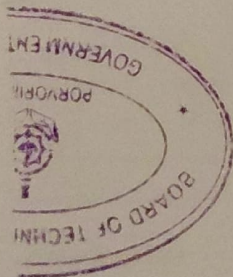


SEMESTER III

		DIPLOMA IN ELECTRONICS ENGINEERING - CURRICULUM STRUCTURE									
	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
THIRD	CC304	Basic Electrical Engineering	3	0	2	5	75	25	-	25	125
	EX302	Programming in C	0		4	4	-	-	50	25	75
	CC308	Basic Electronics Engineering	3	0	2	5	75	25	25	25	150
	CC309	Digital Electronics	3	0	2	5	75	25	25	25	150
	EX301	Communication Engg	3	0	2	5	75	25	-	25	125
	CC303	Circuits & Networks	3	0	2	5	75	25	-	25	125
				15	0	14	29	375	125	100	150



(CC304) BASIC ELECTRICAL ENGINEERING

1. COURSE OBJECTIVES:

This course will enable the students to understand the basic concepts and principles of AC Circuits, Transformers and Motors.

1. To understand basic concepts in Electrical Engineering
2. To understand working & use of Transformer, DC & AC motors
3. To understand importance of safety precautions and use of protective devices

2. TEACHING AND EXAMINATION SCHEME

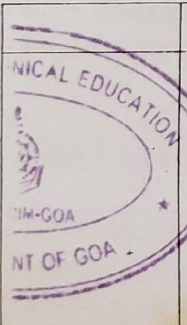
Semester	III	Periods/Week (in hours)			Total Hours	Examination Scheme				
						Theory Marks		Practical Marks		Total Marks
						TH	TM	TW	PR/OR	
(Course Code)		L	T	P	H	TH	TM	TW	PR/OR	125
BASIC ELECTRICAL ENGINEERING		3	-	2	5	75	25	25	--	

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Explain terms related to ac waveform, operating principle and functions of parts of transformer, motors; need for earthing and operation of protective devices
2. Describe the procedure for starting and speed control of different motors
3. Differentiate between types of motors, types of earthing, protective devices, star and delta connection
4. Test & Compute parameters of transformers

4. Mapping Course Outcomes with Program Outcomes

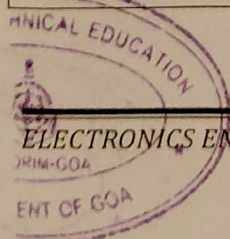
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
 PO 1: Basic & Discipline Specific Knowledge		Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	0	0	0	0	1
CO2	3	2	0	3	0	3	1
CO3	2	2	3	3	2	3	1
CO4	2	2	0	0	2	0	1

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Th r	CO
1 AC CIRCUITS			15	9	CO1,3
1.1 Sinusoidal AC voltage waveform. Definition and numerical Values of, average value, RMS value, form factor, peak factor, frequency of Sinusoidal quantities. Principle of single phase alternator					
1.2 Three-phase circuits. Concept of phase sequence, balanced system and unbalanced system Relation between line and phase quantities for star and delta connections.					
1.3 Concept & definition of Real, reactive and apparent power in three-phase system.					
2 TRANSFORMER			15	10	CO1,4
2.1 Principle of operation and basic construction (Core & Shell type) of a single phase transformer. EMF equation, Calculations of Rated Currents & Voltages & Turns using emf equation					
2.2 Losses in transformer (Hysteresis, Eddy Current & copper loss, their brief description), efficiency and voltage regulation. Rating of transformer ,Applications of transformer					
3 DC MOTORS			15	10	CO 1,2,3
3.1 Working principle of DC motors, main parts of DC motor and their functions(Yoke ,pole core ,pole shoe, armature core, armature winding ,Commutator& Brushes), classification of DC motors (shunt, series and compound and their applications).					
3.2 Necessity of starter, methods of reversal of direction of rotation of DC shunt and series motor.					



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3.3 Speed Equation , Armature resistance control & Field resistance control method for DC shunt Motor			
4 AC MOTORS	15	10	CO1,2,3
4.1 Principle of three phase induction motor, main parts, classification (squirrel cage & Slip ring), torque-slip characteristics and application (only diagram).			
4.2 Necessity of starter, Starters - Direct On Line starter, star delta starter (Manual) and autotransformer starter (Manual), (w.r.t. circuit diagram, working and application). Method of reversal of direction of rotation.			
4.3 Working principle and application of - Single phase induction motor (split phase only) - Universal motor - Stepper motor (Variable reluctance type & permanent Magnet type.)			
5 EARTHING & PROTECTIVE DEVICES	15	09	CO1,3
5.1 Electric shock, precautions against shock. Necessity of earthing, types of earthing- equipment earthing & system earthing (definitions only). Types of earthing electrodes- Pipe and Plate. Methods of reducing earth resistance.			
5.2 Fuse- Definition, Types of Fuses- Rewirable fuse, HRC fuse & Cartridge fuse. Rating for fuse such as Voltage ratings, Current ratings, Breaking capacity (Rupture capacity) & Minimum fusing current. MCB- Principle of operation and application. ELCB- Current operated type. Principle of operation and application.			
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	AC CIRCUITS	09	15
2	TRANSFORMER	10	15
3	DC MOTORS	10	15
4	AC MOTORS	10	15
5	EARTHING & PROTECTIVE DEVICES	09	15
	Total	64	75



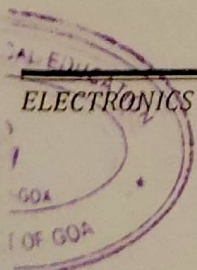
8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical (Minimum 8)	Marks
1.	Connection of single transformer & Measure its Voltages, Currents, Voltage Regulation & Efficiency	
2.	Verify relationship between phase & line quantities in star connected load	
3.	Speed control of DC motor	
4.	Starting of DC shunt motor and reversal of direction of rotation	
5.	Starting of three phase induction motor using star delta starter	
6.	Verify relationship between phase & line quantities in Delta connected load	
7.	Study of MCB & ELCB (Current Operated)	
8.	Study of stepper motors	
9.	Study of servo motors	
10.	Study of universal motors	
11.	Study of rotor resistance starter for starting of Slip ring induction motor.	
12.	Checking of Ceiling fan using series test lamp	
13.	Measurement of voltages in a single phase system(between phase and neutral, phase and earth and neutral and earth)	
	Total	25
No	Class room Assignments	Marks
1	At least 2 Assignments	
2		
...		
No	Tutorial Exercise	Marks
1	NIL	
2		
...		
	Total	25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	B.L.Theraja	Electrical Technology (Vol I and Vol II)	S. Chand
2	V.K Mehta	Principles of Electrical Engineering & Electronics	S. Chand
3	J.B.Gupta	Fundamentals of Electrical Engineering	S.K. Kataria& sons



(EX302) PROGRAMMING IN C

1. COURSE OBJECTIVES:

The course is designed to provide students with programming skills through C language. The course aims to develop student's logical skills to write C program and to compile, debug and execute them on various platforms.

2. TEACHING AND EXAMINATION SCHEME

Semester	III	Periods/Week (in hours)			Total Hours	Examination Scheme				
Course code & course title						Theory Marks		Practical Marks		Total Marks
(EX302) Programming In C		L	T	P	H	TH	TM	TW	PR/OR	
		-	-	4	4	-	-	25	50	75

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

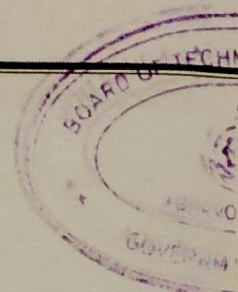
1. Understand the program statement and draw flow chart.
2. Develop basic programming skills and write programs using C.
3. Analyze C programs.
4. Execute C programs on various platforms.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	0	2	1	0	0	3	0
CO2	3	3	1	2	2	3	0
CO3	3	3	1	2	3	3	2
CO4	0	1	0	2	0	3	0

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	1	1



CO2	2	2
CO3	1	3
CO4	1	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	P	CO
1 Introduction to C			12	10	co1
1.1 Overview of C: Brief history of C language, Features of C language ,Application of C language in electronics, Structure of C language					
1.2 Flow chart: Definition and uses, symbol used in flow chart- flow line, terminal, input/output, processing, decision, on-page connector, off-page connector, predefined process/function, Simple examples of flow chart.					
2 Basic elements of C programming			18	14	co2, co4
2.1 Lexical elements of C: C character set, Variables, Constants, Data types, delimiters, reserved words					
2.2 Operators and Expressions in C: Arithmetic operators, expressions, relational operators, logical operators, increment/decrement operators, bitwise data operators,					
2.3C pre-processor: File inclusion (usage only)					
2.4Input/Output in C Different types of input functions and output functions, conversion specification, formatted input/output function					
3 Control statements of C programming			18	14	co2,co4
3.1 Decision control statements : if else, nested if					
3.2 Loops: for loop, break and continue statement, nested for loop, while loop, do-while loop					
3.3Case control statement: switch-case-default					
3.4 Functions: Call by value, call by reference, recursive function					
4 Data types			21	18	co3,co4
4.1 Arrays: Declaration of Arrays, one dimensional Array , two dimensional Array					
4.2 Strings: Declaration of String, string library functions					

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4.3 Pointers: Declaration of Pointers, pointer operators, Basic pointer arithmetic			
5 Structures	06	08	co3,co4
5.1 Declaration of structure, array of structure, structure within a structure.			
Total	75	64	

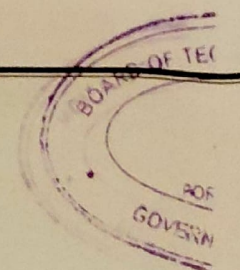
6. COURSE DELIVERY: The Course will be delivered through practicals, laboratory interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of Practical	Marks
1	Introduction to C	10	12
2	Basic elements of C programming	14	18
3	Control statements of C programming	14	18
4	Data types	18	21
5	Structures	08	06
	Total	64	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS(any 8 to 10)

No	Practical	Marks
1.	Program on flow chart	
2.	program on input and output	
3.	program on calculations using operators and expressions	
4.	program on controls statements-if , switch	
5.	Program on loop	
6.	program on function	
7.	program on pointers	
8.	program on arrays	
9.	Program on strings	
10.	program on structures	
	Total	25
No	Class room Assignments	Marks
1	At least 2 assignments	
No	Tutorial Exercise	Marks
1	NIL	
...		
	Total	25



9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Yeshwant Kanetkar	Let Us C	Jones and Bartlett publishers, USA
2	J. Jayasri	The 'C' Language Trainer with C Graphics and C++	New Age International (P) LTD.
3	Anil Bikas Chaudhuri	The Art of Programming Through Flowcharts & Algorithms	FIREWALL MEDIA, New Delhi
4	Luciano Mandli	Understanding Algorithm and Flow Chart	Create Space Independent Pub

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	B. W. Kernigham, D. M. Ritchie	The C programming language	
2	Byron gottfried	Programming with c- Schaum's outlines	Tata McGraw Hill
3			

(CC308) BASIC ELECTRONICS ENGINEERING

1. COURSE OBJECTIVES:

The course is designed to introduce students to semiconductor devices and their applications. The course aims to encourage students to Build and test electronic circuits based on semiconductor devices.

2. TEACHING AND EXAMINATION SCHEME

Semester	III			Total Hours	Examination Scheme				Total Marks
Course code & course title	Periods/Week (in hours)				Theory Marks	Practical Marks		Total Marks	
	L	T	P			TW	PR/OR		
CS308 Basic Electronics Engineering	3	-	2	5	TH 75	TM 25	TW 25	PR/OR 25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

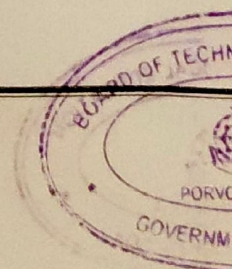
1. Understand the operation and characteristics of semiconductor devices
2. Apply the knowledge of semiconductor devices to build electronic circuits
3. Analyze semiconductor device based electronic circuits
4. Select an appropriate semiconductor device based circuit for a specific application

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of	Engg. Tools, Experimentation &	Engg. Practices for Society, Sustainability &	Project Management	Life-long Learning
CO1	3	1	1	3	2	0	2
CO2	3	2	1	3	2	2	0
CO3	3	3	2	2	3	0	2
CO4	2	2	2	1	3	0	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	1
CO2	3	2
CO3	3	3
CO4	3	2



5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives				
Unit			M	Thr	CO	
1 Introduction to Semiconductors			10		CO1	
1.1 Classification of solids as conductors , semiconductors and insulators				1		
1.2 Types of semiconductors-Intrinsic and Extrinsic semiconductors, structure of intrinsic semiconductor Extrinsic semiconductor- definition of doping, pentavalent and trivalent impurity. P-type and N-type, structure, majority and minority carriers				4		
2 Semiconductor diode			18		CO1,CO2 CO3,CO4	
2.1 P-N junction and depletion region. forward bias , reverse bias, V-I characteristics, Important diode ratings				4		
2.2 Rectifiers- Half wave rectifier, Centre tap Full wave rectifier, Full wave bridge rectifier, (working, input , output waveforms, Vdc ,PIV) , comparison between rectifiers				4		
2.3 Filters- definition of ripple factor, Types of filters, C filter operation(ripple factor, waveforms), numerical on c filter				2		
3 Zener Diode			12		CO1,CO2 CO3,CO4	
3.1 Construction, operation, forward and reverse characteristics, breakdown mechanism, Important zener diode ratings, comparison with semiconductor diode				4		
3.2 Zener diode as voltage regulator, numerical on variable supply and variable load.				3		
4 Bipolar Junction Transistor			20		CO1,CO2 ,CO3	
4.1 Schematic of NPN and PNP transistor, working of NPN transistor.				2		
4.2 Transistor configurations-CE, CB and CC configurations				2		
4.3 Transistor input and output characteristics in CB configuration, Transistor input and output characteristics in CE configuration ,Alpha, Beta and the relation between them				6		
4.4 leakage currents- concept of ICBO, ICEO, numerical on leakage currents				2		
4.5 Comparison between transistor configurations				1		
4.6 Transistor as a switch				1		
5 Field Effect Transistors			15		CO1	
5.1 JFET: Structure, operation, characteristics of n and p- channel JFET,				3		
5.2 important JFET parameters (rd, μ and gm, no derivations), comparison with BJT				2		
5.3 MOSFET: Structure, operation and characteristics of n-channel and p-channel enhancement type MOSFET.				3		
5.4 Structure, operation and characteristics of n -channel and p- channel depletion type MOSFET				3		
5.5 Comparison between JFET and MOSFET				1		
			Total	75	48	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to Semiconductors	5	10
2	Semiconductor diode	10	18
3	Zener Diode	7	12
4	Bipolar Junction Transistor	14	20
5	Field Effect Transistors	12	15
Total		48	75

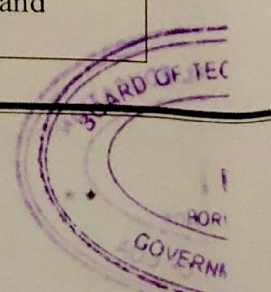
8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Practical Title	
1	Plot VI characteristics of semiconductor diode	
2	Plot VI characteristics of zener diode	
3	Assemble and test zener diode as a voltage regulator	
4	Assemble and test half wave rectifier with and without capacitor filter	
5	Assemble and test bridge full wave rectifier with and without capacitor filter	
6	Plot input characteristics of transistor in CB configuration	
7	Plot output characteristics of transistor in CB configuration	
8	Plot input characteristics of transistor in CE configuration	
9	Plot output characteristics of transistor in CE configuration	
10	Assemble and test circuit of transistor as a switch	
11	Plot VI characteristics of JFET	
Total		25
No	Class room Assignments	Marks
1	At least 2 assignments	
...		
Total		25

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Bhargava & others	Basic Electronics and Linear circuits	Tata McGraw Hill
2	Robert L. Boylestad	Electronic Devices and Circuit Theory	Prentice – Hall India
3	V.K. Mehta	Principles of Electronics Engineering	S. Chand



(CC309) DIGITAL ELECTRONICS

1. COURSE OBJECTIVES:

The students need to learn basic concepts of digital circuits and system which leads to design of complex digital system such as microprocessors.

The students need to know combinational and sequential circuits using digital logic fundamentals. This is the first course by which students get exposure to digital electronics world.

The students will able to

1. To understand various number representations and conversion between different representation in digital electronic circuits.
2. To introduce the students to various logic gates, SOP, POS and their minimization techniques.
3. To analyze logic processes and implementation of logical operations using combinational logic circuits.
4. To understand, analyze and design sequential circuits

2. TEACHING AND EXAMINATION SCHEME

Semester	III			Total Hours	Examination Scheme				Total Marks
Course code & course title	Periods/Week (in hours)				Theory Marks	Practical Marks			
	L	T	P		TH	TM	TW		
Digital Electronics CC309	03	-	02	05	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1: Relate the knowledge of Number Systems in Digital Applications.

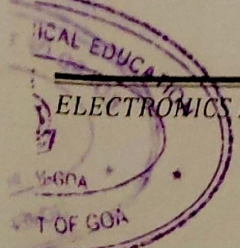
CO2: Build different Sequential and Combinational Circuits.

CO3: Simplify logical problems using digital circuits.

CO4: Develop basic digital electronics circuits.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	& Basic Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentatio n & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	2	3	3	0	0	3
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	0	3
CO4	3	3	3	3	2	2	3

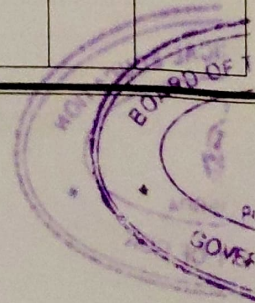


Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

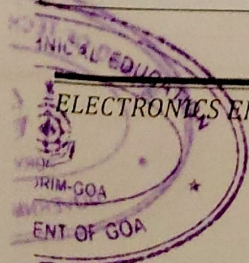
5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 Number System			14	09	CO1
1.1 Digital and Analog Signals. Definition of digital and analog signals, Comparison between Analog and Digital signals.					
1.2 Number System:- Decimal, Binary, Hexadecimal. Introduction to Decimal, Binary and Hexadecimal Number Systems. Counting in each system. Conversion from one system to other.					
1.3 Codes:- introduction and importance of Codes. BCD code, GRAY code conversion of Gray to Binary, Binary to Gray, BCD to binary and Binary to BCD. Represent Decimal Numbers in BCD and Gray codes. ASCII code and its importance.					
1.4 Binary Addition (upto 4 bits), 1's complement of a Binary number, 2's complement of a Binary number. Binary Subtraction using 2's complement method. Addition of signed decimal numbers.					
2. Combinational Circuits			19	12	CO1, CO2, CO3
2.1 Logic Gates:- Symbol, Expression and Truth Tables of Basic gates(AND,OR,NOT) and Combinational gates(NOR,NAND,EXOR,EXNOR).					
2.2 Boolean Algebra:- DeMorgan's Theorems, Laws of Boolean Algebra ,Duality Theorem					
2.3 Simplification of Boolean Expressions using Boolean Algebraic laws and by using K-Maps Techniques(upto 4 Variables in SOP Form),					
2.4 Universal Gates:- Implementation of NOT,OR,AND,EXOR gates using NOR and NAND gates					
2.5 Adders:- Half Adder circuit using logic gates , Full Adder circuit using logic gates, block diagram of 4 bit parallel adder. Subtractors:- Half subtractor circuit using logic gates, Full Subtractor using logic gates					
2.6 Combinational circuits:- Block diagram and Implementation using basic gates:- Multiplexers(4 to 1), Demultiplexer(1 to 4), Encoder (4 to 2), Decoder(2 to 4). BCD to 7 segment Decoder driver (Common Cathode).					



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3 Flip Flops	12	08	CO1, CO2
3.1 Definition of Flip Flop. Applications. Symbol, Truth Tables, Operation and timing diagrams of RS F/F using NAND gates. ,			
3.2 Symbol, Truth Tables, Operation and timing diagrams of clocked RS F/F using NAND Gates, Concept of Asynchronous inputs(Preset and Clear)			
3.3 Symbol, Truth Tables, Operation of Clocked D F/F			
3.4 Symbol, Truth Tables, Operation of Clocked JK F/F, Excitation table of JK flip flop			
3.5 Race around condition in JK F/F. Symbol, Truth Tables, Operation of JK master slave F/F.			
3.6 Symbol, Truth Tables, Operation of T F/F,			
4 Registers And Counters	19	12	CO1, CO2, CO4
4.1 Registers: Definition of Shift Registers, Applications of Registers Symbols and Logic block diagram of SISO,SIPO,PIPO and PIPO Registers,			
4.2 Serial IN Serial Out Register (size of the register 4 bits) Logic Diagram and Operation of SISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams			
4.3 Serial IN Parallel Out Register (size of the register 4 bits) Logic Diagram and Operation of SIPO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams.			
4.4 Parallel IN Serial Out Register (size of the register 4 bits) Logic Diagram and Operation of PISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams			
4.5 Parallel In Parallel Out Register (size of the register 4 bits) Logic Diagram and Operation of PISO Register using negative edge triggered D F/F along with the Truth Table and Timing diagrams . . Concept of Shift right, Shift left, Ring Counter.			
4.6 Counters: Introduction to counters, Modulus of counters. Count sequence, No of Flip Flops required for Specified counters			
4.7 Asynchronous Counters:- 4 bit UP counter using JK Flip Flops only and 4 bit DOWN counter using JK Flip Flops only.			
4.8 Synchronous Counters:- 4 bit UP counter using JK Flip Flops only and 4 bit DOWN counter using JK Flip Flops only, Decade (Mod 10) using JK Flip Flops only			
4.9 Design of Synchronous counters(upto 4 bit) using only JK Flip Flops			
5 DAC and ADC and Memories	11	7	CO1, CO4
5.1 Definitions, Types of DAC and ADC(noDescription),Applications		1	
5.2 Binary Ladder Network for DAC:- Logic circuit and operation. Simple numerical problems Successive Approximation ADC :- Logic circuit and operation. Simple numerical problems.		4	
5.3 Memories: Introduction, Semiconductor memories and its types – ROM,RAM,PROM, EPROM,EEPROM(only definition and applications)		2	
Total	75	48	



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6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Number System	09	14
2	Combinational Circuits	12	19
3	Flip Flops	08	12
4	Registers And Counters	12	19
5	DAC and ADC	07	11
	Total	48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical (Perform any 8)	Marks
1.	Verification of Logic gates and Demorgan's Theorems	
2.	Universal gates (NAND and NOR)	
3.	Verification of Boolean Expression	
4.	Half Adder and Full Adder using logic gates	
5.	Half Subtractor and Full Subtractor using logic gates	
6.	MUX and D-MUX	
7.	RS F/F, D F/F and JK F/F	
8.	Assemble and Test Binary Counter/Decade counter	
9.	Assemble and test DAC using DAC0808	
10.	Assemble and test ADC using ADC0808	
	Total	25
No	Class room Assignments	
	At least 2 assignments	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	R.P.Jain,	Modern Digital Electronics	Fourth Edition, Tata McGraw-Hill Education.
2	Malvino & Leach	Digital Principles and Applications	Seventh Edition, McGraw-Hill Education

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Thomas L. Floyd,	Digital Fundamentals	10th Edition, Pearson Education Inc, 2011
2	By A.K. Maini,	Digital Electronics: Principles and Integrated Circuits	Wiley India Publications

(EX301) Communication Engineering

1. COURSE OBJECTIVES:

The course is designed to introduce students to the basics of communication systems and to impart in depth knowledge about of AM& FM. The course aims to develop among student understanding AM/ FM transmitter and receiver and concept of radio wave propagation.

2. TEACHING AND EXAMINATION SCHEME

Semester	III				Examination Scheme				
Course code & course title	Periods/Week (in hours)			Total Hours	Theory Marks		Practical Marks		Total Marks
	L	T	P		TH	TM	TW	PR/OR	
Communication Engineering EX301	03	-	02	05	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

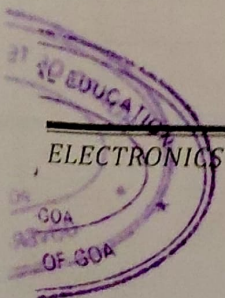
1. Describe different modulation and demodulation techniques used in communication systems.
2. Classify types of noise ,frequency bands, modulation techniques, Antennas & wave propagation techniques associated with communication systems
3. Apply the concept of modulation and demodulation in AM and FM transmitters and receivers.
4. Analyze various Analog Communication techniques.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of	Engg. Tools, Experimentation&	Engg. Practices for Society, Sustainability &	Project Management	Life -long Learning
CO1	3	2	1	1	0	1	2
CO2	3	0	2	0	0	2	2
CO3	3	2	2	2	1	2	3
CO4	2	0	2	0	1	0	3

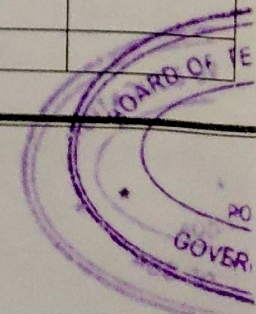
Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2



5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Th r	CO
1 Basics of communication Engg			12	07	CO1 & CO2
1.1 Block diagram of communication system ✓					
1.2 Frequency bands used in communication system ✓					
1.3 Noise : Definition & Classification of noise <ul style="list-style-type: none"> • External Noise: Atmospheric noise, Industrial Noise & Extraterrestrial noise • Internal Noise: Thermal Noise, Shot Noise & Transit time Noise • Definition of signal to noise ratio & noise figure. 					
1.4 Need for modulation & types of modulation <ul style="list-style-type: none"> • Analog Modulation techniques: AM, FM, PM Definitions, • Pulse Modulation techniques: Definition & waveforms of PAM, PWM & PPM. • Digital Modulation techniques :Definition & waveforms of ASK,FSK & PSK 					
2 Amplitude Modulation			21	14	CO1 & CO2
2.1 Amplitude Modulation: Waveforms, Derivation of mathematical expression of AM signal. ✓					
2.2 Derivation of Modulation Index equation using AM waveform, Frequency Spectrum of AM, Power and current relations, Simple numericals ✓					
2.3 Block diagram of AM Transmitter-Low level and high level					
2.4 Detection of AM Waves. Envelope detector					
2.5 Single sideband AM : <ul style="list-style-type: none"> • Advantages of SSB • Suppression of carrier using Balanced modulator(no derivation) • Suppression of unwanted sideband using filter method • Block diagram and operation of ISB 					
3 Angle Modulation			18	12	CO1 & CO3
3.1 Angle Modulation : Definition & types of Angle Modulation					
3.2 Frequency Modulation : <ul style="list-style-type: none"> • Waveforms , Mathematical expression of FM (no derivation) • Modulation index & maximum frequency deviation • Frequency spectrum of FM using expanded form of FM equation and important observations • Bandwidth of FM wave ,Carson's rule 					
3.3 Narrow band & Wide band FM ,Pre-emphasis and De-emphasis					



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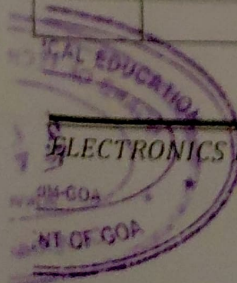
3.4 Generation of FM using varactor diode modulator, Detection of FM wave using Balanced slope detector			
3.5 Phase Modulation : Definition and mathematical expression (No derivation)			
3.6 Comparison between AM,FM & PM			
4 Receivers	12	07	CO1&C03
4.1 Characteristics of Receivers : Sensitivity, Selectivity & fidelity (definitions)			
4.2 AM Receivers : <ul style="list-style-type: none"> • TRF receiver : Block diagram, Operation & limitations • Superheterodyne Receiver: Block diagram & operation 			
4.3 FM Receiver: <ul style="list-style-type: none"> • Block diagram & operation • Stereo FM multiplex transmitter and receiver: Block diagram, operation & frequency spectrum 			
5 Antennas& Wave Propagation	12	08	CO4
5.1 Antennas: <ul style="list-style-type: none"> • Antenna parameters:-definitions of antenna gain, antenna resistance, beam width and polarization. • Construction and radiation pattern of Yagi-uda & parabolic reflector (horn feed) Antennas. 			
5.2 Wave Propagation <ul style="list-style-type: none"> • Ground Wave propagation • Sky Wave Propagation: Ionosphere & its effect; definitions of virtual height, critical frequency, skip distance , fading, maximum usable frequency. • Space Wave propagation 			
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Basics of communication Engg	07	12
2	Amplitude Modulation	14	21
3	Angle Modulation	12	18
4	Receivers	07	12
5	Antennas& Wave Propagation	08	12
	Total	48	75



8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Perform Amplitude Modulation on trainer kit. (Observe and draw the waveform of AM & calculate modulation index of AM)	
2.	Perform Amplitude Demodulation on trainer kit.(Observe and draw the input waveform and output waveform)	
3.	Test the performance of SSB SC AM Modulation on trainer kit.	
4.	Test the performance of SSB SC AM Demodulation on trainer kit	
5.	Test the performance of DSB-SC AM modulation on trainer kit.	
6.	Perform frequency modulation on trainer kit.(Observe and draw the waveform of FM)	
7.	Perform frequency demodulation on trainer kit.(Observe and draw the input waveform and output waveform)	
8.	Test the performance of Superheterodyne Receiver on trainer kit.(Observe the wave forms at various points in AM receiver)	
9.	Field visit to All India Radio Transmitter Station (Optional)	
	Total	25
No	Class room Assignments	Marks
1	Atleast 2 assignments	
...		
No	Tutorial Exercise	Marks
1	NIL	
...		
	Total	25

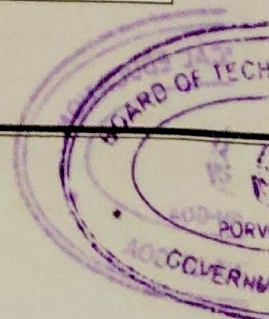
9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Kennedy, George and Bernard Davis	Electronic & Communication System	Tata McGraw Hill, India, ISBN:978-00-746-3682-4
2	Roddy Collen	Electronic communication	Pearson Education ISBN:81-297-746-0106-5
3	Mithal G.K	Radio Engineering	Khanna Publishers, NewDelhi ISBN:978-8174090140

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	R P Singh & S D Sapre	Communication Systems	Tata McGraw Hill, India ISBN:13-978-0-07-063454-1



Directorate of Technical Education, Goa State

(CC303) Circuits & Networks

1. COURSE OBJECTIVES:

The course is designed to introduce students to the facts, concepts & principles of electrical & electronics engineering circuits. The course aims to develop among student understanding to analyze and test different DC & AC circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	III								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
	L	T	P		TH	TM	TW	PR/OR	
Circuits & Networks (CC303)	3	-	2	5	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand network concepts, theorems & resonance
2. Interpret the response of different RLC circuits to AC supply.
3. Apply various theorems to simplify resistive circuits.
4. Design basic electrical filters.

4. Mapping Course Outcomes with Program Outcomes

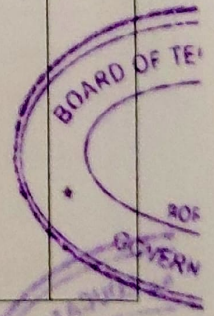
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentatn & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	3	3	2	2	1	2	2
CO2	3	3	3	3	0	2	3
CO3	3	3	3	3	1	3	3
CO4	3	3	3	3	1	2	2

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 BASIC TERMINOLOGY			6	4	1
1.1 Definitions of circuit, network, voltage, current, power, mesh, loop, node & branch, port.					
1.2 Definition of network elements Active & passive, Unilateral & bilateral, Linear & non-linear, lumped & Distributed.					
1.3 Energy Source Voltage & Current Sources Concept of Ideal & practical energy source					
1.4 Series & Parallel equivalent expressions of resistors, capacitors & inductors. (No derivations), Simple numericals on it.					
2 NETWORK THEOREMS (RESISTIVE ONLY WITH DC SOURCE)			30	22	3
2.1 Voltage & Current Divider theorem—Statement of theorem, simple numerical on it.					
2.2 Kirchhoff's voltage & current Laws-Statement of laws & simple numerical on it.					
2.3 Concept of Mesh & Node analysis-Explanation of method & simple numerical(maximum 3 loops ,3 nodes)					
2.4 Superposition Theorem- Explanation of statement of theorem & simple numerical					
2.5 Thevenin's Theorem- Explanation of statement of theorem & simple numerical					
2.6 Maximum Power Transfer Theorem -- Explanation of statement of theorem & simple numerical,					
2.7 Star Delta transformation - Explanation of conversion from star to delta & vice versa, simple numerical on it					
3 AC CIRCUITS			20	10	2,1
3.1 Response of basic R, L, C , RL , RC, RLC elements to AC signal.					
3.2 Phasor diagrams of series RC & series RL circuits, Concept of impedance.					
3.3 Simple problems to find impedance,VR,VC,VL ,Phase angle in above circuits					
3.4 Concept of series resonance Circuit .Graphical representation of resonance curve, bandwidth, half power frequencies. Problems based on $F_r, I_{max}, F_1, F_2, Z$.(Note: Resonance problems are of L4)					



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3.5 Concept of Q factor, Problems to calculate Q factor.			
3.6 RC Integrator & Differentiator for sine & square wave input.			
4 NETWORKS	10	6	3
4.1 Introduction & Applications: Two port networks: Symmetrical T & Pi networks			
4.2 Characteristics of two port network: Characteristic impedance, short circuit & open circuit impedance			
4.3 Derivations & Simple numerical on Z_o , Z_{oc} , Z_{sc} (only for T type)			
5 FILTERS	9	6	4
5.1 Introduction of Filter circuits			
5.2 LPF, HPF, BPF, BRF (graphical interpretation), Constant k (LPF, HPF-T type only)			
5.3 Design formulae & numerical			
Total	75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN:

Unit No	Unit	Number of lectures	Marks
1	Basic Terminology	4	6
2	Network Theorems (Resistive circuits with DC Source)	22	30
3	AC Circuits	10	20
4	Networks	6	10
5	Filters	6	9
	Total	48	75



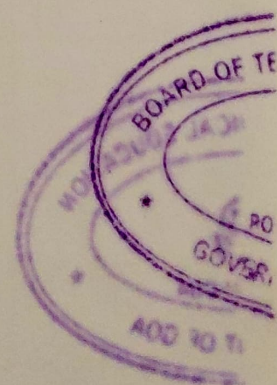
8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1	Verification of Ohms law and its application to series parallel circuits	
2	Verification of KVL and KCL	
3	Verification of superposition theorem	
4	Verification of Thevenin's theorem	
5	Verification of maximum power transfer theorem	
6	Study of RLC series resonance circuits	
7	RC Integrator and RC Differentiator	
8	Study of filters LPF & HPF ,T & PI Type	
No	Class room Assignments	Marks
1	At-least two assignments	
2		
...		
No	Tutorial Exercise	Marks
1	NIL	
2		
...	Total	

9. LEARNING RESOURCES

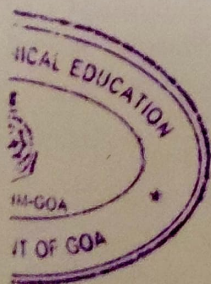
Text Books

S. No.	Author	Title of Books	Publishers
1	Sudhakar & shyammohan	Circuits & Networks	McGrawHill Education
2	B.L.Theraja	Basic electrical eng.Vol I	S.Chand
3	Royal Signals	Handbook of Line Communication	HMSO
4	B.R.Gupta & V.Singhal	Network filters & Transmission lines	S.K.Kataria & Sons
5	Schaum Series	Electrical Circuits	McGrawHill Education



SEMESTER IV

DIPLOMA IN ELECTRONICS ENGINEERING - CURRICULUM STRUCTURE											
	Code	Subjects	L	T	P	H	TH	TM	PR	TW	TOT
FOURTH	EX401	Electronic Circuits	3	0	2	5	75	25	-	25	125
	EX602	Power Electronics	3	0	2	5	75	25	-	25	125
	EX403	8051 Microcontroller	3	0	2	5	75	25	25	25	150
	EX404	Maintenance and Circuit simulation using CADD	0	0	4	4	-	-	50	25	75
	EX405	Linear Integrated Circuits	3	0	2	5	75	25	25	25	150
	EX406	Electronic Measurements & Instrumentation	3	0	2	5	75	25	-	25	125
				15	0	14	29	375	125	100	150



(EX401) ELECTRONIC CIRCUITS

1. COURSE OBJECTIVES:

The course is designed to introduce students to the working of various types of electronic circuits using transistors. The course aims to develop among student understanding to assemble and test the performance of transistor circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				
					Theory Marks		Practical Marks		Total Marks
(EX401) ELECTRONIC CIRCUITS	L	T	P	H	TH	TM	TW	PR/OR	
	3	-	2	5	75	25	25		

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

CO1: Explain working of different electronic circuits based on transistors and their applications.

CO2: Classify and build transistor amplifiers

CO3: Analyze different types of feedback systems.

CO4: Develop transistor based electronic circuits.

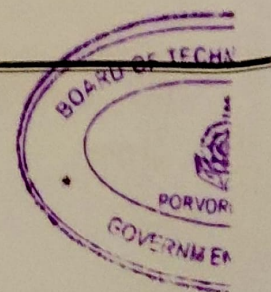
4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	1	1	2	0	0	1
CO2	3	1	2	2	1	1	2
CO3	1	2	1	1	0	0	0
CO4	3	2	3	3	2	3	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	1	1
CO4	3	3



5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 Transistor biasing techniques and amplifiers			21	15	CO1/ CO2/ CO4
1.1 Transistor biasing techniques: need and types (fixed & voltage divider biasing- comparison), Steps for selection of Q point for fixed and voltage divider biasing, simple numerical on finding Q point(fixed and voltage divider biasing)					
1.2 Single stage transistor CE amplifier- working, frequency response					
1.3 General block diagram of multi-stage amplifier, necessity of multistage amplifiers					
1.4 Different coupling methods- working, frequency response, applications and comparison of:- <ul style="list-style-type: none"> ➤ RC coupled ➤ Direct-coupled ➤ Transformer Coupled 					
2 Feedback Circuits			21	12	CO1/ CO3/ CO4
2.1 Concept of feedback, block diagram of feedback systems, types of feedback, merits and limitations of negative feedback					
2.2 feedback connections-Block diagram of voltage series, voltage-shunt, current-series, current –shunt					
2.3 Derivation of input impedance, output impedance, voltage gain, stability factor (for voltage series), simple numerical on feedback					
2.4 Bandwidth of a voltage series amplifier(block diagram only) Feedback with & without bypass capacitor in single stage CE amplifier					
2.5 Emitter follower circuit					
3 Power Amplifiers			12	9	CO1/ CO2/ CO4
3.1 Need for Power amplifier, Difference between Power and voltage amplifier					
3.2 single ended power amplifier					
3.3 Classification- A, B, AB; operation, comparison.					
3.4 Push pull, complimentary symmetry power amplifier (no analysis)					
4 Oscillators			12	06	CO1/ CO3/ CO4
4.1 Principle of oscillations; Barkhausens criteria					
4.2 Working of RC oscillators- phase shift and Wien Bridge. (numerical for frequency)					
4.3 Working of LC oscillators- Hartley, Colpitts and crystal oscillator (numerical for frequency)					
5 Multivibrators			09	06	CO1/ CO4
5.1 Multivibrator-operation of Astable (simple numerical on T_{on} and T_{off}), Bistable and Monostable (simple numerical on pulse width) type circuit, List of applications					
5.2 Schmitt trigger circuit					
Total			75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises & practical.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Directorate of Technical Education, Goa State

Unit No	Unit	Number of lectures	Marks
1	Transistor biasing techniques and amplifiers	15	21
2	Feedback Circuits	12	21
3	Power Amplifiers	9	12
4	Oscillators	6	12
5	Multivibrators	6	9
Total		48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS (Any 8)

No	Practical	Marks
1.	Assemble and test fixed bias circuit to determine Q point	
2	Assemble and test voltage divider bias circuit to determine Q point	
3	Assemble & Test a single stage CE amplifier without feedback	
4	Assemble & Test a single stage CE amplifier with feedback	
5	Test the performance of RC coupled amplifier	
6	Assemble and test Emitter follower	
7	Assemble and test performance of class A power amplifier	
8	Assemble and test the performance of Hartley oscillator	
9	Assemble and test the performance of Colpitts oscillator	
10	Assemble and test RC phase shift oscillator	
11	Assemble and test performance of Bistable multivibrator	
12	Assemble and test performance of Astable multivibrator	
13	Assemble and test performance of Schmitt trigger circuit	
Total		25
Class room Assignments		
Atleast 2 assignments		

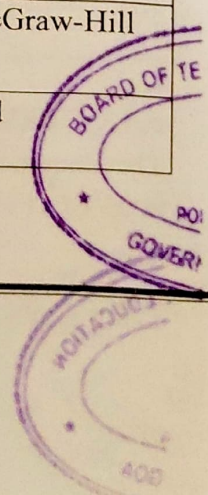
9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Bhargava & Gupta	Basic Electronics & Linear circuits	McGraw Hill Education
2	Boylestad, Robert & Nashelsky Louis	Electronic Devices and circuit theory	Pearson India Education Services Pvt Ltd
3	Mottershead Allen	Electronic devices and circuits : Introduction	Prentice Hall India Learning Private Limited

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	S Salivahanan N Sreshkumar	Electronic devices and circuits	Tata McGraw-Hill
2	B.L.Theraja A.K.Theraja	A Textbook of Electrical Technology Vol. IV, Electronic Devices and Circuits	S Chand



Directorate of Technical Education, Goa State

(EX 602) POWER ELECTRONICS

1. COURSE OBJECTIVE:

This course will enable the students to understand the working of power electronic devices and converter circuits. The course aims to develop an understanding of basic concepts of Power Electronic devices and their working. It also aims at introducing the student to different triggering methods used in power electronics circuits and the working of various converter circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV			Total Hours	Examination Scheme				
Course code & course title	Periods/Week (in hours)				Theory Marks		Practical Marks		Total Marks
	L	T	P		TH	TM	TW	PR/OR	
(EX602) POWER ELECTRONICS	03	-	02	05	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

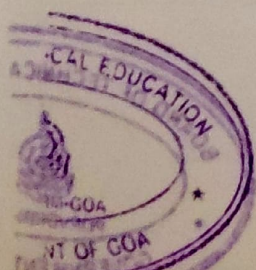
1. Explain working of various power electronics devices and circuits.
2. Demonstrate operation and applications of various power electronics circuits.
3. Distinguish between different types of rectifiers, converters, choppers and inverters.
4. Choose appropriate power electronic circuits for specific applications.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	1	2	1	0	0	1
CO2	2	2	2	3	1	3	1
CO3	2	1	2	3	1	3	2
CO4	2	2	3	3	2	3	3

Relationship : Low-1 Medium-2 High-3

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2



6. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit	M	Thr	CO		
1. POWER ELECTRONIC DEVICES	21	16	CO1		
1.1 Schematic, symbol, working and characteristic of SCR, DIAC, TRIAC, LASCR, UJT, PUT.			CO2		
			CO3		
1.2 Two transistor model of SCR, turn on-turn off characteristics of SCR, V-I characteristic of SCR Triggering methods: Voltage triggering, Gate triggering, dv/dt triggering, light triggering.			CO4		
1.3 Pulse triggering circuits using UJT & PUT					
1.4 Commutation: types & working of commutation(A ,B,C,D,E and F type) (no waveforms)					
1.5 Protection of Power Electronic Device: Snubber circuit, gate protection and over current protection					
2. PHASE CONTROLLED CONVERTERS	15	06	CO1		
2.1 Working of half wave controlled converters with R, RL & RL with freewheeling diode. (input and output voltage waveforms only)			CO2		
			CO3		
			CO4		
2.2 Working of full wave Bridge controlled converter with R and RL load, Three phase half wave controlled converter with R load (input and output voltage waveforms only)					
3. CHOPPERS AND SWITCHING MODE REGULATORS	09	06	CO1		
3.1 Operation of Single thyristor chopper and two thyristor chopper.			CO2		
3.2 Circuit diagram and working of Buck and Boost regulators.			CO3		
			CO4		
4. INVERTERS ,UPS AND SMPS	15	08	CO1		
4.1 Definition, classification of inverters, Single phase half and full bridge inverter with R load, Series and parallel inverter.			CO2		
			CO3		
4.2 Block diagram of UPS (on-line and off-line), Comparison between Online and Offline UPS, Block diagram of SMPS.			CO4		
5. AC CONTROLLERS AND CYCLOCONVERTERS	15	12	CO1		
5.1 Working of On-Off and Phase Controlled AC voltage controllers, single phase unidirectional and bidirectional AC Voltage controllers with R load (fully controlled).			CO2		
			CO3		
			CO4		
5.2 Principle of operation of cycloconverter, single phase to single phase step up (2F) and step down cycloconverter (F/2) (mid-point & bridge configuration) (circuit with waveforms), Applications of Cycloconverters (to list).					
Total	75	48	-		

7. COURSE DELIVERY:

The course will be delivered through lectures, class room interactions, exercises and case studies



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8. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	POWER ELECTRONIC DEVICES	16	21
2	PHASE CONTROLLED CONVERTORS	06	15
3	CHOPPERS AND SWITCHING MODE REGULATORS	06	09
4	INVERTERS ,UPS AND SMPS	08	15
5	AC CONTROLLERS AND CYCLOCONVERTERS	12	15
Total		48	75

9. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS (MIN 8)

No	Practical	Marks
1.	To study V-I characteristic of SCR	
2.	To study V-I characteristic of UJT	
3.	To study V-I characteristic of DIAC and TRIAC	
4	To study V-I characteristic of PUT	
5.	To study the Resistance triggering and Resistance Capacitance triggering of	
6.	To study pulse triggering using UJT and PUT firing circuits	
7.	To study of Half wave controlled rectifier using R load	
8.	To study of Full wave controlled rectifier using R load	
9.	To study of Series and Parallel inverter using SCR	
Total		
No	Class room Assignments	Marks
1	Atleast 02 assignments	

10. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Mohammed H. Rashid	Power Electronics	Prentice Hall of India, New Delhi
2	Bhimbhra P.S	Power Electronics	Khanna Publishers New Delhi
3	PC Sen	Power Electronics	McGraw Hill Education Private Limited, India

(EX403) 8051 MICROCONTROLLER

1. COURSE OBJECTIVES:

The course is designed to understand the architecture and features of 8051 microcontroller. The course aims to develop among student understanding to write, debug and execute 8051 programs and to develop 8051 application circuits.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV	Periods/Week (in hours)		Total Hours	Examination Scheme				Total Marks
Course code & course title	L	T	P	H	Theory Marks		Practical Marks		
					TH	TM	TW	PR/OR	
(EX403) 8051 Microcontroller	3	-	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

On successful completion of the course, students will be able to:

1. Explain the features of 8051 microcontroller and contrast between microcontrollers & microprocessors
2. Classify and interpret 8051 assembly language instructions
3. Develop, execute and debug assembly language programs for various applications
4. Interface 8051 microcontroller with external hardware for various applications

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	2	2	3	1	1	2	3
CO2	2	2	3	3	1	3	3
CO3	3	3	3	3	3	3	3
CO4	2	3	3	2	3	3	3

Relationship : Low-1 Medium-2 High-3

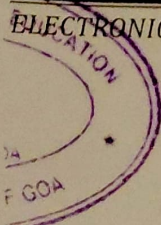
Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	3
CO2	3	3
CO3	3	3
CO4	3	3



5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 Introduction to microcontrollers and 8051 microcontroller			15	09	CO1
1.1 Definition of embedded system, use of microcontrollers in embedded systems					
1.2 Difference between Harvard and Von Neumann architecture, microcontroller and microprocessor					
1.3 Advantages of microcontroller-based systems					
1.4 Architecture of 8051, it's pin functions, clock and oscillator					
1.5 Memory organization of 8051 – RAM, ROM, SFRs, flags; connections to external memory					
1.6 Ports of 8051 – registers, I/O configuration, features					
2 8051 additional built-in hardware and control			18	11	CO1
2.1 Timers/Counters – registers, modes of operation, configuration					
2.2 Interrupts – types (external & internal), priority, registers, configuration, interrupt-handling, interrupt service routine, ISR vector addresses					
2.3 Serial I/O – registers, configuration, serial data transfer operation					
3 Assembly language instructions for 8051 microcontroller			12	08	CO2
3.1 Addressing modes					
3.2 Assembly language instructions – data move, arithmetic, logical, branching, bit-wise					
4 Assembly language programming for 8051 microcontroller			18	12	CO3
4.1 Programs using assembly language for the following: Data transfer between internal memory locations, data transfer to/from external memory, writing data to and reading data from ports Binary arithmetic (binary addition, subtraction, multiplication, division), BCD addition Logical operations Bit-wise operations Branching operations Subroutines, time delay subroutines, interrupt subroutines					
(Students to be examined on assembly language programs that can include a combination of any instructions. Minimum instruction set should be provided to students during the examination)					
5 Interfacing external hardware to 8051 microcontroller			12	08	CO4
5.1 Hardware connections and programs to interface the following to the 8051 microcontroller: LED and seven-segment display, LCD (Only interface diagram, no program for LCD) Switch and matrix keyboard Stepper motor IR sensor					



	Total	75	48	
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6. COURSE DELIVERY:

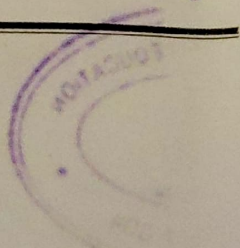
The course will be delivered through lectures, class room interactions, exercises and case studies, laboratory practical, etc.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to microcontrollers and basics of 8051 microcontroller	09	15
2	8051 additional built-in hardware and control	11	18
3	Assembly language instructions for 8051 microcontroller	08	12
4	Assembly language programming for 8051 microcontroller	12	18
5	Interfacing external hardware to 8051 microcontroller	08	12
Total		48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
Minimum FIVE - List 1		
1.	Program to add, subtract, multiply and divide two numbers.	
2.	Program to add N binary numbers	
3.	Program to add BCD numbers	
4.	Program to transfer N data bytes within memory	
5.	Programs to implement logical instructions AND, OR, XOR, NOT	
6.	Program to implement logical instructions to swap and rotate data	
7.	Program to determine the largest/smallest binary number	
List 2		
8.	Hardware interface of 8051 board to LEDs and assembly language program for blinking LEDs using bitwise instructions and software time delay routines	
9.	Hardware interface of 8051 board to LEDs and assembly language program for blinking LEDs using timer	
10.	Hardware interface of 8051 board to stepper motor and assembly language program to drive stepper motor	
11.	Hardware interface of 8051 board to LCD and assembly language program to display data on LCD	
Total		25
No	Class room Assignments	
	At least 2 assignments	



13

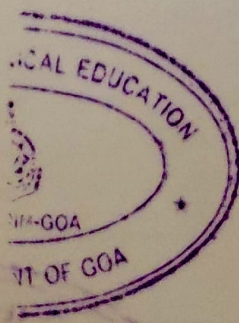
9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Muhammad Mazidi, Janice Mazidi, Colin McKinlay	The 8051 Microcontroller and Embedded Systems	Pearson
2	Kenneth Ayala	The 8051 Microcontroller	Cengage Learning

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	MykePredko	Programming and customizing the 8051 Microcontroller	McGraw-Hill



(EX404) MAINTENANCE AND CIRCUIT SIMULATION USING COMPUTER AIDED DESIGN AND DRAFTING

1. COURSE OBJECTIVES:

The aim of this course is to develop required skills in the students so that they are able to:

- (i) Maintain the electronic circuits of various equipment
- (ii) Design a Printed Circuit Board
- (iii) Simulate a given circuit using EDA tools.

The students will able to:

- 1. Develop skills to maintain basic electronic circuitry used in consumer goods segments
- 2. Design a Printed Circuit Board
- 3. Simulate electronic circuits using EDA tools.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV			Total Hours	Examination Scheme				
Course code & course title	Periods/Week (in hours)				TH	TM	Practical Marks		Total Marks
	L	T	P				TW	PR/OR	
(EX404) MAINTENANCE AND CIRCUIT SIMULATION USING CADD	-	-	4	4	-	-	25	50	75

3. COURSE OUTCOMES:

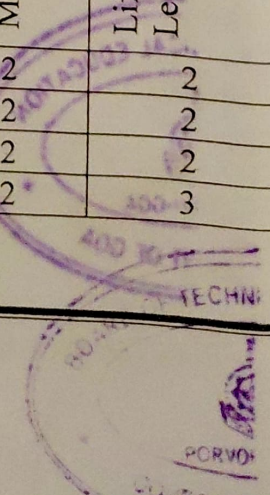
On successful completion of the course, the student will be able to:

- 1. Test various electronic components
- 2. Use test & measurement equipment to find faults and maintain electronic circuits
- 3. Apply EDA tools to design Printed Circuit Boards.
- 4. Design, simulate and analyze electronic circuits using EDA tools.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life -long Learning
CO1	2	2	1	2	2	2	2
CO2	3	3	1	3	3	2	2
CO3	2	1	3	1	2	2	2
CO4	2	2	2	2	2	2	3

Relationship : Low-1 Medium-2 High-3



Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	2	0
CO2	2	0
CO3	1	3
CO4	1	3

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1. Testing of Electronic Components				14	1,2
1.1 Standard values and ratings of resistors and capacitors					
1.2 Reading of datasheets (IC 741, 555, 723)					
1.3 Testing of passive components- Cold testing of resistors, capacitors, switches, fuses, connectors, inductors, relays, transformers, crystals					
1.4 Testing of active components- Diodes, BJTs, JFETs, MOSFET's, SCR, DIAC, TRIAC, Displays using LED and Opto electronics components, ICs					
2. Testing and Maintenance of Electronic Circuits (Use multimeter)				10	1,2
2.1 Measurement of A.C. and D.C. voltage					
2.2 Continuity test of PCB track, wiring, switch etc.					
2.3 Inspection of solder joints, defects of soldered joints, defects of soldered joints, use of soldering gun, desoldering tools and rework station.					
2.4 Maintenance of any two home appliances					
3. PCB Design				18	3,4
3.1 Prepare components for soldering, soldering and de- soldering techniques.					
3.2 Exposure to computer aided PCB making (layout from given schematic)					
3.3 Design of PCB (any electronic circuit) using the automated layout.					
3.4 Concept of machine soldering, SMD soldering (could be imparted through online videos)					
4. Circuit building and debugging using EDA tools				11	3,4
4.1 Introduction to EDA tools and need for the same					
4.2 Simulation of simple R/RC/RLC networks					
4.3 Simulate a power supply circuit for specified I,V,P rating					
4.4 Simulation of summer/ averaging/ comparator/ zero crossing detector/ Schmitt trigger/ integrator/differentiator using op-amps					
5. Circuit simulation and documentation using EDA tools				11	3,4
5.1 Simulation of an astable multivibrator					
5.2 Simulation of a RC amplifier					
5.3 Simulation of an oscillator					
5.4 Simulation of a controller based circuit for specified application					
5.5 Prepare documentation i.e circuit diagram, bill of material, and specification table for any of the simulated circuit.					
5.6 Drafting and modification of piping and instrumentation diagrams. (AutoCAD 3D plant may be used)					
Total				64	

NOTE 1: For units 3,4 and 5, the student may use software tools like Orcad, Eagle, TINA, Matlab, Labview, Autocad(P&ID), Automation Studio, Multisim, Proteus or any other suitable suite.

NOTE 2: The practical examination for CADD (50) will be based on the simulations carried out using EDA tools.

Term work marks (25) may be distributed for performance in testing electronic components and fabricating the PCB.

6. COURSE DELIVERY:

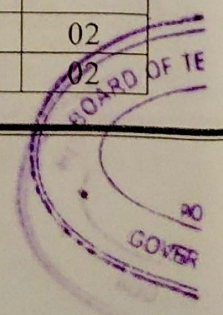
The Course will be delivered through lab sessions, study videos, group interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Testing of Electronic Components	14	--
2	Testing and Maintenance of Electronic Circuits	10	
3	PCB Design	18	
4	Circuit building and debugging using EDA tools	09	
5	Circuit simulation and documentation using EDA tools	13	
Total		64	

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Hours
1.	Explore datasheet of any three electronics components/analog/ Digital IC's.	04
2	Testing of passive components- Cold testing of resistors, capacitors, switches, fuses, connectors, inductors, relays, transformers, crystal	04
3	Testing of active components- Diodes, BJTs, JFETs, MOSFET's, SCR, DIAC, TRIAC	04
4	Testing of Displays using LED and Opto electronics components, ICs	02
5	To test continuity of PCB tracks, identify solder defects and rectify faults where possible	02
6	Maintenance/repair (if possible) of any two home appliances	08
7	Study of soldering and de-soldering techniques	02
8	Study of any computer aided PCB making (layout from given schematic)	08
9	Design of a PCB of any electronic circuit	08
	The following circuits may be simulated using any suitable EDA tool	0
10	Introduction to EDA tools and need for simulation Simulation of simple R/RC/RLC networks	02
11	Simulate a power supply circuit for specified I,V,P rating	01
12	Simulation of a summer/ averaging/ comparator/ zero crossing detector/ Schmitt trigger / integrator/ differentiator using opamps	06
13	Simulation of an Astable multivibrator	02
14	Simulation of a RC amplifier	02



Directorate of Technical Education, Goa State

15	Simulation of an oscillator	02
16	Simulation of a controller based circuit for specified application	03
17	Prepare documentation i.e circuit diagram, bill of material, and specification table for any of the simulated circuit.	02
18	Use AutoCAD 3D plant to draft and modify piping and instrumentation diagrams.	02
TOTAL HOURS		64

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Singh K. Sudeep	Troubleshooting and Maintenance of Electronics Equipment	Katson Book, New Delhi, Reprint 2014
2	Khandpur R. S	Troubleshooting Electronic Equipment: Includes Repair and Maintenance	Tata McGraw-Hill Education, New Delhi, India

(EX405) LINEAR INTEGRATED CIRCUIT

1. COURSE OBJECTIVES:

The course is designed to introduce students to working and applications of different Linear ICs. The course aims to develop among student understanding to analyze the working of a given OPAMP based circuits and develop simple circuits using Linear ICs.

2. TEACHING AND EXAMINATION SCHEME

Semester	IV			Total Hours	Examination Scheme				
Course code & course title	Periods/Week (in hours)				TH	TM	TW	PR/OR	Total Marks
	L	T	P						
(EX405) LINEAR INTEGRATED CIRCUIT	3	-	2	5	75	25	25	25	150

3. COURSE OUTCOMES:

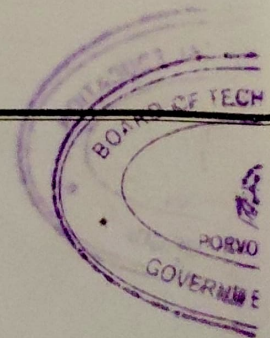
On successful completion of the course, the student will be able to:

1. Understand the parameters & specifications of various ICs.
2. Explain op-amp based circuits, 555 timer and regulators.
3. Compare and select appropriate IC based circuit for specific application.
4. Analyze and build IC based circuits.

4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	2	1	0	0	3
CO2	3	2	1	2	0	1	2
CO3	3	3	2	2	1	1	2
CO4	2	2	2	1	1	1	3

Relationship : Low-1 Medium-2 High-3



Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2

Note:- IC Pin diagrams should not be asked in theory examination

5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives		
Unit			M	Thr
1 Introduction to operational amplifiers			12	8
1.1 Integrated circuit –List of IC Classification List of IC Packages.				
1.2 Advantages of IC over discrete components				
1.3 Op-amp—Block diagram and function of each block				
1.4 Symbol and equivalent circuit of op-amp Pin configuration of IC741.				
1.5 Characteristics of ideal and practical Op-amp.				
1.6 Op-amp Parameters(only definition)- I/p offset voltage, I/p offset current, I/p bias current, o/p offset voltage, input impedance, output impedance, bandwidth, CMRR, slew rate.				
2 Op-amp configuration			9	6
2.1 Concept of Negative feedback				
2.2 Voltage series feedback amplifier- block diagram, circuit diagram , expression for voltage gain.(No derivation)				
2.3 Voltage shunt feedback amplifier- block diagram, circuit diagram, expression for voltage gain. (No derivation)				
2.4 Numerical problems based on voltage gain equation				
3 Applications of Op-Amp				
3.1 Inverting Op-amp as summing, scaling , averaging amplifier			21	12
3.2 Subtractor				
3.3 Voltage to current convertor (with grounded load only)				
3.4 Current to voltage convertor				
3.5 Integrator				
3.6 Differentiator				
3.7 Voltage comparators: Non-inverting with positive and negative reference				
3.8 Clippers: Positive with positive and negative reference				

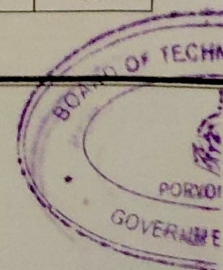
3.9 Clampers : Non-inverting with positive reference			
4.0 Waveform generators and Filters			
4.1 Op-amp Wein bridge oscillator	15	10	CO1, CO2, CO3, CO4
4.2 Op-amp as Astablemultivibrator			
4.3 Triangular waveform generator.(Using 4.2)			
4.4 Concepts of active filters, comparison of active & passive filters			
4.5 Butter worth low pass filter (1st order only)			
4.6 Butter worth high pass filter (1st order only)			
4.7 Simple numerical problems on above filters.			
5 Special function ICs			
5.1 Block diagram of IC 555 and its pin configuration/ functionality	18	12	CO1, CO2, CO3, CO4
5.2 IC555 as Astablemultivibrator			
5.3 IC555 as Monostablemultivibrator			
5.4 Numerical problems (no derivations)			
5.5 Voltage regulators performance parameters of a regulator – load & line regulation and ripple rejection			
5.6 Salient features of three pin regulators, IC78XX series and IC79XX series fixed voltage regulators.			
5.7 Adjustable Positive voltage regulator using LM317: Circuit diagram, working, Output voltage equation (No derivation)			
5.8 VCO IC 566 block diagram and list of applications			
Total			
	75	48	-

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies.

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Introduction to operational amplifiers	8	12
2	Op-amp configuration	6	9
3	Applications of Op-Amp	12	21
4	Waveform generators and Filters	10	15
5	Special function ICs	12	18
	Total	48	75



8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Determine the op-amp parameters	
2.	Determine the gain of Inverting and Non-inverting amplifier using op-amp and compare it with theoretical gain.	
3.	Verify the operation of Adder and Subtractor circuit.	
4.	Verify the working of active integrator and differentiator circuits.	
5.	Assemble and test V to I converter.	
6.	Verify the working of Comparator	
7.	Assemble and test Clipper circuit.	
8.	Assemble and test Clamper circuit.	
9.	Assemble and test first order filter.	
10.	Assemble and test Astablemultivibrator using OPAMP	
11.	Assemble and test a multivibrator circuit using IC 555.	
12.	Assemble and test a IC fixed voltage regulator	
13	Assemble and test an Adjustable positive voltage regulator	
14	Test a VCO.	
	Total	25
	Class room Assignments	
	Atleast 2 assignments	

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	RamakantGayakwad	Op-Amps and Linear Integrated Circuit	Pearson Education
2.	K.R. Botkar	Integrated Circuit	Khanna

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	David A.Bell	Op-amp & Linear ICs	Prentice Hall of India
2	Dr.Y. Venkataramani	Linear Integrated Circuits & Applications	ISTE

Directorate of Technical Education, Goa State

(EX406) ELECTRONIC MEASUREMENT AND INSTRUMENTATION

1. COURSE OBJECTIVES:

The course is designed to introduce students to measurements and measuring instruments and various sensors. The course aims to develop among student the following

1. Employ appropriate instruments to measure a given set of parameters.
2. Deep understanding about blocks in various instruments used in practicals.
3. Identify various sensors that will be useful in measuring different parameters in industry

2. TEACHING AND EXAMINATION SCHEME

Semester	IV								
Course code & course title	Periods/Week (in hours)			Total Hours	Examination Scheme				Total Marks
	L	T	P		H	Theory Marks		Practical Marks	
					TH	TM	TW	PR/OR	
(EX406) ELECTRONIC MEASUREMENT AND INSTRUMENTATION	3	-	2	5	75	25	25	-	125

3. COURSE OUTCOMES:

On successful completion of the course, the student will be able to:

1. Understand the working of analog and digital instruments and transducers
2. Classify different types of errors in measurements
3. Use appropriate instrument/bridges for measurement and testing of electronic circuits
4. Compare and select appropriate transducer/ instrument for specific application

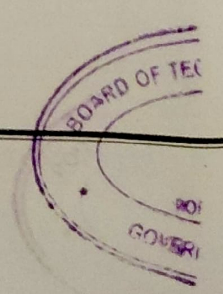
4. Mapping Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
	Basic & Discipline Specific Knowledge	Problem Analysis	Design and Development of Solutions	Engg. Tools, Experimentation & Testing	Engg. Practices for Society, Sustainability & Environment	Project Management	Life-long Learning
CO1	3	2	3	0	0	2	3
CO2	3	2	2	2	2	2	3
CO3	3	2	2	2	2	2	3
CO4	2	3	3	3	2	2	3

Relationship : Low-1 Medium-2 High-3

Mapping Course Outcomes with Program Specific Outcomes

	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	2	2
CO4	3	3



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5. DETAILED COURSE CONTENTS / MICRO-LESSON PLAN

M = Marks	Thr = Teaching hours	CO = Course Objectives			
Unit			M	Thr	CO
1 Basics of Measuring Instruments			9	6	1,2
1.1 Static Characteristics- Accuracy, Resolution (only Definitions)					
1.2 Dynamic characteristics- Speed of response, Lag, Fidelity					
1.3 Error: Systematic, Limiting Errors, numerical on error calculation, systematic and limiting errors.					
1.4 Construction and working of PMMC movement, Block Diagram of Analog Multimeter, Digital Multimeter.					
2 Generators, Bridges and Display			24	15	3
2.1 Oscilloscope – Block Diagram of CRT and CRO, Types of CRO- Dual trace , DSO					
2.2 Block Diagram of Function Generator					
2.3 Block Diagram of Basic Spectrum Analyzer					
2.4 Bridges : Wheatstone, Maxwells, Schering, Wein Bridge, along with numerical for each type of bridge.					
2.5 Digital Display- working of LED and LCD					
3 Instrumentation System and Transducers			18	12	1
3.1 Block Diagram of Instrumentation System and their functions					
3.2 Transducer – Characteristics, classification(Active and Passive; Analog and Digital)					
3.3 Resistive Transducer – Potentiometer, Strain Gauge (Bonded and Semiconductor), RTD, Thermistor.					
3.4 Inductive Transducer : LVDT					
3.5 Capacitive Transducer – Varying of distance, area, permittivity					
3.6 Piezoelectric Transducer – Principle and material used.					
3.7 Optical Transducer : Construction and characteristics of LDR, Photodiode, phototransistor					
3.8 Digital Transducer : construction and working of Shaft Encoders					
4 Applications of Transducers			15	8	4
4.1 Displacement Measurement – Linear and angular displacement using Resistive , Capacitive and Inductive Transducer					
4.2 Angular Speed Measurement - Photoelectric pickup, magnetic pick up					
4.3 Pressure Measurement – Diaphragm with strain gauge					
4.4 Level Measurement - Float operated resistive method					
4.5 Flow Measurement : Turbine Meter					
5 Application of Instrumentation Systems			9	8	4
5.1 signal conditioning – Need for Signal Conditioning, Block Diagram of AC and DC					
5.2 Block Diagram and applications of the following: <ul style="list-style-type: none"> • Data Acquisition System • Process Control • SCADA 					
Total			75	48	

6. COURSE DELIVERY:

The Course will be delivered through lectures, class room interactions, exercises and case studies

7. SPECIFICATION TABLE FOR THEORY/ MACRO-LESSON PLAN

Unit No	Unit	Number of lectures	Marks
1	Basics of Measuring Instruments	6	9
2	Instrumentation System and Transducers	15	24
3	Instrumentation System and Transducers	12	18
4	Applications of Transducers	9	15
5	Application of Instrumentation Systems	6	9
Total		48	75

8. SPECIFICATION TABLE FOR TERM WORK & PRACTICALS HOURS

No	Practical	Marks
1.	Measurement of current, voltage and resistance using PMMC meter	
2	Measurement of current, voltage, frequency and time period using CRO	
3	Testing of Wheatstone's Bridge	
4	Testing of Maxwell's bridge	
5	Temperature measurement using RTD	
6	Displacement measurement using LVDT	
7	Weight measurement using strain gauge bridge	
8	Speed measurement of motor using photo electric pickup	
9	Liquid level measurement	
10	Study of light sensors, photo transducers, Piezoelectric transducer	
Total		25
Class room Assignments		
At least 2 assignments		

9. LEARNING RESOURCES

Text Books

S. No.	Author	Title of Books	Publishers
1	Cooper	Electronic measurement and instrumentation	Prentice Hall
2	H. S. Kalsi	Electronic measurement and instrumentation	McGraw Hill India
3	A.K. Sawhney	Electrical & Electronic Measurement and Instrumentation	Khanna Publishers, Delhi

Reference Books for further study

S. No.	Author	Title of Books	Publishers
1	Curtis Johnson,	Process Control Instrumentation technology	Pearson/Prentice Hall
2	Murty, D.V.S.,	Transducers and Instrumentation	Prentice Hall of India, New Delhi,
3	Doebelin,	Measurement Systems: Application and Design	McGraw Hill India

