Semester (Teaching–15 Weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3 contact hrs./ week	Class Test (Internal Examination): 20 Marks
Practical: 2 contact hours/week	Attendance = 10 marks and Quizzes/Assignment/Student Activity = 10 marks
	EndSemesterExamination:60Marks
Credit: 4(TH:3+PR:1)	Practical: 100 Marks

Course Outcomes:

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

- Familiar with the basics of Measurements, measuring instruments like electronic voltmeter, Multimeter, Q-meter, CRO, signal generator, spectrum analyzer etc.
- Measure unknown parameters using different types of AC and DC Bridges
- Develop the knowledge of TRANSDUCER and POTENTIOMETER

Content (Name of topic)		**Periods**
Group-A		
Unit 1	**BASICS OF MEASUREMENTS**	**4**

	1.1 Explanationofaccuracy,precision,sensitivity,resolution,Dynamicrange,response andrepeatabilityofmeasuringinstruments 1.2 Units in measurements and different types of units, Definition of Errors and type of errors, Concept of Calibration	
Unit 2	**TYPES OF DC & AC BRIDGES**	**6**
	2.1 DC Bridges – Wheatstone and Kelvin Double Bridge and its application 2.2 AC Bridges - Maxwell's Bridge, Hay's Bridge, Wien Bridge and its application	
Unit 3	**TRANSDUCER and POTENTIOMETER**	**8**
	3.1 Working Principles and Application including Classification, Selection Criteria, Characteristics, Construction of following Transducers- RTD, Thermocouple, Thermistor, LVDT, Strain Gauge, Load Cell Piezoelectric Transducers. 3.2 DC and AC Potentiometer -Basic DC slide wire Potentiometer, Crompton's DC Potentiometer and the applications of DC Potentiometer. 3.3 AC Potentiometers and its applications.	
Unit4	**MEASURING INSTRUMENTS**	**5**
	Working principle and construction of- 4.1 Permanent Magnet Moving Coil Instruments (PMMC). 4.2 Moving Iron type Instruments (MI). 4.3 Electro Dynamo Type Instruments. 4.4 Single Phase Energy Meter.	
	Group–B	
Unit 5	**ELECTRONIC INSTRUMENTS**	**10**
	Basics and working principle of - 5.1 Analog and Digital Ammeter, Voltmeter and Multimeter 5.2 Different types of DMM: Integration and successive approximation type. 5.3 Advantages of DMM over Analog MultiMeter. 5.4 Q-Meter. 5.5 Vector Impedance Meter. 5.6 Spectrum Analyzer. 5.7 Function Generator.	
Unit 6	**CATHODERAYOSCILLOSCOPE**	**12**
	6.1 Block diagram of CRO, CRT- constructional features, principle of operation screens, graticules 6.2 Block schematic description of: Vertical Amplifier, (b) Time Base Generator, (c) Trace Synchronization, (d) Triggering Modes, (e) Front Panel Controls, (f) Probe Characteristics (Structure of 1:1 and 10:1 probe). 6.3 Features of dual trace oscilloscopes, chopper beam switch, alternate beam switch. 6.4 Block schematic description of digital storage oscilloscope. 6.5 Measurement of amplitude, frequency, time period, phase angle, modulation index (trapezoidal method) and delay time by CRO.	

	No. of classes required for conducting Internal Assessment examination	**06**
	TOTAL	**51**

Sl. No.	**Suggested List of Laboratory Experiments**
1.	To study the operation of **:** (a)Multimeter (b) Function Generator (c) PMMC (d) Single Phase Energy Meter.
2.	Measure unknown inductance using following bridges (a) Wheatstone Bridge (b) Maxwell Bridge.
3.	Measurement of displacement with the help of LVDT.
4.	Measurement of strain/force with the help of strain gauge load cell.
5.	Draw the characteristics of the following temperature transducers (a) RTD (Pt-100) (b) Thermistor.
6.	Calibrate a single-phase energy meter by phantom loading.
7.	Calibrate a voltmeter using Crompton potentiometer.
8.	Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes.
9.	Study the working of Q-meter and measure Q of coils.
10.	To study the spectrum analyzer.

References:

Sl. No.	**Name of the Author**	**Title of the Book**	**Name of the Publisher**
1.	Kalsi	Electronic Instrumentation	Tata McGraw-Hill
2.	A.K.Sawhney	A Course in Electrical and Electronic Measurement and Instrumentation	Dhanpat Rai & Sons
3.	David Bell	Electronic Instrumentation and Measurement	Oxford University Press
4.	RK Rajput	Electronics Measurements & Instrumentation	S Chand
5.	Oliver Cage	Electronic Measurement and Instrumentation	McGraw Hill
6.	Wolf and Smith	Students Reference Manual for Electronic Instrumentation Lab	Prentice Hall of India
7.	JB Gupta	Electrical & Electronics Measurement	SK Kataria & Sons
8.	Brownes	Digital Instruments	Tata McGraw Hills
9.	U Sinha	Electrical & Electronics Measurements and Instrumentation	
10.	Cooper	Electronic Measurement and Measurement Technique	Prentice Hall of India

Suggested Scheme of Question Paper for End Semester Examination: [Duration 3 hours]

A: Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A1	**1,2, 3&4**	**08**		
A2	**5 & 6**	**07**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
B: Fill-in the Blank Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B1	**1,2, 3&4**	**08**		
B2	**5 & 6**	**07**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
C: Short Answer Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
C1	**1,2, 3&4**	**08**		
C2	**5 & 6**	**07**	**10**	**10x01=10**
	Total:	**15**	**10**	**10**
			Sub-Total[A+B+C]:	**30**
D: Subjective Type Questions (Carrying 2 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
D1	**1,2, 3&4**	**05**		
D2	**5 & 6**	**05**	**06**	**06x02=12**
	Total:	**10**	**06**	**12**
E: Subjective Type Questions (Carrying 6 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
E1	**1,2, 3&4**	**05**		
E2	**5 & 6**	**04**	**03**	**06x03=18**
	Total:	**09**	**03**	**18**
			Sub-Total[D+E]:	**30**
			Total[A+B+C+D+E]:	**60**

Name of the course: Digital And Microwave Communication Systems	
Course Code: ETCE/DMC/S4	Semester: Fourth
Duration: One Semester (Teaching-15 Weeks + Internal Exam-2 weeks)	Maximum Marks: 100 Marks
Teaching Scheme:	**Examination Scheme**
Theory: 3 contact hrs./ week	Class Test(Internal Examination): 20 Marks
Practical: 2 contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity=10 marks
	End Semester Examination: 60 Marks
Credit: 4(TH:3+PR:1)	Practical: 100 Marks

Course Outcomes:

On completion of the course students will be able to :

- Develop the knowledge of further study on digital communication
- Prepare them for work in modern upcoming advanced communication systems
- Increase their skill in the field of microwave communication

Content (Name of the topic)		Periods
Group– A		
Unit 1	**PCM and Delta modulation System**	**07**
	1.1 Basic concept of PCM system – Sampling – Quantizing – Encoding 1.2 Block schematic description of Transmitter and Receiver of PCM system 1.3 Principle of uniform and non-uniform quantization – Companding - signal to quantization noise ratio analysis of linear and nonlinear quantizer 1.4 Block schematic diagram of Delta modulation technique 1.5 Limitations of Delta modulation – Slope overload and Granular noise, Concept of Adaptive Delta Modulation	
Unit 2	**Digital modulation techniques**	**10**
	2.1 RF Modulation for base band signal – Geometric representation of signals 2.2 Basic idea of Maximum likelihood decoding 2.3 Generation, detection and waveform of ASK, BPSK, coherent and non-coherent FSK, QPSK and DPSK, comparison of bandwidth and bit rate of digital modulation scheme. 2.4 QAM, MSK and multicarrier modulation – comparison of bandwidth and bit rate of digital modulation scheme.	
Group– B		
Unit3	**Multiplexing**	**10**
	3.1 Idea of multiplexing and its necessity 3.2 Types of multiplexing – Time division multiplexing – Frequency division multiplexing – Code division multiplexing 3.3 Principles of Time division multiplexing and synchronization in a digital communication system 3.4 PCM – TDM in modern applications 3.5 Frequency division multiplexing with practical examples	
Unit 4	**Spread Spectrum Modulation**	**06**
	4.1 Introduction to PN sequence 4.2 Model of spread spectrum modulation 4.3 Direct sequence spread spectrum (DSSS) 4.4 Frequency hop spread spectrum (FHSS) – Slow frequency hopping and Fast frequency hopping 4.5 Application of spread spectrum modulation	
Group– C		
Unit 5	**Microwave Communication**	**12**

	5.1 Problems associated with conventional tubes at microwave frequency 5.2 Basic idea of amplification with velocity and density modulation – multi cavity Klystron – Reflex Klystron – Travelling Wave Tube (TWT) with efficiency, power output and frequency range of operation – field of application 5.3 Principle operation of GUNN and IMPATT and their field of operation 5.4 Detectors used at microwave frequency –detector diode 5.5 Microwave passive devices – Directional coupler – Attenuator – Isolator – Magic Tee 5.6 Basic idea – Rectangular waveguide, Circular waveguide 5.7 Concept of Propagation of EM wave through waveguide with TE and TM modes.	
	No. of classes required for conducting Internal Assessment examination	**06**
	Total	**51**

Sl. No.	**Suggested List of Laboratory Experiments**
1	To study generation of TDM signal and the detected waveforms
2	To study generation of FDM signal and the detected waveforms
3	To study generation of ASK signal and the detected waveforms
4	To study generation of FSK signal and the detected waveforms.
5	To study generation of PSK signal and the detected waveforms
6	To study the characteristics of GUNN diode
7	To study the characteristics of KLYSTRON
8	To study the characteristics of Directional Coupler
9	To study the characteristics of Attenuator
10	To study the characteristics of Isolator
11	To study the characteristics of Magic Tee
12	Mini projects on (A) TDM transmitter (B) TDM receiver (C) FDM transmitter (D) FDM receiver

References:

Sl No.	**Name of the Author**	**Title of the Book**	**Name of the Publishers**
1.	Taub Schilling	Principles of communication systems	T.M.H
2.	Simon Haykin	Communication Systems	Wiley
3.	B.P. Lathi	Modern Digital & Analog Communication	Oxford Publications
4.	Dr. Sanjay Sharma	Communication Systems (Analog and Digital)	S. K. Kataria & Sons
5.	Wayne Tomasi	Advanced Electronic Communication System	P. H. I.
6.	Kennedy, Devis	Electronic Communication	T.M.H.

		Systems	
7.	Frenzel	Electronics Communication	T.M.H.

Suggested Scheme of Question Paper for End Semester Examination: [Duration 3 hours]

A: Multiple Choice Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
A1	**1&2**	**06**	**10**	**10x01=10**
A2	**3&4**	**05**		
A3	**5**	**04**		
	Total:	**15**	**10**	**10**
B: Fill-in the Blank Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
B1	**1&2**	**06**	**10**	**10x01=10**
B2	**3&4**	**05**		
B3	**5**	**04**		
	Total:	**15**	**10**	**10**
C: Short Answer Type Questions (Carrying 1 mark each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
C1	**1&2**	**06**	**10**	**10x01=10**
C2	**3&4**	**05**		
C3	**5**	**04**		
	Total:	**15**	**10**	**10**
			Sub-Total[A+B+C]:	**30**
D: Subjective Type Questions (Carrying 2 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
D1	**1&2**	**04**	**06**	**06x02=12**
D2	**3&4**	**04**		
D3	**5**	**02**		
	Total:	**10**	**06**	**12**
E: Subjective Type Questions (Carrying 6 marks each)				
Group	**Unit**	**To be Set**	**To be Answered**	**Total Marks**
E1	**1&2**	**03**	**03**	**06x03=18**
E2	**3&4**	**03**		
	5	**03**		
	Total:	**09**	**03**	**18**
			Sub-Total[D+E]:	**30**
			Total[A+B+C+D+E]:	**60**