Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)



Course Contents (Syllabus) for

Second Year B. Tech. (Electronics Engineering) Sem – III to IV

AY 2020-21

Title of the Co	urse: 5EN 202	Circuit Theory					
				L	Т	Р	Cr
				3	0	0	3
Pre-Requisite	Engineering	Mathematics, Basic Electrical Engineerin	g				
Textbook:		n Valkenburg, "Network Analysis", PHI p	•	rd Edition 198	3		
Textbook.		onard S. Bobrow, "Fundamentals of Elect				Press, 19	96
References:	2. C. I	P. Huelsman, "Basic Circuit Theory", PHI K. Alexander, M. N. O. Sadiku, "Electrica vish R Singh, "Network Analysis and Synt	l Circuits", T	Tata McGraw-I	Hill, 2008.		
Course	On	completion of the course, students shou	ld be suffici	ently familiar	with the th	eoretica	l structure,
Objectives :	for	mal representation, computational method	s, notation, a	and vocabulary	of linear m	odels to	be able to
	stud	bly them to the analysis and design of diginal dents will be able to perform signal analysis.		-		•	
Course					. .		
Learning Outcomes:	СО	After the completion of the course the s be able to	tudent will	Bloom's Cognitive level	Descrij	otor	Assess ment Tool
	C01	Work with basic fundamentals, theorem	ms used in	II	Understa	nding	ISE,
	CO2	Carry out transient and steady state a different circuits	analysis of	IV	Analyz	zing	MSE,
	CO3	Do analysis and synthesis of circuit char	racteristics	V	Evalua	ting	ESE
	CO4	Design a circuit and network		VI	Creati	ng	
	Assessment						
	Teacher As		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~				
	-	nents of In Semester Evaluation (ISE),			ination (M	SE) and	d one End
		amination (ESE) having 20%, 30% and 50	-	respectively.			
	Assessmen ISE 1	lt	Marks 10				
	MSE		10 30				
	ISE 2		10				
	ESE		50				
		ISE 2 are based on assignment/declared te		nar etc.			
		essment is based on 50% of course content	-		(les)		
			•				11
	ESE: Asse	essment is based on 100% course content	with /0-80%	% weightage fo	or course co	ntent (n	ormally

CO-PO															
Mapping		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	C01	1	1												
	CO2 CO3		1 1	2	2									3	
	CO4		-	1	2									3	
			1	1			•								
Course	1	Modu	le 1: 1	Netwo	ork Aı	nalysi	5							8 hrs	
Contents:		circuit repres variab	ts, app entatio le ana ems: S	licatio ons d alysis, Superp	ons to ual a T-II positic	netwo nd in transfe	orks, g verse ormati	raphs netwo	and tro orks, oridge	ees, no admit d-T ar	ode and tance nd latti	l mesh and im ce netw	and ph analysis pedanc vorks, 1 power 1	, matrix e, state Network	
	2			Transi		espons	e of C	ircuits						8 hrs	
		RL an	nd RO orm, i	C circ mport	uits, ant th	switch eoren	ning c ns and	onditi prop	ons, l erties,	appli	cation	analysi	ew of s of cir	Laplace cuits ir	•
	3	time domain, transfer function, Initial Conditions and Solutions to networksModule 3: Sinusoidal Steady State Analysis6 hrs.													
		Voltag	ge and (sis Using	Curren	t, Inst	antane	ous an	d Aver	age Po	ower, C	Complex	x Power	values of, Steady ems to A	State	
	4	Modu	le 4:	Resor	nance	and N	Magne	eticall	y Cou	pled	Circuit	ts		6 hrs.	
		current bandw circuit, reactar Magne double	t in ser idth, so , and v nce cur etic cou	ies res elective ariation ves. upled c circuit	onant on ity and n of in ircuits	circuit, qualit pedan : Mutu	effect y facto ce with al indu	of rest or. Para h frequ	istance allel rea ency f	on fre sonanc factor o	equency ce, resor of parall	respons nant frec el reson	oltage an se curve, juency fo ant circu agle tune	or tank iit,	
	5	Modu												8 hrs.	
		matrix	t form form	of in cal ne	put o twork	utput as, pro	relatio pagat	ons, in ion fu	teracti	ion of	two fo	our terr	rid para ninal ne , balano	etworks	,
	6	Modu	le 6: 1	Netwo	ork Fu	inctio	ns							6 hrs.	
		and zer	ros of and	networ transfe	k func	tions,	restrict	ions o	n poles	s and z	eros loc	ation fo	rt netwo r driving plot, sta	g point	5
		Chara	cterist	ics of	RLC	and L	C high	ı pass,	low p	oass, b	and pa	ss and b	and sto	p filter.	

Module	1. Apply circuit theorems to D.C. & A. C. Circuits.
wise	2. Compute transient response of first order and second order systems.
Measurabl	3. Carry out steady state analysis of AC Circuits.
e Students	4. Carry out analysis of resonant and magnetically coupled circuits.
Learning	5. Determine parameters of two port electrical network.
U	6. Analyze the behavior of different types systems and filters.
Outcomes	
Tutorial	The tutorials consist of Quiz, Tests, Assignments in addition to a mini project work
	based on circuit theory.

	uise. ei	EN2	203	Digi	ital	Ele	ectro	onic	S								
														L	Т	Р	Cr
														3	0	0	3
re-Requisite	Course	s: F	Engi	neer	ring	Phy	sics	5									
extbooks:																	
 John F. Anand I Mandali Douglas 	Kumar, S.K , " <i>L</i>	"Fu Digit	ında tal I	men Eleci	tals tron	of l ics"	Digi 1 st E	<i>tal</i> Edic	Ciro ctior	<i>cuits</i> n.Mc	", PH -Grav	I, 2 nd H w-Hill	Editior , 2009	n, 2009.		98.	
eferences:	,				- 8			<u>, , , , , , , , , , , , , , , , , , , </u>		T		,		,			
1. RP 2. Mor	ris Man														ndia, 4 th e	edition,	2014.
 To deve To make To motion To teac ourse Learning	e differe vate stu h stude	ence uder nts t	es be nts l to de	etwe earn	en c imj	com plen	bina nent	tior atio	nal a	and s f dig	seque gital c	ircuits	using			ents.	
CO After t	he comp	oleti	on o	f the	e coi	ırse	the	stu	dent	: sho	uld b	e able	to		Bloom's	Cognitiv	ve
														_	Level	Descrip	otor
	e rsion of										-	ons			II	Unders	
•	i combi					-		-			uits				III	Applyi	-
	is the sec	-					-		Ū						IV	Analyz	U
CO4 Classif	fy PAL,	PL	A, I	PLD	and	l the	ir a	rchi	tect	ure					VI	Evalua	ting
	i ng :																
				2	4	5	6	7	8	9	10	11	12	PSO1	PSO2	7	
	PO	1	2	3				-								-	
	PO CO1	1 1	2 1	3													
				3	2										2	-	
	CO1		1		2 2										2 2	-	
	CO1 CO2		1	1											-	-	
CO-PO Mappi	CO1 CO2 CO3	1	1	1											-	-	
CO-PO Mappi	CO1 CO2 CO3 CO4	1	1	1											-	-	
CO-PO Mappi Seessments : Ceacher Asses Wo componer emester Exam	CO1 CO2 CO3 CO4 sment:	1 2	1 1 2	1 1	2 Eva				<i>,</i> .						2	E) and	one E

ISE 1	0	
	30	
	10	
	50	
ISE 1 and ISE 2 are based on assignment/declared test/quiz		
MSE: Assessment is based on 50% of course content (Nor	mally first three modules)	
ESE: Assessment is based on 100% course content with three modules) covered after MSE.	h 70-80% weightage for course content (norm	ally last
Course Contents:		
course contents.		
Module 1: Number system		Hrs.
Introduction, Revise of Decimal, Binary, Octal &	Hex number system. Interconversion of	
number system, Arithmetic operations, Addition, S numbers. Review of logic gates, NAND/NOR as u Boolean algebra, converting AOI to NAND/NOR	Subtraction on binary, Octal, Hex, BCD	8
Module 2: Combinational Circuit		Hrs.
Review of Digital circuits, algebraic minimizat minimization, Realization using gates, Quine: Mc Designs using MUX and Demux, Priority Encoder Checker, Carry look ahead adder, ALU, tristate bu Hazards, Hazard removal, Code converter	-cluskey method for logic minimization, , Priority decoder, Parity Generator and	8
Module 3: Sequential Circuits		Hrs.
Latches & Flip Flop (S-R Latch, D Latch, D FF, J- other FF, Switch Denouncing, Synchronous Counters		7
Module 4 :Shift Registers & parameters	, Wod-IV Counter,	Hrs.
Shift register, SISO, SIPO, PISO, PIPO, Bidirection	nal shift register universal shift register	1115.
Johnson counter, universal shift resistor, Ring Counter, time, timing parameters of flip flop Clock Skew, Cloc	er. twisted ring counters, Setup time, hold	7
Module 5: State Diagram	· · ·	Hrs.
Mealy and Moore machines, State diagram, State a Machines Design using J-K, D, T FF (sequence detect counter state, ASM Chart Logic Families TTL,CMOS, and their characteristics.	tor, counters, priority resolver), decoding	6
Module 6 :PLD	,	Hrs.
Programmable Logic Devices, Design Using PLA & 1	PAL, CPLD architectures. Generic. Xilnx	
& Altera family	, 2122	3
Module wise Measurable Students Learning Outcor	nes :	
After the completion of the course the student shoul	d be able to:	
1. Perform the arithmetic operations, convert the r	numbers	

- 2. Design the Combinational circuits and analyze the operations
- 3. Design sequential circuits and analyze the operations
- 4. Know the various parameters and operations of other sequential circuits
- 5. Design sequential circuits with state diagram and state table using FSM methodology.
- 6. Illustrate the application of PLDs (PLA and CPLD) in designing digital circuits

Title of the Course: 5EN 201	Electronics Circuit Analysis and	L	Т	Р	Cr
Design-I		3	0	0	3
Pre-Requisite Courses: Engineering	g Physics	•		•	

Textbooks:

- 1. D. A. Neaman, "*Electronic Circuit Design and Analysis*", McGraw Hill Education (India) Private Limited, New Delhi, 3rd Edition, 2007.
- 2. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Edition, 2004.
- 3. Allen Mottershed, "Electronic Devices and Circuits", PHI, 2nd Edition, 1979.

References:

- 1. R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", PHI, 9th Edition, 2009.
- 2. Millman and Halkias, "*Electronic devices and Circuits*", Tata McGraw Hill, 1st Edition, 1991.
- 3. Gerald E. Williams, "*Practical Transistor Circuit Design and Analysis*", Tata McGraw Hill, New Delhi, 1st Edition, 1973.

Course Objectives :

- 1. To **explain** the working of electronic circuits: rectifiers, Zener diode voltage regulator, amplifiers using BJT and MOSFETs and feedback amplifiers.
- 2. To **illustrate** the small signal models used for analysis of electronic circuits.
- 3. To illustrate the methods of designing the electronic circuits using discrete components.

Course Learning Outcomes:

COs	After the completion of the course the student should be able to	Bloor	n's Cognitive
		Level	Descriptor
CO1	Analyze the performance of diode circuits.	IV	Analyzing
CO2	Analyze the performance of electronic circuits (amplifiers) using small signal models such as hybrid- π , r_e and h -parameter model.	IV	Analyzing
CO3	Evaluate the performance of feedback amplifiers, oscillators and power amplifiers.	V	Evaluating
CO4	Design the electronic circuits (amplifiers) for given specifications using discrete components such as BJT, FET and MOSFET.	VI	Creating

POs	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2	3												
CO2	2	3												
CO3		3	3											

CO4	3		2
			3-H, 2-N
Assessments :			
eacher Assessment:			
-		(ISE), One Mid Semester Examinat	ion (MSE) and on
Semester Examination (I	ESE) having 20%, 30	% and 50% weights respectively.	
Ass	sessment	Marks	5
	ISE 1	10	
]	MSE	30	
I	ISE 2	10	
-	ESE	50	
ESE: Assessment is ba last three modules) cov	sed on 100% course	e content (Normally first three module content with60-70% weightage for co	
ESE: Assessment is ba last three modules) cov	sed on 100% course	•	
ESE: Assessment is ba last three modules) cov	used on 100% course vered after MSE.	content with60-70% weightage for co	
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and	content with60-70% weightage for co	ourse content (norn 4 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg	used on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator.	content with60-70% weightage for co	ampers;
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. ifiers	content with60-70% weightage for complications pplications and full-wave rectifier, clippers and cl	ampers; 8 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. ifiers nethods considering s	content with60-70% weightage for complications pplications and full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier:	ampers; DC and
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis,	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave an gulator. ifiers nethods considering s small signal hybrid-	content with60-70% weightage for complications and full-wave rectifier, clippers and clipted factor; Basic BJT amplifier: π model: analysis of common emitted	ampers; DC and
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave an gulator. ifiers nethods considering s small signal hybrid- itter follower) amplifi	content with60-70% weightage for complications pplications and full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier:	ampers; 8 Hrs. DC and er (CE), 9
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. ifiers nethods considering s small signal hybrid- itter follower) amplific blifiers	content with60-70% weightage for complications ad full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier.	ampers; 8 Hrs. DC and er (CE), 5 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp JFET (Junction Field I	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave an gulator. ifiers nethods considering s small signal hybrid- itter follower) amplifi blifiers Effect Transistor): op	content with60-70% weightage for complications pplications ad full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier. weration, characteristics, biasing meth	ampers; 4 Hrs. ampers; 8 Hrs. DC and er (CE), 5 Hrs. bods for 5 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode of Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp JFET (Junction Field I JFET: self bias, voltag	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. ifiers nethods considering s small signal hybrid- itter follower) amplifient blifiers Effect Transistor): op ge divider bias; small	content with60-70% weightage for complications pplications ad full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier. peration, characteristics, biasing meth- ll signal equivalent circuit, JFET c	ampers; 4 Hrs. ampers; 8 Hrs. DC and er (CE), 5 Hrs. bods for 5 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp JFET (Junction Field I JFET: self bias, voltag source amplifier, JFET	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. ifiers nethods considering s small signal hybrid- itter follower) amplifi Difiers Effect Transistor): op ge divider bias; smal common drain ampli	content with60-70% weightage for complications pplications ad full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier. peration, characteristics, biasing meth- ll signal equivalent circuit, JFET c	4 Hrs. ampers; 8 Hrs. DC and er (CE), 5 Hrs. nods for common
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode of Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp JFET (Junction Field I JFET: self bias, voltag source amplifier, JFET Module 4: MOSFET	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. Ifiers nethods considering s small signal hybrid- itter follower) amplifie Differs Effect Transistor): op ge divider bias; sma common drain ampli Amplifiers	content with60-70% weightage for complications pplications ad full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier. peration, characteristics, biasing meth- ll signal equivalent circuit, JFET c	ampers; 4 Hrs. ampers; 8 Hrs. DC and er (CE), 5 Hrs. nods for common 8 Hrs. 8 Hrs. 8 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp JFET (Junction Field I JFET: self bias, voltag source amplifier, JFET Module 4: MOSFET A Two terminal MOS	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. Active follower of the second small signal hybrid- itter follower of amplified bifiers Effect Transistor): op ge divider bias; smat common drain amplifiens structure, enhancem	content with60-70% weightage for complications pplications ad full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier. eration, characteristics, biasing meth- ll signal equivalent circuit, JFET content fier.	ampers; 8 Hrs. DC and er (CE), 5 Hrs. nods for common 8 Hrs. Nods for common 8 Hrs. 9 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp JFET (Junction Field I JFET: self bias, voltag source amplifier, JFET Module 4: MOSFET A Two terminal MOS characteristics, biasing	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave an gulator. ifiers nethods considering s small signal hybrid- itter follower) amplifi Differs Effect Transistor): op ge divider bias; sma common drain ampli Amplifiers structure, enhancem in MOSFET amplifi	content with60-70% weightage for complications pplications and full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier. peration, characteristics, biasing meth- ll signal equivalent circuit, JFET c fier. ent-mode MOSFET, ideal current-	ampers; 4 Hrs. ampers; 8 Hrs. DC and er (CE), 5 Hrs. nods for common 8 Hrs. • 8 Hrs. 8 Hrs.
ESE: Assessment is ba last three modules) cov Course Contents: Module 1: Semicondu Types of diode, diode Zener diode voltage reg Module 2: BJT Ampli BJTs and its biasing m AC load line analysis, common collector (emi Module 3: JFET Amp JFET (Junction Field I JFET: self bias, voltag source amplifier, JFET Module 4: MOSFET A Two terminal MOS characteristics, biasing	ased on 100% course vered after MSE. Actor Diode and its A circuits: half-wave and gulator. ifiers nethods considering s small signal hybrid- itter follower) amplifi Difiers Effect Transistor): op ge divider bias; sma common drain ampli Amplifiers structure, enhancem in MOSFET amplifi , common drain (so	content with60-70% weightage for complications pplications and full-wave rectifier, clippers and cl tability factor; Basic BJT amplifier: π model: analysis of common emitted er and common base (CB) amplifier. eration, characteristics, biasing meth- ll signal equivalent circuit, JFET con fier. ent-mode MOSFET, ideal current- ers, small-signal equivalent circuit, c	ampers; 4 Hrs. ampers; 8 Hrs. DC and er (CE), 5 Hrs. nods for common 8 Hrs. • 8 Hrs. 8 Hrs.

Multistage amplifiers, Darlington pair, general feedback structure, amplifiers with negative feedback, properties of negative feedback, four basic feedback topologies; Oscillators: basic principle of oscillation, Phase-Shift oscillator; frequency response of amplifiers.	
Module 6: Power Amplifiers	6 Hrs.
Classification of power amplifiers: class-A, class-B, class-AB, class-C power amplifiers;	
transformer-coupled amplifiers, class-AB push-pull complementary output stage.	

Module wise Measurable Students Learning Outcomes :

- 1. **Examine** the performance of diode circuits.
- 2. **Apply** the small signal models (tools) to **compare** the performance of voltage and current amplifiers built using BJT.
- 3. **Illustrate** the performance of JFET amplifiers in terms voltage gain.
- 4. Analyze and design MOSFET amplifiers.
- 5. Analyze the performance of feedback amplifiers and **design** a two-stage amplifier with feedback.
- 6. Evaluate the performance of power amplifiers in terms of efficiency and harmonic distortion.

Requisite Courses: 1. "C The Programming language", Kernigham & Ritchie Textbook: 1. "Object Oriented Programming", Lafore, Tata McGraw-Hill 3. "Fundamentals of Data structures in C++", S.Sahni and D.Mehta, Galgotia Boc Source References: 1. "Data structures via C++", A. Michael Berman, Oxford University Press, 2002 2. "Data structures via C++", A. Michael Berman, Oxford University Press, 2002 2. "Data structures via C++", A. Michael Berman, Oxford University Press, 2002 Course Objectives : • An ability to describe basic concepts of Data structures • To apply knowledge of engineering, information technology, mathematics, ar science • An ability to design a system or component, or process to meet stated specifications • An ability to identify, formulate and solve engineering problems Course Earning Outcomest: CO CO After the completion of the course the student should Bloom's Cognitive be able to Discuss the basic concept of data structure 2 Understanding 2 1 Image: Structures 3 Applying 3 2 Understanding 2 1 1 1 2 Understanding 3 Applying 3 Applying 3 2 <td< th=""><th></th><th></th><th></th><th></th><th>S.</th><th>Y. Ele</th><th>ectron</th><th>ics En</th><th>ginee</th><th>ring</th><th></th><th></th><th></th><th></th><th></th><th></th></td<>					S.	Y. Ele	ectron	ics En	ginee	ring						
Requisite Courses: 1. "C The Programming language", Kernigham & Ritchie Textbook: 1. "C The Programming language", Kernigham & Ritchie 2. "Object Oriented Programming", Lafore, Tata McGraw-Hill 3. "Fundamentals of Data structures in C++", S.Sahni and D.Mehta, Galgotia Boc Source References: 1. "Data structures via C++", A. Michael Berman, Oxford University Press, 2002 2. "Data Structures and Algorithm Analysis in C++" M.Weiss, Pearson Education, 2002. Course • The important objectives are: Objectives : • An ability to describe basic concepts of Data structures • To apply knowledge of engineering, information technology, mathematics, ar science • An ability to identify, formulate and solve engineering problems • An ability to identify, formulate and solve engineering problems CO Discuss the basic concept of data structure 1 <u>g</u> CO Discuss the basic concept of data structure 1 <u>g</u> CO Apply the knowledge in applications like RDBMS, 3 Applying <u>structures</u> CO Apply the knowledge in applications like RDBMS, 3 Applying Network data models, Hierarchical data model CO-PO <u>CO</u> Mapping : <u>CO</u>	Title of the C	ourse:5	EN20	4 Data	a Stru	cture	and A	lgorit	hm	L- 3	Т	-	P-		Cr-	3
2. "Object Oriented Programming", Lafore, Tata McGraw-Hill 3. "Fundamentals of Data structures in C++", S.Sahni and D.Mehta, Galgotia Boc Source References: 1. "Data structures via C++", A. Michael Berman, Oxford University Press, 2002 2. "Data Structures and Algorithm Analysis in C++" M.Weiss, Pearson Education, 2002. Course Objectives : • The important objectives are: Objectives : • An ability to describe basic concepts of Data structures • To apply knowledge of engineering, information technology, mathematics, ar science • An ability to design a system or component, or process to meet stated specifications • An ability to identify, formulate and solve engineering problems Course CO Course Bloom's Cognitive Learning CO Outcomes: CO CO Discuss the basic concept of data structure 2 Understandi g CO Discuss the basic concept of data structure 2 1 g CO Discuss the basic concept of data structure 3 2 Understandi g CO Apply the knowledge in applications like RDBMS, 3 Applying 3	Pre- Requisite Courses:	I	Progra	mmin	g basic	es, C p	rograr	nming								
2. "Data Structures and Algorithm Analysis in C++" M.Weiss, Pearson Education, 2002. Course Objectives : • An ability to describe basic concepts of Data structures • To apply knowledge of engineering, information technology, mathematics, ar science • An ability to design a system or component, or process to meet stated specifications • An ability to identify, formulate and solve engineering problems Course Learning Outcomes: CO CO Discuss the basic concept of data structure 1 g CO Discuss the basic concept of data structure 2 Understanding CO Illustrate programming skills with various data 3 Network data models, Hierarchical data model CO-PO Mapping : CO-PO POI PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO1 PO PS PS PS CO-PO I I I I I I I I I I I I I I I I I	Textbook:	2.	"Ob "Fu	oject O ndame	riente	d Prog	gramm	ing", 1	Lafore	e, Tata	McGı	aw-H		ta, Ga	lgotia	Bool
Objectives : An ability to describe basic concepts of Data structures To apply knowledge of engineering, information technology, mathematics, ar science An ability to design a system or component, or process to meet stated specifications An ability to identify, formulate and solve engineering problems Course Learning Outcomes: CO After the completion of the course the student should be able to Descriptor CO Discuss the basic concept of data structure 2 Understanding g CO Illustrate programming skills with various data 3 Applying structures CO Apply the knowledge in applications like RDBMS, 3 Applying Network data models, Hierarchical data model 	References:		"Da	ta Stri										•		
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	Assessment	Marks	
	ISE 1	10	
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	ISE 2 ESE	<u> </u>	
	ISE 1 and ISE 2 are based on assignment/declared test		
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	MSE: Assessment is based on 50% of course content (Normally first three modules	\$)
	ESE: Assessment is based on 100% course content will last three modules) covered after MSE.	ith 60-70% weightage for cou	urse con
Course	Module 1 Introduction		6 Hrs
Contents:			
	Basic Concepts: Algorithm, Pseudo code, ADT, D	Data Structure, Algorithmic	
	Efficiency Recursion: Direct and Indirect recursion		
	functions e.g. Towers of Hanoi, etc.		7.11
	Module 2 Linked Lists		7 Hrs
	Concept of linked organization, Singly linked list, dou storage management, circular linked list, Operations inversion, concatenation, computation of length, the Representation and manipulations of polynomials usi	such as insertion, deletion, raversal on linked list,	
	Module 3 Stacks and Queues		7 Hrs
	Fundamentals stack and queue as ADT, Representati	1	
		· ·	
	Recursion, Priority queue Doubly Ended QueueModule 4 Trees & Graphs		8 Hrs
	Would 4 Trees & Graphs		01115
	Tree: Basic terminology, binary trees and its represent (recursive and non-recursive), operations such as co expression trees, General Trees, Binary Search Trees Introduction to Multiway Trees	opy, equal on binary tree,	
	Graphs : Terminology and Representation of graph	s using adjacency matrix,	

adjacency list and adjacency Multilist, Traversals Depth First and Breadth First,	
Minimum Spanning Tree	
Module 5 Searching & Sorting	6 Hrs
Search: Importance of searching, Sequential, Binary, Fibonacci search algorithms	
bearen. Importance of searching, bequential, binary, i toonaeer search argorithms	
Sorting Internal and External Sorta Insertion Shall Hoop Ovial sort Marga	
Sorting: Internal and External Sorts, Insertion, Shell, Heap, Quick sort, Merge	
sort, Radix sort, Two-way merge sort	
Module 6 Hashing and Indexing Technique	6 Hrs
Hashing: Hashing functions, overflow handling with and without chaining, open	
addressing: linear, quadratic, double, rehashing	
addressing. mour, quadrane, asabie, renasining	
Eiles and Indexes, Indexing Techniques, hashed indexes. Tree indexing D trees	
Files and Indexes: Indexing Techniques: hashed indexes, Tree indexing - B-trees	
(concept only implementation not expected), File Organizations: Sequential,	
Random and Linked organizations, Storage Management	

Module wise Measurable Students Learning Outcomes:

After the completion of the course the student should be able to:

Module 1

Discuss Basic Concepts of Algorithm, Pseudo code, ADT, Data Structure, Algorithmic Efficiency Recursion etc.

Module 2

Illustrate singly linked list, doubly linked list and dynamic storage management, circular linked list etc.

Module 3

Illustrate Representation and Implementation of stack and queue using sequential and linked organization

Module 4

Examine use of Trees and Graphs

Module 5

Examine application of Searching and Sorting

Module 6

Illustrate use of Hashing and Indexing Techniques.

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Silva, Sensors and Actuators: Control System PRC Press 2007. atranabis D.," Sensor and Actuators", Prentice Hall of India nces: awlak, Andrzej M., Sensors and actuators in mechatronics : of pplications, CRC Press, Taylor & Francis Group, 2007. tenganathan S.," Transducer Engineering", Allied Publisher Dijectives : Students will able to Inderstand the required sensor and actuator criteria for a mechatron inderstand the required sensor and actuator criteria for a mechatron inderstand the operation of commonly employed sensors and actua nalyze and select the most appropriate sensors or actuator for an a construct the appropriate interface circuits for the sensors and actua inderstand the operation of the course the student should be able to Explain fundamental physical and technical base of sensors and actuators, Identify the acquired data and measured results, Analyse the required sensors and actuators for their design Mapping : <u>PO 1 2 3 4 5 6 7 8 9 10 11 12</u> <u>CO3 3 3 1 1 1 1 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ISE 1 10	
MSE 30	
ISE 2 10	
ESE 50	
ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.	
MSE: Assessment is based on 50% of course content (Normally first three modules)	ally loo
ESE: Assessment is based on 100% course content with 70-80% weightage for course content (norn three modules) covered after MSE.	lally las
Course Contents:	
Module 1: Instrumentation of an Engineering System	Hrs.
Instrumentation of an Engineering System: Role of Sensors and Actuators,	
Human Sensory System, Mechatronic Engineering, Control System Architectures, Instrumentation Process	
	4
Component Interconnection and Signal Conditioning: Signal Modification	
and Conditioning, Impedance Matching Methods, Data Acquisition Hardware,	
Bridge Circuits, Linearizing Devices, Signal-Modification Hardware	
Module 2: Performance Specification and Instrument Rating Parameters	Hrs.
Performance Specification, Time-Domain Specifications, Frequency-Domain	
Specifications, Linearity, Instrument Ratings, Bandwidth Analysis, Aliasing	
Distortion Due to Signal Sampling, Instrument Error Considerations,	
	4
Estimation from Measurements, Sensing and Estimation, Least-Squares	
Estimation, Maximum Likelihood Estimation, Scalar Static Kalman Filter.,	
Linear Multivariable Dynamic Kalman Filter, Kalman Filter	
Module 3: Analog Sensors and Transducers	Hrs.
Sensors and Transducers, Sensors for Electromechanical Applications,	
Potentiometer, Variable-Inductance Transducers, Permanent-Magnet and	
Eddy Current Transducers, Variable-Capacitance Transducers., Piezoelectric	4
Sensors, Strain Gauges, Torque Sensors, Gyroscopic Sensors, Thermo-	
Fluid Sensors.	
Module 4: Digital and Innovative Sensing	Hrs.
Innovative Sensor Technologies, Shaft Encoders, Incremental Optical	
Encoder, Motion Sensing by Encoder, Encoder Data Acquisition and	
Processing, Absolute Optical Encoders, Encoder Error, Optical Sensors,	4
Lasers, and Cameras, Miscellaneous Sensor Technologies, Tactile Sensing,	
MEMS Sensors, Sensor Fusion, Wireless Sensor Networks	
Module 5: Mechanical Transmission Components	Hrs.
Actuator-Load Matching, Mechanical Components., Lead Screw and Nut,	5
Harmonic Drives, Continuously Variable Transmission, Load Matching for	-

Actuators								
Actuators								
Stepper Motors: Principle of Operation, Stepper Motor Classification, Driver and Controller, Torque Motion Characteristics, Static Position Error, Damping of Stepper Motors, Stepper Motor Models, Control of Stepper Motors, Stepper Motor Selection and Applications								
Module 6: Continuous-Drive Actuators	Hrs.							
Actuator Classification, Actuator Requirements, DC Motors, DC Motor Equations, Control of DC Motors, Motor Driver and Feedback Control, DC								
Motors, Linear Actuators, Hydraulic Actuators, Hydraulic Control Systems,	5							
Pneumatic Control Systems, Fluidics.								
Module wise Measurable Students Learning Outcomes : After the completion of the course the student should be able to: Module 1: Develop their signal conditioning circuit for their application								
Module 2: Understands instrument rating and filtering technique								
Module 3: Study various analog sensors								
Module 4: understand principle of digital sensing technique								
Module 5: Explain various mechanical components and stepper motor operation								
Module 6: Study various actuators for their applications								
Tutorial:								

Professional Core (Lab)

Title of the Course: 5EN 251 ECAD-I Laboratory	L	Т	Р	Cr	
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Pre-Requisite Courses: Engineering Physics					
Te-Requisite Courses, Engineering Thysics					
Textbooks:					
1. D. A. Neaman, " <i>Electronic Circuit Design and Analysis</i> ", McGraw H Limited, New Delhi, 3 rd Edition, 2007.				,	
 A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford U 2004. All M. H. L. L. (Element Designation of Circuits) Physical Circuits (Circuits) (Circuits)			Press,	5 ⁻ E	dition,
3. Allen Mottershed, " <i>Electronic Devices and Circuits</i> ", PHI, 2 nd Edition	n, 197	9.			
References:					
1. R. Boylestad and L. Nashelsky, " <i>Electronic Devices and Circui</i> 2009.	it The	ory",	PHI,	9 th E	Edition,
 Millman and Halkias, "Electronic devices and Circuits", Tata McG Gerald E. Williams, "Practical Transistor Circuit Design and An New Delhi, 1st Edition, 1973. 					
Course Objectives :					
1. To explain the working of electronic circuits like rectifiers, amplifiers amplifiers and feedback amplifiers using BJT, FET and MOSFETs.	(volta	ige ar	nd cur	rent),	power
 To illustrate the methods of designing the electronic circuits using disc 	crete c	ompo	onents	S.	
3. To explain the practical ways of measuring AC and DC parameter					its like
amplifiers for their performance analysis.					
Course Learning Outcomes:					
COs After the completion of the course the student should be able to	Bloo	m's C	Cogniti	ive	
	Level	D	escrip	otor	
CO1 Demonstrate the working of electronic circuits: rectifiers, Zener	III	A	Applyi	ng	
diode voltage regulator, and amplifiers built using BJT, JFET and MOSFET.				-	
CO2 Test and analyze the performance of amplifiers built using BJT, JFET and MOSFET.	IV	A	nalyzi	ing	
CO3Evaluate the performance of voltage, current, power and feedback	V	F	valuat	ina	
amplifiers.				U	
CO4 Design the electronic circuits (amplifiers) for given specifications	VI	0	Creatii	ng	
using discrete components such as BJT, FET and MOSFET.					
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	Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
	LA1	Lab activities,	Lab Course Faculty	During Week 1 to Week 4	25
	LAI	attendance, journal	Lab Course Faculty	Submission at the end of Week 5	23
	LA2	Lab activities,	Lab Course Faculty	During Week 5 to Week 8	25
		attendance, journal	Lab Course Faculty	Submission at the end of Week 9	23
	LA3	Lab activities,	Lab Course Faculty	During Week 10 to Week 14	25
		attendance, journal	Lab Course Faculty	Submission at the end of Week 14	23
	Lab ESE	Lab Performance and	Lab Course faculty	During Week 15 to Week 18	25
		related documentation	Lab Course faculty	Submission at the end of Week 18	23

Course Contents:

List of Experiments:

- A. Verification of Truth table one or two expt.
- B. VHDL based practical followed by downloading on kit.

Introduction to Xilinx with sample experiment
1 bit full adder using 1 bit half adder as a component
4 bit full adder using 1 bit full adder as a component.
1 bit full adder using 8:1 multiplexer as component
1 bit full adder using 1:8 demux as component
Implementation of 4:1 mux using 2:1 mux as a component
Implementation of demultiplexer IC 74138
4 bit comparator
Implementation of flip flops
UP counter and DOWN counter
MODN counter
UP-DOWN counter
Shift registers
Universal shift register
Parallel loading shift register
Sequence detector
Creation of project in Quartus-II & download
rable Students Learning Outcomes •

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

- 7. Know the difference in HDL language and other high level language.
- 8. Capable to write, execute and debug the code

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Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessme	Based on	Conducted by	Conduction and Marks	Marks	
nt			Submission		
LA1	Lab activities,	Lab Course	During Week 1 to Week 4	25	
LAI	attendance, journal	Faculty	Submission at the end of Week 5	23	
LA2	Lab activities,	Lab Course	During Week 5 to Week 8	25	
LAZ	attendance, journal	Faculty	Submission at the end of Week 9	23	
LA3	Lab activities,	Lab Course	During Week 10 to Week 14	25	
LAS	attendance, journal	Faculty	Submission at the end of Week 14	25	
Lob ESE	Lab Performance and	Lab Course	During Week 15 to Week 18	25	
Lab ESE	related documentation	faculty	Submission at the end of Week 18	23	

Course Contents:	
Module 1:Review of C programming, File handling	Hours
Review of C programming concepts: loops, functions, decision making blocks, array,	
structure and pointers.	5
Concept of a file: FILE, text and binary files, opening files, closing files, writing a file,	J
reading file, file pointer, inbuilt file functions, standard files.	
Lab session:	
Programs to revise arrays, structures and pointers	4
Programs to study different file operations opening files, closing files, writing a file,	-
reading file	
Module 2: Introduction to data structure and algorithm	
Algorithm, pseudo code, ADT, data structure, algorithmic efficiency.	
	4
Recursion: Direct and Indirect recursion, analysis of recursive functions	
Lab session:	2
Program to implement algorithm and observing complexity measures	4
Module 3: Linked Lists	
Concept of linked organization, singly linked list, doubly linked list and dynamic	
storage management, circular linked list, operations such as insertion, deletion,	5
inversion, concatenation, computation of length, traversal on linked list	

Lab session:	
Program to implement singly linked list with all operations	
Program to implement doubly linked list with all operations	6
Program to implement circular linked list with all operations	
Module 4: Stacks and Queues	
Fundamentals stack and queue as ADT, representation and implementation of stack and	
queue using sequential and linked organization.	5
Circular queue: representation and implementation, applications of stack	
Lab session:	
Program to implement Stack (Static and Dynamic)	
Program to implement Queue (Static and Dynamic)	6
Program to implement applications of Stack (Expression evaluation and string reversing	
)	
Module 5: Searching & Sorting Technique	
Search: Importance of searching, linear, binary, Fibonacci search algorithms with	
complexity measure	5
Sorting: Internal and External Sorts, insertion sort, quick sort, merge sort, selection sort,	5
bubble sort, shell sort with complexity measure	
Lab Session :	
Programs to Search the data with complexity measure	4
Programs to Sort the data with complexity measure	
Module 6: Trees and Graphs	
Basic terminology, binary trees and its representation, binary tree traversals (recursive	4
and non-recursive), terminology and representation of graphs	
Lab sessions:	2
Implementation of binary search tree	
Computer Usage / Lab Tool: Windows / Linux based system, Turbo C++ compiler / I	Dev C++
compiler / Code blocks / visual studio	
	utcomes:
	ble to
	handling.
Module 2: demonstrate different data st	tructures.
Module 3: implement linked	list.
Module3:implementlinkedModule4:implementstackand	queue.
Module 3: implement linked	

	the Course: 5EN252 Simulation Tools Laboratory				
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Pre-Re	quisite Courses:				
Compu	ter Programming for Electronics Engineers 4EN152				
Fextbo	oks:				
Online	books available through internet)				
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	Documentation				
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Course	Objectives :				
	To explain simulation of electronic circuit and creating its PCB layou To explain ngspice statements for describing and analyzing an electro	•			
	To explain ngspice statements for modeling electronic devices.		icuit.		
3. 4.	To explain statements for programming in SciLab or MatLab.				
3. 4. 5.	To explain built in functions in SciLab or MatLab .	tLah			
3. 4. 5. 6.	1 1 0 0	tLab			
3. 4. 5. 6.	To explain built in functions in SciLab or MatLab . To explain creation of GUI and modeling of system in SciLab or Ma		Bloom's	Cognitive	
3. 4. 5. 6. Course	To explain built in functions in SciLab or MatLab . To explain creation of GUI and modeling of system in SciLab or Ma Learning Outcomes:	-	Bloom's level	Cognitive	or
3. 4. 5. 6. Course	To explain built in functions in SciLab or MatLab . To explain creation of GUI and modeling of system in SciLab or Ma Learning Outcomes:	-			
3. 4. 5. 6. Course	To explain built in functions in SciLab or MatLab . To explain creation of GUI and modeling of system in SciLab or Material SciLab or MatLab (SciLab or MatLab) (SciLab) (SciLa	for	level	Descripto	

CO-PO Mapping : PO PO PO PO PO 11 PO 12 PSO1 PO PO PO PO PO **PO 10** PO 1 2 9 3 4 5 6 7 8 CO1 1 **CO2** 1 CO3 1

1- High, 2-Medium, 3- Low

PSO2

Assessments :

Teacher Assessment:

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities,	Lab Course Faculty	During Week 1 to Week 4	25
LAI	attendance, journal	Lab Course Faculty	Submission at the end of Week 5	23
LA2	LA2 Lab activities, Lab Course Faculty		During Week 5 to Week 8	25
LAZ	attendance, journal	Lab Course Faculty	Submission at the end of Week 9	23
LA3	Lab activities,	Lab Course Faculty	During Week 10 to Week 14	25
LAS	attendance, journal	Lab Course Faculty	Submission at the end of Week 14	23
Lab ESE	Lab Performance and	Lab Course faculty	During Week 15 to Week 18	25
Lauese	related documentation	Lab Course faculty	Submission at the end of Week 18	23

Course Contents:

Module 1	Hrs.
PCB layout eSim environment; using KiCad for creating schematic, placing components, wiring, annotating schematic, creating netlist; netlisting to ngspice, setting analysis parameters; simulating circuit; creating PCB layout using KiCad	2
Module 2	Hrs.
Circuit Analysis Ngspice statements for describing independent voltage and current sources, dependent voltage and current sources, resistor, inductor and capacitor; ground node; ngpice statements for performing DC, transient and AC analysis; writing circuit file to perform an analysis and simulating it in ngspice	3

Module 3	Hrs.
Device Modeling	
Subcircuit; Ngspice statements for modeling PN junction diode, bipolar junction transistor, junction field effect transistor and metal oxide semiconductor field effect transistor; writing circuit file using device model and simulating it in ngspice	2
Module 4	Hrs.
Operations and Statements	
SciLab or MatLab environment; data types supported; predefined, scalar and vector variables; scalar, vector and matrix operations; if, switch, try-catch, while, for statements; creating sci or m file	2
Module 5	Hrs.
Functions Built in functions for interaction with user, mathematical operations, rounding operations, plotting 2D and 3D graphs, string conversion, file handling; writing user defined function	3
Module 6	Hrs.
Object handles; Graphics object property; GUI components and their properties; dialog boxes; menus; creating GUI; using Xcos or simulink for creating system model and simulating system	2
Module wise Measurable Students Learning Outcomes : After the completion of the course the student should be able to:	
 Use eSim for simulation of electronic circuit and creating PCB layout. Use ngspice statements for describing and analyzing an electronic circuit. Use ngspice statements for modeling electronic devices. Write SciLab or MatLab programs for performing mathematical and logical operations. Use built in functions in SciLab or MatLab for plotting graphs and file management. Create GUI and model a system in SciLab or MatLab 	
 Simulating an Electronic circuit using KiCAD Creating PCB layout of an Electronic circuit using KiCAD DC Analysis of an Electronic circuit using ngspice AC Analysis of an Electronic circuit using ngspice Modeling an Electronic device using ngspice Solving simultaneous equations using SciLab or MatLab Plotting 2D graph using SciLab or MatLab Ploting 3D graph using SciLab or MatLab Creating GUI using SciLab or MatLab Modeling a system in SciLab or MatLab 	

S. Y. B. Tech. (Electronics Engineering) Sem IV AY 2020-21

Professional Core (Theory)

Fitle o	of the Course: 5EN221 Electronic Circuit Analysis a		Т	Р	Cr
Design-	-II	3	0	0	3
Pre-Re	quisite Courses:				
	nic Circuit Analysis and Design-I				
Textbo	oks:				
	gio Franco, "Design with op-amp and analog integrated on, 2009.	circuits",	Tata N	AcGraw	Hill, 3 ¹
2. Ram	akant Gaikwad, "Op-amp and Linear Integrated Circuits'	', PHI, 4 th	edition	2008.	
Referei	nces:				
	bert F.Coughlin, Frederick F.Driscoll, "Operational A ", Sixth Edition, PHI, 2001.	mplifiers	and L	inear Iı	ntegrate
	oy Choudhury and S. B. Jain, " <i>Linear Integrated Circuits</i> ", Non, 2003.	lew Age Ir	nternatio	onal Pub	lishers,
Course	Objectives :				
	To explain the importance of the course, (along with COs, PC To illustrate the working of differential amplifier and operation			c.)	
	To illustrate the methods used for analysis of op-amp based c			GATE)	
	To illustrate the practical aspects of op-amp in analog signal	,		,	
	To illustrate the working of and design methods of important	opamp bas	sed circ	uits (use:	ful for
	industry, mini-projects and projects)				
Course	Learning Outcomes:				
СО		Bloom's (Cognitiv	/e	
		level		Descrip	otor
CO1	Illustrate and Apply the understanding of various op- amp based linear and nonlinear circuits, such as amplifiers, waveform generators, active filters, PLL etc., to solve related problems.	III		Applyin	ng
CO2	Analyze the ideal opamp based circuits such as various amplifiers, filters, waveform generators, precision rectifiers, voltage regulators etc.	IV		Analyz	ing
CO3	Analyze the electronic circuits considering practical limitations of opamp, for amplifiers and related linear circuits, applications of adder, subtractors, waveform generator etc.	IV		Analyz	ing
	generator etc.				

I-V, Precision Rectifier, Linear voltage regulator etc.	

CO-PO Mapping : Use 3: High **2:** Moderate **1:**Low **for mapping;**

	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3													3
CO2		3												3
CO3		3												3
CO4			3											3

Assessments:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

ISE 1: 10 Marks to be submitted before MSE marks. It is open to students.

ISE 2: 10 Marks to be submitted before ESE. It is hidden component for students.

MSE: 30 Marks to be submitted within 10 days after MSE examination is over (Generally on module 1-3)

ESE: 50 Marks to be submitted within 10 days after ESE examination (60-70% weight for module 4-6 and 30-40% on module 1-3)

Course Contents:

Module 1: Operational Amplifier (5)

Amplifier fundamentals, differential amplifier, basic op-amp configuration, op-amp powering,

feedback in op-amp circuits, ideal op-amp circuits analysis.

Module 2: Basic Opamp Circuits (8)

Inverting and Non-inverting amplifiers, adder, subtractor, voltage to current converters, current to voltage converters, instrumentation amplifier, transducer bridge amplifier, Log/Antilog amplifier.

Module 3: Opamp Practical Limitations (6)

Simplified op-amp internal circuit diagram, input bias current, input offset voltage, input offset error compensation, low input bias/offset voltage op-amps, open loop response, closed loop response, transient response; sources of noise, stability in op-amp circuits, frequency compensation.

Module 4: Opamp based Filter Circuits (5)

Opamp as Integrator and Differentiator, Advantage of active filters, First order active filter, standard second order active filters. Design of simple active filters.

Module 5: Comparator and Waveform Generators (8)

Voltage Comparator, Schmitt triggers and applications, peak detector, sample and hold circuit, Sine wave generators, square/triangular wave generators, waveform generator ICs, V to F, F to V converter, Precision rectifier.

Module 6: Voltage Regulator and PLL (7)

Linear regulators and applications, three pin regulators, switching regulators, phase locked loop and applications, monolithic PLLs: NE565, CD4046.

Module wise Measurable Students Learning Outcomes

Module 1: Illustrate the basics of differential amplifier, opamp powering, ideal opamp characterisitics, opamp internal circuit basics etc.

Module 2: Illustrate, Analyse the basic opamp amplifier circuits

Module 3: Illustrate the practical limitations of opamp and Analyse their effect on the circuit performance

Module 4: Illustrate, Design the analog signal processing circuits and basic active filters

Module 5: Illustrate, Design Comparator, Schmitt trigger, waveform generators, precision rectifier.

Module 6: Design of Linear voltage regulator using opamp. Illustrate the operation of switched regulators and PLL.

	ourse: 5EN	222 Signals and Systems							
			L 3	T P 1 0	Cr 4				
					-				
Pre-Requisite		ng Mathematics, Basic Electrical Engineering		10					
Textbook:	 A.V. Oppenheim, A.S. Willsky, S.H. Nawab, Signals and Systems, Prentice Hal 1997. Ashok Ambardar, Analog and Digital Signal Processing, CL Engineering, 1999 								
References:	1.F	3. P. Lathi, Linear systems and signals ,Oxfo M. J. Roberts , Signals and Systems, Tata M	rd University	y press, 2005	<u></u>				
	3. 1	Simon Haykin, Barry Van Veen, Signals and	l systems ,Wi	ley, 2003	11 1005				
Course		Hwei P Hsu, Schaum's Outline Signals and S completion of the course, students show							
Objectives :	the voo dig	coretical structure, formal representation, c cabulary of linear models to be able to app gital and analog communications and control form signal analysis with reference to spectr	omputational ly them to th systems. Th	e students wil	tation, an d design c l be able t				
Course Learning Outcomes:	СО	After the completion of the course the student will be able to	Bloom's Cognitiv e level	Descriptor	Asses smen t Tool				
	CO1	Demonstrate the concept of signals and systems	II	Understandi g	n ISE,				
	CO2	Examine the response of linear systems in the time domain	IV	Analyzing	MSE,				
	CO3	Evaluate systems in the frequency domain	V	Evaluating					
	CO4	Use frequency domain techniques to solve input/output problems for linear time invariant systems.		Creating	ESE				
	Assessmen	nts :							
		Assessment:	ne Mid Seme	ester Examina	tion (MSF				
	-								
	-	nd Semester Examination (ESE) having 20%							

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MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content last three modules) covered after MSE.

CO-PO															
Mapping		PO	РО	PO	PO	PO	PO	PO	PO	PO	PO1	PO11	PO1	PSO	PSO
	CO	1 1 1	2	3	4	5	6	7	8	9	0		2	1	2
	CO		1	1										1	
	CO					2								1	
	CO	4	2	2										1	
Course	1 Module 1: Introduction to Signals and Systems – Continuous and 8 hrs														
Contents:		Discrete													
		Introduction, standard signals, signal representation, classification of signals,													
		Introduction, standard signals, signal representation, classification of signals, systems – representation, classification, Linear, Time invariant, causal, BIBO													
		stable, Static, dynamic.													
	2	Modu	ıle 2:	: Tin	ne Do	omai	n An	alysi	s of	Cont	inuou	s and	Discr	ete 7	7 hrs
		Time	Syste	ems											
						-	-		-		-	se, Co		ion int	tegral
		and co	onvol	ution	sum,	grap	hical	repre	senta	tion o	of conv	volutio	n.		
	3	and convolution sum, graphical representation of convolution.Module 3: Fourier Domain Analysis of Continuous Time Signal6 hrs.													
	0	Trigonometric Fourier series, Compact Trigonometric Fourier series,													
		Trigo	nome	tric	Four	ier s	series	, Co	ompa	ct T	rigonc	metric	Fou	rier s	eries,
	0	Trigo Expoi	nome nentia	tric Il fori	Four n, Di	ier s irichle	series et Co	, Co nditio	ompa ons, I	ct T Frequ	rigonc ency c	ometric lomain	Four repres	rier s sentati	eries, on of
		Trigo Export period	nome nentia dic si	tric Il fori ignals	Four n, Di s, Fo	ier s irichle ourier	series et Co Tra	, Co onditionsform	ompa ons, I m re	ct T Frequ prese	rigono ency o ntation	ometric lomain n of a	Four repres	rier s sentati lic sig	eries, on of gnals,
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Module wise Measurabl e Students Learning Outcomes	 cases. 3. Apply time-domain and frequency-domain analysis tools to linear continuous systems. 4. Analyze continuous-time signals and system responses using the concepts of transfer function representation by use of Laplace and inverse Laplace transforms. Use MATLAB to simulate and analyze signals and systems using these transforms. 5. Apply time-domain and frequency-domain analysis tools to linear discrete
	5. Apply time-domain and frequency-domain analysis tools to linear discrete systems. Explore sampling concepts that link continuous-time and discrete-time
	signals and systems. Use MATLAB to simulate and to analyze signals and systems for this situation.
	6. Analyze discrete-time signals and system responses using the concepts of transfer function representation by use of Z and inverse-Z transforms. Use MATLAB to simulate and analyze signals and systems using these transforms.
Tutorial	Elaborating various fields of Signals and System

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														L-3	T-0	P-0	Cr-2
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2.	T.L. Si Roy Bl Taub S	ake , "E	lectror	nic C	Com	mun	icati	on Sys	stem	", Th	omsor	n Publi	catio	ons, 2^{nc}	¹ Editio	on,2002 2013	
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2.	Simon B. P. L Edition George	athi, "M , 1998	lodern	Dig	ital	and	Anal	og Co	mmı	unicat	ion Sy	stems	', O	xford P	ublicat		1
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PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
C01		3											2	
CO2		2	2										3	
CO3			2										2	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 70-80% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Module 1 : Amplitude Modulation and Demodulation	Hrs.
DSB-FC, DSB-SC, SSB, VSB and ISB transmissions: mathematical Analysis-time and frequency domain	
analysis, modulation index, generation and detection methods, power requirement of these systems,	9
Comparison of AM modulation schemes, Quadrature Carrier Multiplexing(QAM), frequency division	,
Multiplexing, AM detection : envelope detection, Demodulation of DSBSC : synchronous detection	
Module 2: Frequency Modulation and Demodulation	Hrs.
Frequency Modulation (FM),: Single Tone Frequency Modulation, Spectrum Analysis, Narrowband FM,	
Wideband FM, Transmission Bandwidth of FM Waves, Generation of FM waves: Direct and Indirect	9
Methods, Demodulation of FM, Phase Locked Loops, Limiting of FM waves, comparison between AM &	
FM, Phase Modulation, Relation between FM and PM.	
Module 3: Sampling theorem and Pulse Modulation Techniques	Hrs.
Sampling theorem, Types of sampling, Inter symbol interferences, Modulation & Demodulation of PAM, PWM, PPM, merits & demerits, Introduction to PCM system, quantization of signals, Differential PCM, Delta Modulation, Adaptive Delta Modulation.	4
Module 4: Digital Data Transmission	Hrs.
Definition of Line Coding, various line codes, unipolar, bipolar RZ and NRZ techniques, split phase manchester formats	5
Module 5: Digital Modulation Techniques	Hrs.
Coherent Quadrature Modulation Techniques, Non Coherent Binary Modulation Techniques,	6

Comparison of Binary and Quaternary Modulation Techniques; M array modulation	
Techniques, Power spectra, Bandwidth efficiency, M array Modulation formats Viewed in the	
light of channel Capacity theorem, Effect of inters symbol interference.	
Module 6: Noise	Hrs.
Classification and sources of noise, signal to noise ratio (SNR), noise analysis and	6
measurements, equivalent noise bandwidth, noise figure, noise temperature, AWGN	0
Module wise Measurable Students Learning Outcomes :	
After the completion of the course the student should be able :	
Module 1, 2: To analyze, compare the performance of various analog modulation and demodu terms of power, S/N ratio, and bandwidth.	lation in
Module 3, 4, 5: To evaluate performance of digital modulation system in terms of different performasure.	ormance
Module 6: To evaluate performance of analog and digital systems in terms of noise.	

Tutorial: N/A

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PIC16F87 CO3 Design In	itel 8051 a	et give				contro	ller ba	ised syste	em.	VI	Creatin	g
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ISE 2					10							
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Vector addresses, Interrupt structure of Intel 8051, Interrupt blocking conditions, Interrupt	
priorities, Interrupt latency, Writing an Interrupt Service Routine in C.	
Module 5 : RISC Microcontrollers	Hrs.
Block diagram of PIC microcontroller; configuration word, oscillator configurations, power up timer, oscillator startup timer, brown out reset; operation of on chip reset circuit, Timer 0, Watchdog timer; Interfacing devices like relay, unipolar stepper motor, seven segment display (Static and Dynamic) with PIC microcontroller and writing corresponding C programs.	7
Module 6: System Design	Hrs.
System requirements; Interface design; Implementing state machine in C; Design of digital voltmeter, temperature indicator, ON OFF temperature controller, Mains frequency meter and Multiprocessor communication system using Intel 8051 and PIC microcontroller; compare Intel 8051 and PIC microcontroller.	5
Module wise Measurable Students Learning Outcomes :	
After the completion of the course the student should be able to:	

		S.Y. Electronics Engi	neering			
Title of the	Course:	5 EN 225 Control Systems	L- 3	Т-	P-	Cr- 3
Pre- Requisite Courses:						
Textbook:	W.D. C 2. "C	odern Electronic Instrumentation and I Copper, 5 th Edition, Pearson Education, 20 ontrol System Engineering", I.J. Na	002.			
		tional Publications, 2008 dern Control Engineering", Katsuhiko (Ogata, 5 th Eo	lition, Pre	entice H	all, 2015.
References	1. "Ele	ctronic Measurement and Instrumentatio	<i>n"</i> , Oliver C	age, Tata	McGraw	Hill Publication.
:		odern Control System", Dorf, Bishop, 12 edback and Control Systems", Schaum ²				
		lucation, 2012.	s Outilites L		/K, 2110 1	Lattion, McGraw
Course Objectives		purse is designed as fundamentals of con	ntrol system	s. The im	portant (objectives are:
:		provide with the necessary information ition System required in the industries.	regarding se	ensing of	various	parameters, Data
	-	rovide fundamentals of Control system liagram, Signal flow graph etc.	s such as op	oen loop a	and clos	ed loop systems,
	3. To i	ntroduce fundamentals of time and fre	quency dom	nain analy	sis.	
	4. To d	evelop concept of stability in time and	frequency d	omain.		
Course	СО	After the completion of the course	the student	should	Bloom	's Cognitive
Learning		be able to			Level	Descriptor
Outcomes:	CO	Discuss characteristics of various typ	bes of sensor	rs, open	2	Understandin
	1	and closed loop systems, Mathemati				g
		constants, Design specifications for se stability, etc	econd order	system,		
	CO 2	Illustrate measurement of temp, mathematical models, transfer fund diagram and signal flow graph, Comp State space model	ction using	Block	3	Applying
	CO 3	Examine time response analysis, stat Hurwitz criteria, Nyquist criteria, Roc Controllability and Observability etc.	• •		3	Applying

СО-РО															
Mapping :															
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO1	PS O1	PS
	CO1	2									0	1	2	01	02
	CO2	1													2
	CO3		1	2											2
Assessmen	Two co and on	-													
ts				Asse	essmer							/0 WCI	Ma	rks	
					SE 1									0	
					ASE SE 2									0 0	
					ESE									0	
	ISE 1	and I	SE 2 a			assign	ment/c	leclare	d test/	/quiz/s	emina	r etc.			
			ssmen								•				a cont
			odules					e cont	ent wi	ui 00-	/U% W	eignta	ige 101	cours	se conte
Course Contents:	-		Intro	,										9	9 Hrs
201100000	source	es of e	rpes of rrors, l ns, re	Mathe	matica	ıl mod	els of	physic	cal sys	tem, C	Dpen le	oop an	nd clos	ed	

reduction techniques including signal flow graphics, deriving transfer function control system components
Module 2 Time response Analysis
Standard test signals, time response of second order system, steady state errors
and error constants, design specifications of second order system. Preliminary
design considerations of Compensators need of compensation, lead
compensations, lag compensation, lag-lead compensation.
Module 3 Stability Analysis in Time Domain
Concept of stability, condition of stability, characteristic equation, relative
stability, Routh-Hurwitz criterion, special cases for determining relative stability
Module 4 Root locus techniques
Basic concept, rules of root locus, application of root locus technique for control
systems.
Module 5 Frequency Response Analysis
Polar plots, Bode plots, Nyquist stability criterion, gain margin, phase margin,
effect of addition of poles and zeros on bode plots
Module 6 Analysis of Control Systems in State – Space
Basic concepts of state, state variable and state models, transfer matrix,
Controllability, observability, obtaining state space equations in canonical form.

Module wise Measurable Students Learning Outcomes:

After the completion of the course the student should be able to:

Module 1

Discuss characteristics of transducers for sensing of different parameters, open loop, closed loop systems, mathematical models, Block diagram, Signal flow graph etc.

Module 2

Illustrate time response of second order system, will get familiar with Error constants, Compensators

Module 3

Illustrate stability of system in time Domain using Routh-Hurwitz criteria

Module 4

Examine root locus and analyze it

Module 5

Examine stability of system in frequency Domain using Polar plots and Bode Plots

Module 6

Illustrate circuits in state space.

Professional Core (Lab)

	L	Т	Р	Cr
Title of the Course: 5EN 271 ECAD-II LAB	0	0	2	1
Pre-Requisite Courses:				
Electronic Circuit Analysis and Design-I Theory and Lab co	urses			
Textbooks:				
1. Sergio Franco, "Design with op-amp and analog integ edition, 2009.	rated circuit	ts", Tat	a McGra	aw Hill, 3 ^{rc}
2. Ramakant Gaikwad, "Op-amp and Linear Integrated Circ	cuits", PHI,	4 th editi	on 2008	
References:				
1. Robert F.Coughlin, Frederick F.Driscoll, " Operatio Circuits", Sixth Edition, PHI, 2001.	nal Amplifi	ers and	l Linear	Integrated
2. B.S.Sonde, "System design using Integrated Circuits", 2	nd Edition,	New Ag	ge Pub, 2	2001
Course Objectives :				
The primary objective of this lab is to give the students exp circuits.	erience of w	orking (on the o	pamp based
1. To illustrate demonstrate, proper use of instruments and	simulator so	oftware		
2. To explain the process of constructing a circuit and veri the experiment list.	fying worki	ng of ci	rcuits m	entioned in
3. To illustrate the methods used for analysis and design of	op-amp base	d circui	ts.	
	ocumenting	the resul	lts.	
4. To Illustrate process of performing the experiment and de				

Course Learning Outcomes:

СО	After the completion of the course the student should be able	Bloom's Cognitive		
CO	to	level	Descriptor	
CO1	Use the required instruments, with proper theoretical understanding of the instruments and modern tools such as circuit simulation software	III	Applying	
CO2	Examine practically the performance of a given opamp based circuit, do correct calculations and properly write the conclusions.	IV	Analyzing	
CO3	Design simple opamp based applications using the circuits studied in related theory course, and as per given problems.	VI	Creating	
CO4	Prepare the documentation of proper observations, neat graphs, writing conclusion in grammatically and technically correct language, explain orally the circuit operation and process of performing the experiments in correct technical language.	V	Evaluating	

CO-PO Mapping : Use 3: High **2:** Moderate **1:**Low **for mapping;**

	1	2	3	4	5	6	7	8	9	10	11	12
CO1					3							
CO2		3										
CO3			3									
CO4										2		

Assessments

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities,	Lab Course Faculty	During Week 1 to Week 4	25
LAI	attendance, journal	Lab Course Faculty	Submission at the end of Week 5	23
LA2	Lab activities,	Lab Course Faculty	During Week 5 to Week 8	25
LAZ	attendance, journal	Lab Course Faculty	Submission at the end of Week 9	23
LA3	Lab activities,	Lab Course Faculty	During Week 10 to Week 14	25
LAS	attendance, journal	Lab Course Faculty	Submission at the end of Week 14	23
Lab ESE	Lab Performance and	Lab Course faculty	During Week 15 to Week 18	25
	related documentation	Lab Course faculty	Submission at the end of Week 18	23

List of Experiments:

- 1. Design of Inverting and Non-inverting amplifier
- 2. Design of Inverting Adder circuit
- 3. Design of Opamp based subtractor / difference amplifier
- 4. Design Instrumentation Amplifier
- 5. Measurement of input offset voltage, input bias current and slew rate
- 6. Effect of offset voltage and bias current of opamp on circuit output voltage
- 7. Effect of circuit gain on circuit frequency response for non-inverting amplifier
- 8. Design of Schmitt trigger
- 9. Active differentiator/ Integrator
- 10. Second order Butterworth low pass filter/ high pass filter
- 11. Square and triangular waveform generator
- 12. Design of Precision rectifier

Title o	of the Course:	5EI	N 273	Com	mu	nica	tion E	ngin	leerin	g and	Cont	rol			
System	n Lab (PART	A)						C		C					
												L-() T-0	P-2	Cr-1
			.	- 17	•			•	<u>г</u> .	•		:			
	equisite Cours	es:	Basic	Electi	roni	cs Ei	nginee	ring,	, Engi	neering	g Mat	hematics	5		
Textbo	DOKS:														
2.	George Kenne Roy Blake , "I Taub Schilling	Elect	ronic	Comr	muni	icati	on Sys	tem'	, Tho	omson	Publi	cations,	2 nd Edit	ion,2002	2
Refere	ences:														
5. 6.	Wayne Tomas 2014 Simon Hykin, B. P. Lathi, "N	"Co	mmun	icatio	on S	ystei	n", 4 ^{tł}	'Edit	tion, J	ohn W	viley &	& Sons, 2	2000		
	Edition, 1998 e Objectives :														
Course 3. 4.	e Objectives : To illustrate d demodulation To enable the	san stud	pling, ents fo	npon	nna (etc.	nalog				systen	ns such a	as modul		1
Course 3. 4.	e Objectives : To illustrate d demodulation,	san stud	pling, ents fo	npon	nna (etc.	nalog				systen	ns such a	as modul		1
Course 3. 4.	e Objectives : To illustrate d demodulation To enable the	sam stud	npling, ents fo nes:	npon anter r des	nna (ign a	etc. and o	nalog develo	pme	nt of a	applica	systen	ns such a	as modul nunicatic		
Course 3. 4. Course	e Objectives : To illustrate d demodulation To enable the e Learning Ou	sam stud	npling, ents fo nes:	npon anter r des	nna (ign a	etc. and o	nalog develo	pme	nt of a	applica	systen	ns such a	as modul nunicatic	n systen	
Course 3. 4. Course	e Objectives : To illustrate d demodulation To enable the e Learning Ou	sarr stud tcor nple	npling, ents fo nes: etion o	npon anter r des f the	nna (ign a	etc. and o rse	nalog develo	pme iden	nt of a	applica	systen ations able t	ns such a of comm	ns modul nunicatio Bloor	n systen n's Cogr Desc	nitive
Course 3. 4. Course CO	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the com	sam stud tcor nple	npling, ents fo nes: etion o	npon anter r des f the ce o	nna (ign a cou f di	etc. and o rse ffere	nalog develo the stu	pme 1den	nt of a	applica Ild be	systen ations of able t emodu	ns such a of comm	as modul nunicatic Bloor level	n systen n's Cogr Desc	nitive
Course 3. 4. Course CO CO CO 202	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the con Analyze the schemes in te Compare the	sam stud tcor nple perf	npling, ents fo nes: etion o forman of ban	npon anter r des f the ce o dwid ce of	f diff	etc. and o rse ffere powe	nalog develo the stu nt mo er requ t samp	pme iden odula irem oling	nt of a t shou tion a nent pr metho	applica and de resence ods, ar	systen ations able t emodu e of no ntenna	ns such a of comm to lation pise.	as modul nunicatio Bloor level IV II	n system n's Cogr Desc Anal Unders	nitive riptor yzing tanding
Course 3. 4. Course CO CO1	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the con Analyze the schemes in te Compare the Demonstrate	sam stud tcor npla perf	npling, ents fo nes: etion o forman of ban forman nall co	npon anter r des f the ce o dwid ce of	nna (ign a cou f di: lth, <u>r</u> diff unica	rse ffere oowe	nalog develo the stu nt mo er requ t samp	pme iden odula irem oling	nt of a t shou tion a nent pr metho	applica and de resence ods, ar	systen ations able t emodu e of no ntenna	ns such a of comm to lation pise.	as modul nunicatic Bloor level IV	n system n's Cogr Desc Anal Unders	nitive riptor yzing
Course 3. 4. Course CO CO CO CO CO CO CO CO CO CO CO CO CO	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the con Analyze the schemes in te Compare the Demonstrate (MATLAB, 1	sam stud tcor npla perf	npling, ents fo nes: etion o forman of ban forman nall co	npon anter r des f the ce o dwid ce of	nna (ign a cou f di: lth, <u>r</u> diff unica	rse ffere oowe	nalog develo the stu nt mo er requ t samp	pme iden odula irem oling	nt of a t shou tion a nent pr metho	applica and de resence ods, ar	systen ations able t emodu e of no ntenna	ns such a of comm to lation pise.	as modul nunicatio Bloor level IV II	n system n's Cogr Desc Anal Unders	nitive riptor yzing tanding
Course 3. 4. Course CO CO CO CO CO CO CO CO CO CO CO CO CO	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the con Analyze the schemes in te Compare the Demonstrate	sam stud tcor npla perf	npling, ents fo nes: etion o forman of ban forman nall co	npon anter r des f the ce o dwid ce of	nna (ign a cou f di: lth, <u>r</u> diff unica	rse ffere oowe	nalog develo the stu nt mo er requ t samp	pme iden odula irem oling	nt of a t shou tion a nent pr metho	applica and de resence ods, ar	systen ations able t emodu e of no ntenna	ns such a of comm to lation pise.	as modul nunicatio Bloor level IV II	n system n's Cogr Desc Anal Unders	nitive riptor yzing tanding
Course 3. 4. Course CO CO CO CO CO CO CO CO CO CO CO CO CO	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the con Analyze the schemes in te Compare the Demonstrate (MATLAB, 1 D Mapping :	sam stud tcor mple perf a si Emo	npling, ents fo nes: etion o forman of ban forman nall co na Dat	npon anter r des f the ce o dwid ce of ommi ex bo	nna (ign a cou f di f di f diff unic; bard)	etc. and of rse 1 ffere cowe eren atior	nalog develo the stu ent mo er requ t samp n syste	pmer iden odula irem oling em us	nt of a t shou tion a eent pr metho sing s	applica and de resence ods, ar	system ations of able t emodu e of no atenna re pac	ns such a of comm to lation bise. kages	as modul nunicatio Bloor level IV II III	n system n's Cogr Desc Anal Unders	nitive riptor yzing tanding
Course 3. 4. Course CO CO CO CO CO CO CO CO CO CO CO CO CO	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the con Analyze the schemes in te Compare the Demonstrate (MATLAB, 1	sam stud tcor npla perf	npling, ents fo nes: etion o forman of ban forman nall co	npon anter r des f the ce o dwid ce of ommi ex bo	nna (ign a cou f di: lth, <u>r</u> diff unica	rse ffere oowe	nalog develo the stu nt mo er requ t samp	pme iden odula irem oling	nt of a t shou tion a nent pr metho	applica and de resence ods, ar	systen ations able t emodu e of no ntenna	ns such a of comm to lation pise.	as modul nunicatio Bloor level IV II	n system n's Cogr Desc Anal Unders	nitive riptor yzing tanding
Course 3. 4. Course CO CO CO CO CO CO CO CO CO CO CO CO CO	e Objectives : To illustrate d demodulation, To enable the e Learning Ou After the con Analyze the schemes in te Compare the Demonstrate (MATLAB, 1 D Mapping : PO	sam stud tcor mple perf a si Emo	npling, ents fo nes: etion o forman of ban forman nall co na Dat	npon anter r des f the ce o dwid ce of ommi ex bo	nna o ign a cou f dir dth, <u>r</u> unica bard	etc. and of rse 1 ffere cowe eren atior	nalog develo the stu ent mo er requ t samp n syste	pmer iden odula irem oling em us	nt of a t shou tion a eent pr metho sing s	applica and de resence ods, ar	system ations of able t emodu e of no atenna re pac	ns such a of comm to lation bise. kages	as modul nunicatio Bloor level IV II III	n system n's Cogr Desc Anal Unders	nitive riptor yzing tanding

Assessments :

Teacher Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks	
LA1	Lab activities,	Lab Course Faculty	During Week 1 to Week 4	25	
LAI	attendance, journal	Lab Course Faculty	Submission at the end of Week 5	23	
LA2	Lab activities,	Lab Course Faculty	During Week 5 to Week 8	25	
LAZ	attendance, journal	Lab Course Faculty	Submission at the end of Week 9	23	
LA3	Lab activities,	Lab Course Faculty	During Week 10 to Week 14	25	
LAS	attendance, journal	Lab Course Faculty	Submission at the end of Week 14	23	
Lab ESE	Lab Performance and	Lab Course faculty	During Week 15 to Week 18	25	
Lao ESE	related documentation	Lab Course faculty	Submission at the end of Week 18	23	

List of Experiments :

- 1. Spectrum analyzer
- 2. AM Transmitter/ Receiver
 - 2.1 DSB-FC system
 - 2.2 DSB SC system
- 3. FM Transmitter/ Receiver
 - 3.1 Reactance and varactor modulator
 - 3.2 PLL, quadrature, Foster- Seeley and detuned resonance detectors
- 4. Sampling theorem and reconstruction
- 5. Pulse Modulation and demodulation
 - 5.1 PAM, PWM, PPM techniques
- 6. PCM Modulation and Demodulation
- 7. Digital Data Transmission Techniques

8. Digital Modulation Techniques

9. Experiments on MATLAB

10. Experiments on National Instrument's Emona Datex Board

Title of the Course: 5EN 273 Communication Engineeringand Control System Lab (PART B)	L- 0	T- 0	P- 2	Cr- 1

Pre-Requisite Courses: --

Textbook:

1. "Control System Engineering", I.J. Nagrath, M. Gopal, 5th Edition, New Age International Publications, 2008.

2. "Modern Control Engineering", Katsuhiko Ogata, 5th Edition, Prentice Hall, 2015.

3. "Modern Control System", Dorf, Bishop, 12th Edition, Prentice Hall, 2013. **References:**

1. "Feedback and Control Systems", Schaum's Outlines Series book, 2nd Edition, McGraw Hill Education, 2012.

2. *"Automatic Control Systems"*, Bejamin C. Kuo, 7th Edition, Wiley Publications, 1995. **Course Objectives :**

This course is designed as first course in control systems. The important objectives are:

1 To introduce open and closed loop systems, transfer function, block diagram and signal flow graphs.

2. To provide fundamentals of sensors, time and frequency domain analysis.

3. To provide the necessary concept of stability in time and frequency domain.

4. To introduce concepts of state space models and its analysis.

Course Learning Outcomes:

CO	After the completion of the course the student should	Bloom'	s Cognitive
	be able to	Level	Descriptor
~ ~ ~		-	
CO	Discuss open and closed loop systems, state space	2	Understandin
1	models, Error constants, Design specifications for second		g
	order system, stability, etc		
CO	Illustrate mathematical models, transfer function using	3	Applying
2	Block diagram and signal flow graph, Compensating		

		networks, State space models		
	CO	Execute stability analysis using Routh-Hurwitz criteria,	3	Applying
	3	Nyquist criteria, Root locus, Bode plots etc. using Matlab		
		Programs		
ſ	CO	Solve PD, PI and PID controllers using Matlab	3	Applying
	4			

CO-PO Mapping :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO1	PS	PS
										0	1	2	01	02
CO1				2									2	
CO2				1										2
CO3					2								2	
CO4				2	1									2

Assessments:

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

sessment	Based on	Conducted by	Conduction and Marks Submission					
LA1	Lab activities,	Lab Course Faculty	During Week 1 to Week 4	25				
	attendance, journal	Lab Course Faculty	Submission at the end of Week 5	20				
LA2	Lab activities,	Lab Course Faculty	During Week 5 to Week 8	25				
LAZ	attendance, journal	Lab Course Faculty	Submission at the end of Week 9					
LA3	Lab activities,	Lab Course Faculty	During Week 10 to Week 14	25				
LAS	attendance, journal	Lab Course Faculty	Submission at the end of Week 14					
ab ESE.	Lab Performance and	Lab Course faculty	During Week 15 to Week 18	25				
	related documentation	Lab Course faculty	Submission at the end of Week 18					

Course Contents:

List of Experiments:

- 1. Potentiometer as transducer and error detector.
- 2. Synchros as transmitter and error detector.
- 3. Effect of negative feedback and Speed control of DC motor.
- 4. DC position Control system (P, PI controller)
- 5. Time response of second order system.
- 6. Selection of kp, ki and kd in PID controller
- 7. To draw Root locus and comment on stability.
- 8. To draw Bode plots and comment on stability.
- 9. Conversion of TF model to state space model

Title	of the Course: 5EN274 Microcontrollers and Peripherals							
	acing Lab							
	0	L	Т	Р	Cr			
		0	0	2	1			
Pre-R	equisite Courses:							
Digital	Electronics Lab 4EN252							
Data S	tructures and Algorithm Lab 4EN253							
Textbo	ooks:							
5.	Kenneth J. Ayala, The 8051 Microcontroller Architecture, Progr	ammir	ng and	Applicat	ions, 2 nd			
	Edition, Penram International Publication, revised edition 2009							
6.	Mohammad Ali Mazidi, The 8051 Microcontroller and Embedded S edition, 2010.	System	ns, Pears	son Educ	ation, 2 nd			
7.	John B. Peatman, Design with PIC microcontrollers, Pearson Educat	ion. 1 ^s	^t edition	. 2003				
	Mohammad Ali Mazidi, PIC Microcontroller and Embedded Seedition, 2008.				ation, 1 ^s			
Refere								
5.	Intel 8085 and 8051 datasheet (www.intel.com)							
6.	Keil A51 and C51 manuals							
	PIC16F877A datasheet (www.microchip.com)							
	Hi-Tech C Compiler manual							
Cours	e Objectives :							
1.	To explain debugging of a C program for AT89C51ED2 and PIC16I respectively.	F877A	in uV4	and MPI	LAB IDE			
2.	To show downloading and testing of C program for AT890	C51EE	02 and	PIC16F	877A in			
	AT89C51ED2 and PIC16F877A development board respectively.	00122		110101				
3.	To explain development of C program for implementing give	en sys	stem re	quiremer	ts using			
	AT89C51ED2 or PIC16F877A microcontroller.			-				
Cours	e Learning Outcomes:							
CO	After the completion of the course the student should be able to		Bloom's Cognitive					
			level	Descript	tor			
CO1	Use uV4 and MPLAB IDE to debug a C program for AT89C511	ED2	III	Applyin	ng			
	and PIC16F877A microcontroller respectively.							
CO2	Test a C program written for AT89C51ED2 using AT89C51	ED2	IV	Analyz	ing			
	development board and for PIC16F877A microcontroller u				C			
	PIC16F877A development board.	0						
				+				
CO3	Develop C program for implementing a given system u	sing	VI	Creatin	g			

CO-PO Mapping :

РО	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO o	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	1	2	3	4	3 1	U	1	0	9	10	11	12		
CO2				1	2									
CO3			1	2	3									

1- High, 2-Medium, 3- Low

Assessments :

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities,	Lab Course Faculty	During Week 1 to Week 4	25
LAI	attendance, journal	Lab Course Faculty	Submission at the end of Week 5	
LA2	Lab activities,	Lab Course Faculty	During Week 5 to Week 8	25
LAZ	attendance, journal	Lab Course Faculty	Submission at the end of Week 9	
LA3	Lab activities,	Lab Course Faculty	During Week 10 to Week 14	25
LAJ	attendance, journal	Lab Course Faculty	Submission at the end of Week 14	
Lab ESE	Lab Performance and	Lab Course faculty	During Week 15 to Week 18	25
	related documentation	Lab Course faculty	Submission at the end of Week 18	

Course Contents:

- 1. Conversion of if and for C statements into 8051 instructions
- 2. Interfacing Unipolar Stepper Motor with 8051 microcontroller.
- 3. Interfacing 4 digit Multiplexed Display with 8051 microcontroller.
- 4. Interfacing 16x2 character LCD with 8051 microcontroller.
- 5. Interfacing 4x4 Matrix Keyboard with 8051 microcontroller.
- 6. Interfacing DAC0800 with 8051 microcontroller.
- 7. Interfacing ADC0809 with 8051 microcontroller.
- 8. Handling External Interrupts
- 9. Using Timer as Timer
- 10. Using Timer as Counter
- 11. Serial communication (Hardware control through PC keyboard)
- 12. Multiprocessor communication (Using Proteus)
- 13. Interfacing Unipolar Stepper Motor with PIC16F877A microcontroller.
- 14. Interfacing 4 digit Multiplexed Display with PIC16F877A microcontroller.

Module wise Measurable Students Learning Outcomes :

After the completion of the course the student should be able to:

- 1. Develop a C program for using external devices or peripherals.
- 2. Use development tools for simulating and debugging C program.
- 3. Use development tools for download and test a C program.

5EN 276 : Presentation and Report writing