	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
			A	Y 2022-23	- /					
Course Information										
Progr	Programme M.Tech. (Electronics Engineering)									
Class, Semester First Year M.Tech., Sem I										
Cours	Course Code 6EN501									
Cours	e Nam	e	Research Methodo	ology for Electronics E	ngineers					
Desired Requisites: None										
T	eachin	g Scheme		Examination Sch	eme (Marks)					
Lectu	re	-	ISE	MSE	ESE	Total				
Tutor	ial	-	20	30	50	100				
Practi	cal	_		Nil						
Intera	ction	2 Hrs/week		Credits	: 2					
		<u> </u>	1							
			Cou	rse Objectives						
-	To de	evelop a researc	h orientation among	g the students and to acc	quaint them with funda	mentals of				
1	resea	rch methods.		·	•					
2	To de	evelop understar	nding of the basic fr	amework of research p	rocess and techniques					
3	To id	entify various s	ources of information	on for literature review	and data collection.					
4	4 To develop an understanding of the ethical dimensions of conducting applied research.									
5	5 To develop understanding about patent process.									
At the	end of	the course the	students will be abl	e to	lomy Level					
CO1		sifv various met	hods to solve resear	ch problem		Apply				
CO2	Cons	<b>truct</b> a research	n problem in respect	tive engineering domain	1.	Apply				
CO3	Inve	stigate various o	data analysis technic	ques for a research prob	olem.	Analyze				
<b>CO4</b>	Iden	t <b>ify</b> various Inte	llectual Property Ri	ghts procedures		Apply				
Modu	ıle		Mo	dule Contents		Hours				
	R	esearch Fundar	nentals							
I	V	/hat is research	, types of research,	the process of researc	h, Literature survey a	nd 4				
	re D	eview, Formula	tion of a research pr	roblem.						
	R	esearch design-	us Meaning Need and	Types Research Desig	on Process Measureme	nt				
II	a	nd scaling tech	niques, Data Collec	tion $-$ concept, types a	and methods, Processi	$\frac{1}{10}$ 5				
	a	nd analysis of da	ata, Design of Exper	riment	,					
	A	nalysis Techniq	ues							
	Q	uantitative Tec	chniques, Sampling	g fundamentals, Testir	ng of hypothesis usi	ıg				
III various tests like Multivariate analysis, Use of standard statistical software, Data										
processing, Preliminary data analysis and interpretation, Uni-variate and bi-variate										
		iarysis or uata, t	coung of hypothese	, i-wsi, <b>∠</b> -wsi, uni-syu	are test, anova test.					
	R	esearch Comm	unication							
	V	riting a confe	rence paper, Journ	al Paper, Technical re	eport, dissertation/the	is				
IV	W	riting. Presenta	tion techniques, sof	ftware used for report	writing such as WOR	D, 4				
		atex etc. Types	ot journal/conference	ce papers						

v	Intel Natu Pater deve Prop	Intellectual Property RightsNature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.5													
VI	Pate Pater infor Adm Syste	Patents and Patenting ProceduresPatent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patentnformation and databases. Geographical Indications. New Developments in IPR:Administration of Patent System. New developments in IPR; IPR of BiologicalSystems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs													
1			C	RK	othari	Lex Researcl	<b>а во</b> h Me	oks thodole	οσν Νά	ew Age	e interr	national			
2	Ι	Deepak	Chopr	a and	Neena	Sondhi, Publisł	Rese	arch M House,	lethodo New I	ology : Delhi	Conce	pts and	cases,	Vikas	
			1.D	1- D	1. 11	Ref	feren	ices		- 1- f	- 4	(	1	· · · ·	
1	E. PI	mp ar	la Dere	ek Pug	n, How	to get a	en ur	D. – a I niversit	iandbo v press	OK IOF	studen	is and i	neir su	perviso	Jrs,
2	Stu	art Me	lville a	nd Wa	ayne Go	oddard, H	Resea	rch Me	ethodol	ogy: A	n Intro	oductio	n for So	cience	&
	Engineering Students														
1							I <mark>UI L</mark> NPTI	<b>іпкs</b> EL Lec	tures						
-	CO-PO Mapping														
				]	Program	nme Ou	itcon	nes (PC	))					PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2		1												
CO2					2	2									
CO3				2											
CO4		2													
	The	strengt	h of m	appin	g is to b	e writte	n as 1	1,2,3; V	Vhere,	1:Low	, 2:Me	dium, 3	:High		
			Ea	ach C	O of the	e course	must	map to	o at lea	st one	PO.				
				1 1		Asses	sme	nt	1						
I here are th IMP: Lab E	ree co SE is	a sepai	ents of ate hea	lab as	sessmer bassing.	LA1, LA1, LA1, LA1, LA1, LA1, LA1, LA1,	LA2 A2 to	and Lagether	is trea	ted as ]	In-Sem	nester E	valuati	on.	
Assessment	;	Base	d on		Condu	cted by	]	<b>Typica</b>	Schee	lule (fo	or 26-v	veek Se	em)	Marl	KS
LA1		Lab ac	tivities	, 	Lab C	Course	Du	ring W	eek 1 t	o Weel	k 6	- <b>f W</b>	1- 6	20	
	all	endand Labac	tivities	nai	Fac Lab (			irks Su ring W	omissi Teek 7 t	on at tr	$\frac{10}{12}$	of wee	ко		_
LA2	att	endanc	e. jour	, nal	Fac	ultv	Ma	arks Su	bmissi	on at th	ne end	of Wee	k 12	30	
Lab DOD		Lab ac	tivities	,	Lab C	Course	Du	ring W	eek 15	to Wee	ek 18		_	50	
Lab ESE	att	endanc	e, jour	nal	Fac	ulty	Ma	arks Su	bmissi	on at tł	ne end	of Wee	k 18	50	
Week 1 indi	cates	starting	g week	ofas	emester	r. The ty	pical	schedu	le of la	ab asse	ssmen	ts is sho	own,		.
considering	a 26-	week s	emeste	r. The	actual	schedule	e shal	l be as	per ac	ademic	calend	tar. Lat	o activit	ties/La	b
and other su	itable	activit	ties, as	per th	e natur	e and rec	juire	ment of	f the la	b cours	s, mav	experi	mental	lab	
shall have typically 8-10 experiments.															

	(Government Aided Autonomous Institute)									
	AY 2022-23									
	Course Information									
Progra	Programme M.Tech. (Electronics Engineering)									
Class,	Class. Semester First Year M.Tech., Sem I									
Course	e Code		6EN502							
Course	e Namo	e	Advanced Digital Si	gnal Processing						
Desire	d Requ	uisites:	Signals and Systems	, Digital Signal Proce	ssing					
	-			0 0						
T	eachin	g Scheme		Examination Sc	heme (Marks)					
Lectur	e	3 Hrs/week	MSE	ISE	ESE	Total				
Tutori	al	-	30	20	50	100				
Practio	cal	-		Ni	I					
Intera	ction	-		Credit	ts: 3					
			1							
			Cour	se Objectives						
1	To ill	ustrate the conc	epts of Advanced Sigr	al Processing						
2	Toor	plain the differe	nt tachniquae for dasi	an of filtors and mult	rata avetame					
2	Toer	able the student	s for the design and de	gil 01 Inters and muti avelopment of Adapti	ve DSP systems					
	1001		urse Outcomes (CO)	with Bloom's Taxo	nomy Level					
At the	end of	the course, the s	tudents will be able to							
CO1	Expla	in the basic and	advanced signal proc	essing concepts		Discuss				
CO2	Desig	n FIR and IIR f	ilters with given speci	fications		Design,				
						Solve				
<b>CO3</b>	Analy	yse the various a	lgorithms related with	multi-rate DSP		Analyze				
<b>CO4</b>	Illust	rate adaptive sig	nal processing algorith	hms		Demonstrate				

Module	Module Contents	Hours
Ι	<b>Review of Digital Signal Processing</b> Discrete Time Signals and systems, LTI Systems, Basic Signal Processing Operations, Discrete Time Systems-Classification, impulse and step responses, phase and group delays. Time domain and frequency domain characterization of LTI discrete time systems, Z Transform, Transfer function	8
Ш	<b>DSP Structures</b> Block Diagram Representation, Equivalent Structures, Basic FIR Digital Filter Structures, Basic IIR Digital Filter Structures, All pass Filters, Tuneable IIR Digital Filters, IIR Tapped Cascaded Lattice Structures, FIR Cascaded Lattice Structures, Parallel All pass Realization of IIR Transfer Functions	6
III	<b>DFT Computation Techniques</b> DFT-Definition and properties, symmetry properties, Circular convolution, Computation of DFT, Decimation in time (DIT) and Decimation in Frequency (DIF) Fast Fourier transform (FFT) algorithms, Linear filtering using FFT- overlap add, overlap save methods, Goertzel Algorithm	б

IV	<b>Filter Design Technique</b> Bilinear Transformation Method of IIR Filter Design, Design of Low pass IIR Digital Filters, Design of High pass, Band pass and Band stop IIR Digital Filters, Spectral Transformations of IIR Filters, FIR Filter Design Based on Windowed series, Design of Digital Filters with Least-Mean-Square Error, Constrained Least-Square Design of FIR Digital Filters	8
V	<b>Multi-rate Signal Processing</b> The Basic Sample Rate Alteration Devices, Filters in Sampling Rate Alteration Systems, Multistage Design of Decimator and Interpolator, The Poly phase Decomposition, Arbitrary-Rate Sampling Rate Converter, Digital Filters Banks, Two- Channel Quadrature-Mirror Filter bank	6
VI	<b>Introduction to adaptive signal processing</b> Introduction to Adaptive Filters, Steepest descent technique, LMS algorithm-Convergence analysis, Learning curve, SVD	6

Text Books															
Sanjit K. Mitra, "Digital Signal Processing – A Computer based approach", Tata McGraw-Hill,															
1	4 <sup>th</sup> Edition, 2013														
2	Berna	rd Wi	drow	, Sam	uel D	. Stea	rns "A	Adapti	ve Si	gnal P	roces	sing,"	', Pre	entice	-Hall,
	Engle	wood	Cli, l	NJ, 19	85										
							R	lefere	nces						
1	J. G. 1	Proaki	s, Di	mitris	K Ma	anolak	cis, "A	Advan	ced D	Digital	Signa	al Pro	cessi	ng Pri	ncipals,
-	Algor	ithms	and A	Applic	ation	s,", Po	earsor	n,2007							
							Us	seful l	Links						
1							]	NPTE	L Lee	ctures					
							CO-	PO N	lappi	ng					
				Pro	gran	nme C	Jutco	mes (l	PO)						PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C01			2												
CO2						1									
CO3				2											
CO4															
		 stren	oth of	l f mani	l ning i	s to h	o writ	ten as	122	· Whe	re 1	Low	 2∙M∈	dium	3.High
	1 110	such	gui U	Each		ofthe		$e^{mu}$	1,2,3 t mor	$, $ with $t_{0}$ at	10, 1. 100st	DUW,	2.1010	ulull	, <i>5</i> .111gli
				Laci			cours	e mus	si maj		icast		0.		

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)							
	AY 2022-23						
	Course Information						
Programme	M. Tech. (Electronics Engineering)						
Class, Semester	First Year M. Tech., Sem. I						
Course Code	6EN503						
Course Name	Embedded System Design						
Desired Requisites:	Microprocessors / Microcontrollers, Computer Programming						

Teaching S	cheme		Examinatio	nation Scheme (Marks)						
Lecture	3 Hrs/weel	k MSE	ISE	ESE	Total					
Tutorial	-	30	20	50	100					
Practical	-		Nil							
Interaction	-			Credits: 3						
		Cou	urse Objective	S						
1	Understand on various	Understand ARM processor core architecture with several features of peripherals available on various embedded Cortex- M processors								
2	Understan	d interrupts and its pro	ogramming wit	h peripherals						
3	Develop si application	nall embedded systen 1 software for it.	n by using the A	ARM processor core based syste	ems and					
4	Use EDA	tools to design embed	ded system.							
	C	Course Outcomes (CO	<b>O) with Bloom</b>	's Taxonomy Level						
At the end of t	the course, th	ne students will be abl	le to,							
CO1	Illustrate Cortex M3 / M4 processor architecture and its features Und									
CO2	Apply pro	gramming skills to de	velop algorithm	n for peripherals and interrupts	Apply					
CO3	Develop e	mbedded system softw	ware.		Create					
CO4	Design and	d develop embedded systems based applications Create								
Module		Μ	odule Content	ts	Hours					
I	ARM Cor ARM Cort Memory o Operation	tex –M Architecture ex M3 / M4 Architec organization, Instruct Modes, Embedded C	e and Program ture, Registers, tion Set, Prog Programming	ming , CPU status, Clock generation, gramming model – Registers,	6					
п	<b>Cortex M</b> Nested Ver Interrupt I Pendable Chaining, interrupts,	ex M CPU Interrupts ed Vectored Interrupt Controller (NVIC), Vector table, Interrupt priorities, cupt Inputs and Pending behaviour, Fault Exceptions, Supervisor and able Service Call, SYSTICK Timer, Interrupt Sequences, Exits, Tail ning, Interrupt Latency, Start-up files, initialization of peripherals								
III	ARM Per On chip p Memory, programm	Peripherals and Programming hip peripherals, GPIO, RTC, Watchdog, ADC, DAC, Timer, PWM, bry, DMA programming, External Peripheral Interfacings and their amming.								
IV	Communic Communic programm	cation and Program cation Peripherals: ing, LIN bus program	ming UART, I2C, ming, Drivers	I2S, and SPI, CAN BUS for serial port communication	8					
V	Algorithm	Designing and Deb	ugging		6					

	State Machine based Embedded Programming, Writing initialisation programs,									
	Debugging techniques, Debugging with JTAG, Debugging with UART port,									
	open source tools for software development									
	Embedded System Implementation									
VI	Development Environment, Debugging Techniques, Designing, 4									
	Manufacturing and Testing steps and issues.									
	Text Books									
1	Joseph Yiu, "The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors", Newnes; 3rd edition									
2	Frank Vahid and Tony Givargis, "Embedded System Design", Wiley									
3	Yifeng Zhu, "Embedded Systems with Arm Cortex-M Microcontrollers in Assembly									
5	Language and C", E-Man Press LLC									
	References									
1	Sloss Andrew N, Symes Dominic, Wright Chris, "ARM System Developer's Guide:									
-	Designing and Optimizing", Morgan Kaufman Publication									
2	Steve furber, "ARM System-on-Chip Architecture", Pearson Education									
3	Frank Vahid and Tony Givargis, "Embedded System Design", Wiley									
4	Technical references and user manuals of respective controller									
	Useful Links									
1	https://nptel.ac.in/									
2	https://in.coursera.org/									
3	https://www.ti.com/									
4	https://www.nxp.com/									
5	https://www.arm.com/									

	CO-PO Mapping										
	Programme Outcomes (PO)										
	1	2	3	4	5	6					
CO1	2										
CO2	2										
CO3				2		2					
CO4	<b>CO4</b> 2 2										
		1:Lov	v, 2:Medium, 3	:High							

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)							
AY 2022-23							
	Course Information						
Programme	M. Tech. (Electronics Engineering)						
Class, Semester	First Year M. Tech., Sem. I						
Course Code	6EN546						
Course Name	Embedded System Design Lab						
Desired Requisites:	Microprocessors / Microcontrollers, Computer programming						

Teaching Sc	heme		Examination Scheme (Marks)						
Lecture	-	- LA1		LA2	ESE	Total			
Tutorial	-		30	30 30		100			
Practical	2 Hrs./we	eek							
Interaction	-			Cr	edits: 1				
			Course	Objectives					
1	To use A	To use ARM Cortex M3 / M4 controller architecture and its features							
2	To learn	To learn ARM Cortex –M Architecture and Programming							
3	Write, sin	nulat	e, download and tes	st C programs for	r ARM Cortex M3 / M4 p	rocessor			
4	Develop a	a pro	gram for implement	ting given or req	uired system operation.				
	Co	ourse	Outcomes (CO) w	vith Bloom's Ta	xonomy Level				
At the end of the	e course, th	e stu	dents will be able to	),					
CO1	Apply pro M3 / M4	ograr base	nming skills to integ d controller	grate hardware p	eripherals of ARM Cortex	Apply			
CO2	Debug pr	ogra	ms for ARM Corte	ex M3 / M4 base	ed controller	Analyze			
CO3	<b>Develop</b> s	small ls foi	embedded systems ARM Cortex M3	using ARM C p / M4 based con	rogramming and hardware atroller	Design			

## List of Experiments / Lab Activities

Create

List of Experiments:

**CO4** 

- 1. Experiment 1 : Introduction of the development tools and kit
- 2. Experiment 2 : Simple assembly language, embedded C program and study of startup.s file

**Demonstrate** the developed embedded system

- 3. Experiment 3 : GPIO Programming
- 4. Experiment 4 : Interrupt programming
- 5. Experiment 5 : Programming Timer as Timer and Timer as Counter
- 6. Experiment 6 : Programming PWM and application of it
- 7. Experiment 7 : Programming ADC and DAC
- 8. Experiment 8 : Programming UART
- 9. Experiment 9 : Programming RTC and WDT
- 10. Experiment 10 : Programming demonstration SPI, I2C, CAN bus Protocol
- 11. Experiment 11 : Programming for interfaces like LCD, DC Motor, DHT22 Sensor
- 12. Experiment 12 : Hands-on / Demonstration : Temperature sensing unit / Light sensing unit
- 13. Experiment 13 : Demonstration : Embedded Artificial Intelligence Design
- 14. Mini-Projects and Demonstration

## Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessmen	t Based	on	Conc	lucted by	T	ypical Sche	dule	Marks		
LA1	Lab attend	activities, ance, journal	Lab Co	urse Faculty	Durin	g Week 1 to	Week 6	30		
LA2	Lab attend	activities, ance, journal	Lab Co	urse Faculty	Marks S	ubmission a Week 6	t the end of	30		
Lab ESE	Lab attend	activities, ance, journal	Lab Co	urse Faculty	During	g Week 7 to	Week 12	40		
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.										
				<b>Text Book</b>	S					
1	Joseph Yiu, "The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors", Newnes; 3rd edition									
2	Frank	Frank Vahid and Tony Givargis, "Embedded System Design", Wiley								
3 Yifeng Zhu, "Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C", E-Man Press LLC										
References										
1	1Sloss Andrew N, Symes Dominic, Wright Chris, "ARM System Developer's Guide: Designing and Optimizing", Morgan Kaufman Publication									
2	Steve	furber, "ARM	System-c	on-Chip Arch	itecture", I	Pearson Edu	cation			
3	Frank	Vahid and Tor	ny Givarg	is, "Embedde	ed System	Design", W	iley			
4	Techn	ical references	and user	manuals of re	espective of	controller				
				Useful Link	s					
1	https://	/nptel.ac.in/								
2	https://	/in.coursera.or	<u>'g/</u>							
3	https://	/www.ti.com/	-							
4	https://	/www.nxp.com	<u>n/</u>							
5	https://	/www.arm.cor	<u>n/</u>							
			CO	-PO Mappir	ng					
	Programme Outcomes (PO)									
	1 2 3 4 5 6									
	CO1	2								
	CO2				2					
	CO3					2	2			
	CO4					2	2			
			1: Low,	2: Medium, 3	3: High					

Walchand College of Engineering, Sangli										
	AY 2022-23									
Course Information										
Programme M. Tech. (Electronics Engineering)										
Class,	, Semester		First Year M. Tech., Sem I							
Cours	se Code		6EN545							
Cours	se Name		Advanced Digital Signal Processing Lab							
Desire	ed Requisi	tes:	Digital Signal Pro	ocessing						
Tea	aching Scł	neme (Hrs)		Examination S	Scheme (Marks)					
Lectu	re	-	LA1	LA2	ESE	Total				
Tutor	ial	-	30	30	40	100				
Practi	ical	2Hrs/week				1				
Intera	action	-		Cree	lits: 1					
		1	1							
			Course	Objectives						
1	To make	e students fam	iliar with the mos	st important meth	ods in DSP, inclu	ding digital				
l	<sup>1</sup> filter design, transform-domain processing and importance of Signal Processors.									
2	2									
3										
A / 1	1 6 1	Course C	Outcomes (CO) w	vith Bloom's Tax	conomy Level					
At the	e end of th	e course, the s	students will be al	ble to,		A malaria a				
CO1	Apply s	Ignal processii	ig to various area	is such as speech	and	Applying				
CO2	audio pr	ocessing, ima	ge processing, bio	omedical signal p	rocessing, array	Creating				
	signal p	rocessing etc.								
CO3	Design of	digital filters to	o suit specific req	uirements for spe	ecific applications	s Creating				
	1					1				
			List of Experim	ents / Lab Activi	ities					
List o	of Experir	nents:								
Exper	riments us	ing MATLAB	:							
1.	Generat	ion and analys	is of different sig	gnals in time and t	frequency domain	ns.				
2.	Study an	nd application	s of different tran	storms						
5. 4	Design	of multi rate of	anal system							
5.	Introduc	tion to DSK 6	5713 kit and CCS	environment						
6.	Study of	f input/output.	architecture of C	Cox processor						
7.	Digital f	filter design us	sing DSK 6713	1						
8.	Implem	entation of DS	P applications us	ing DSK 6713						
			Tex	xt Books						

1	Sanjit K. Mitra, "Digital Signal Processing – A Computer based approach", Tata McGraw-Hill, 4 <sup>th</sup> Edition, 2013
2	Bernard Widrow, Samuel D. Stearns "Adaptive Signal Processing,", Prentice-Hall, Englewood Cli, NJ, 1985
3	
	References
1	J. G. Proakis, Dimitris K Manolakis, "Advanced Digital Signal Processing Principals,
1	Algorithms and Applications,", Pearson, 2007
2	User manual of TMS320C6713
3	
	Useful Links
1	
2	
3	
4	

	CO-PO Mapping												
		Programme Outcomes (PO) PSO											
	1	2	3	4	5	6							
C01			2										
CO2				2									
CO3						2							
	1:Low, 2:Medium, 3:High												

AY 2022-23Course InformationProgrammeM.Tech. (Electronics Engineering)Class, SemesterFirst Year M.Tech., Sem ICourse Code6EN511Course NameProfessional Elective 1-Embedded Linux ProgrammingDesired RequisiterNilTeaching SchemeExamination Scheme (Marks)Lecture3 Hrs/weekMSEISEESETotorial-302050100Practical-NilIteration-TotailTo make students familiar with installation and use of the embedded Linux operating system1To facilitate the students to learn the fundamentals of Linux as applied to embedded Linux as applied to embedded hardware3To give exposure to system design using embedded Linux as applied to embedded Linux operating system3To give exposure to system design using embedded Linux as applied to embedded Linux operating systemCourse Outcomes (CO) with Bloom's Taxonomy LevelAt the end of the course, the students will be able to, CO1Apply the understanding of Linux OS for Linux administrationApplyCO2Write, compile, debug multi-file, multi-threaded programs under Linux using Evaluate utilities like make, gdb etc.Apply	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
Course InformationProgrammeM.Tech. (Electronics Engineering)Class, SemesterFirst Year M.Tech., Sem ICourse CodeGENS11Course NameProfessional Elective 1-Embedded Linux ProgrammingDesired Requisites:NilTeaching SchemeMarkan Scheme (Marks)Lecture3 Hrs/weekMSEISEFSETotalTutorial-Course ObjectivesTotalTotas students familiar with installation and use of the embedded Linux operating system1To facilitate the students to learn the fundamentals of Linux as applied to embedded hardwareAt the end of the course, the students will be able to.Course Outcomes (CO) with Bloom's Taxony LevelAt the end of the course, the students will be able to.Course Outcomes (CO) with Bloom's Taxony LevelAt the end of the course, the students will be able to.Course Outcomes (CO) with Bloom's Taxony LevelApply the understanding of Linux OS for Linux administrationApplyWrite, compile, debug multi-file, multi-threaded programs under Linux using Levaluate utilities like make, gdb etc.		AY 2022-23								
Programme       M. Tech. ( Electronics Engineering)         Class, Semester       First Year M. Tech., Sem I         Course Code       6EN511         Course Name       Professional Elective 1-Embedded Linux Programming         Desired Requisites:       Nil         Teaching Scheme       Examination Scheme (Marks)         Lecture       3 Hrs/week       MSE       ISE       ESE       Total         Tutorial       -       30       20       50       100         Practical       -       Nil       Total         Interaction       -       Course Objectives       Total         1       To make students familiar with installation and use of the embedded Linux operating system       Andware         2       To facilitate the students to learn the fundamentals of Linux as applied to embedded hardware       Course Outcomes (CO) with Bloom's Taxonmy Level         At the end of the course, the students will be able to, Course Outcomes (CO) with Bloom's Taxonmy Level       Apply       Apply         CO1       Apply the understanding of Linux OS for Linux administration       Apply       Apply         CO3       Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL Apply       Apply				Cours	e Information	n				
First Year M.Tech., Sem I         Gourse Code       6EN511         Course Name       Professional Elective 1-Embedded Linux Programming         Desired Requisites:       Nil       Image: Schemeter Schemeter Marks)         Teaching Schemeter Schemeter (Marks)         Lecture       3 Hrs/week       MSE       Examination Scheme (Marks)         Lecture       3 Hrs/week       MSE       ISE       ESE       Total         Tutorial       -       30       20       50       100         Practical       -       Course Objectives       Total         Interaction       -       Creatis: 3       Total         1       To make students familiar with installation and use of the embedded Linux operating system         2       To facilitate the students to learn the fundamentals of Linux as applied to embedded hardware       Source Outcomes (CO) with Bloom's Taxonomy Level         3       To give exposure to system design using embedded Linux as applied to embedded hardware       Apply         CO1       Apply the understanding of Linux OS for Linux administration       Apply         CO2       Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.       Apply         CO3	Programme		M.Tech.	( Electronics Engi	ineering)					
Course Code       6EN511         Course Name       Professional Elective 1-Embedded Linux Programming         Desired Requisite:       Nil         Teaching Scherer       Examination Scheme (Marks)         Iecture       3 Hrs/week       MSE       ISE       ESE       Total         Tutorial       -       30       20       50       100         Practical       -       30       20       50       100         Practical       -       Nil       Iteraction       -       Velocities       Step         1       On ake students familiar with installation and use of the embedded Linux operating system       Nil       Step       Step         2       To facilitate the students to learn the fundamentals of Linux as applied to embedded Linux operating system       Apply         3       To give exposure to system design using embedded Linux as per the industry trends       Apply         4       the end of the curse, the students will be able to,       Apply       Apply       Apply         CO1       Apply the understanding of Linux OS for Linux administration       Apply       Apply         6       Write, compile, debug multi-file, multi-threaded programs under Linux using the valuate       Apply         6       Write ike make, gdb etc.       Apply	Class, Semester		First Yea	ar M.Tech., Sem I						
Course Name       Professional Elective 1-Embedded Linux Programming         Desired Requisites:       Nil         Teaching Scheme       Examination Scheme (Marks)         Lecture       3 Hrs/week       MSE       ISE       ESE       Total         Tutorial       -       30       20       50       100         Practical       -       30       20       50       100         Practical       -       Nil       Total       Interaction       -       Scheme (Marks)         Interaction       -       30       20       50       100         Practical       -       Nil       Scheme (Marks)       Scheme (Marks)         Interaction       -       30       20       50       100         Practical       -       Nil       Scheme (Marks)       Scheme (Marks)         Interaction       -       Oscheme (Course Objectives       Scheme (Marks)       Scheme (Marks)         1       To facilitate the students to learn the fundamentals of Linux as applied to embedded Linux operating system       Andware         2       To give exposure to system design using embedded Linux as per the industry trends       Scheme (Co) with Bloom's Taxonomy Level       Apply         At the end of the course, the students wi	Course Code		6EN511							
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Tutorial-302050100Practical-NilInteraction-Credits: 3To make students familiar with installation and use of the embedded Linux operating system1To facilitate the students to learn the fundamentals of Linux as applied to embedded hardware2To facilitate the students to learn the fundamentals of Linux as applied to embedded hardware3To give exposure to system design using embedded Linux as per the industry trendsCourse Outcomes (CO) with Bloom's Taxonomy LevelAt the end of the curse, the students will be able to, CO1Apply the understanding of Linux OS for Linux administrationApplyCO2Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.KevaluateApplyCO3Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL ApplyApply	Lecture	3 H	rs/week	MSE	ISE	ESE	Τα	otal		
Practical       -       Nil         Interaction       -       Credits: 3         Interaction       -       Course Objectives         1       To make students familiar with installation and use of the embedded Linux operators system         2       To facilitate the students to learn the fundamentals of Linux as applied to embedded Linux operators applied to embedded Linux as per the industry treet         3       To give exposure to system design using embedded Linux as per the industry treet         At the end of the ⊂urse, the students will be able to,       Apply the understanding of Linux OS for Linux administration       Apply         CO1       Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.       Evaluate         Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL board such as Raspberry pi       Apply	Tutorial		-	30	20	00				
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2       hardware         3       To give exposure to system design using embedded Linux as per the industry trends         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply the understanding of Linux OS for Linux administration         CO1       Apply the understanding of Linux OS for Linux administration       Apply         Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.       Evaluate         Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL board such as Raspberry pi       Apply	2	To facilitate the students to learn the fundamentals of Linux as applied to embedded								
3       To give exposure to system design using embedded Linux as per the industry trends         Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply the understanding of Linux OS for Linux administration       Apply         CO1       Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.       Evaluate         CO3       Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL board such as Raspberry pi       Apply	2	hard	ware							
Course Outcomes (CO) with Bloom's Taxonomy Level         At the end of the course, the students will be able to,       Apply the understanding of Linux OS for Linux administration       Apply         CO1       Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.       Evaluate         CO3       Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL board such as Raspberry pi       Apply	3	To g	ive exposi	are to system desig	gn using embe	dded Linux as per the	industry trer	nds		
At the end of the course, the students will be able to,CO1Apply the understanding of Linux OS for Linux administrationApplyCO2Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.EvaluateCO3Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL board such as Raspberry piApply	At the end of the e	011460	<u>Cours</u>	e Outcomes (CO)	with Bloom'	s Taxonomy Level				
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CO2Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.EvaluateWrite programs for peripherals such as GPIO/Keyboard/ Serial port using EL board such as Raspberry piApply	CO1	Арр	ly the unot		x OS IOI LIIIu	x administration		Арріу		
CO2       utilities like make, gdb etc.         Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL       Apply         CO3       board such as Raspberry pi		Writ	e, compile	e, debug multi-file	e, multi-thread	led programs under I	Linux using	Evaluate		
CO3Write programs for peripherals such as GPIO/Keyboard/ Serial port using EL board such as Raspberry piApply	CO2	utilit	ies like m	ake, gdb etc.						
CO3 board such as Raspberry pi		Writ	e program	s for peripherals s	such as GPIO/	Keyboard/ Serial por	t using EL	Apply		
	CO3	boar	d such as l	Raspberry pi						

Module	Module Contents	Hours
Ι	Introduction Introduction to Linux, Linux Distributions, Open source Software, GPL, Facilities in Embedded Linux Boards used in Industry/Market, Important Accessories of Linux boards available/used in industry, Care to take in handling the Linux boards, Development Setup for EL, OS installation, init process, initrd, boot loaders, lilo and GRUB boot loaders, Case studies of Embedded Linux Based Systems	5

		Programme Outcomes (PO)							
		CO-PO Mapping							
1									
		Useful Links							
	O'Rei	Ily Media; Second Edition (August 22, 2008) ISBN: 978-0596529680							
	Karin	n Yaghmour, Jon Masters, Gilad Ben-Yossef, Philippe Gerum, "Building Embedded Linux	Systems",						
2	http:/	/crashcourse.ca/introduction-Linux-kernel-programming-2nd-edition							
1	P. Ra Publi <u>http:/</u>	ghavan, Amol Lad, Sriram Neelakandan, " <i>Embedded Linux System Design and Development</i> " cations; 1 edition (December 21, 2005), ISBN: 978-0849340581 //crashcourse.ca/introduction-Linux-kernel-programming-2nd-edition	, Auerbach						
		<b>References</b>	, <u>1</u> 1						
3	Felix	Alvaro, "LINUX: Easy Linux For Beginners", Amazon.com							
2	Richa	ard Stones, Neil Matthew, "Beginning Linux Programming", Wiley; Fourth edition (2008)							
1	Chris (Sept	topher Hallinan, " <i>Embedded Linux Primer: A Practical Real-World Approach</i> ", Prentice Hallember 28, 2006), ISBN 978-0137017836	l; 1 <sup>st</sup> edition						
-		Text Books							
N	/I	image processing on the RPi. Use OpenCV to perform a computer vision face-detection task.	6						
		<b>Basic Image Processing on Embedded Linux</b> Camera interfacing to EL board, Capture image and video uing OpenCV to perform basic							
V		and connect to it from a mobile device for the purpose of building a basic remote-control application. Using Wi-Fi and Xigbee along with EL board.	7						
		Hardware Interfacing and Programming-II Using Interrupt functionality on devices. Increasing the number of available serial UART devices on the RPi using low-cost USB-to-TTL devices. USB Bluetooth adapter for the RPi							
Г	IV Using onboard I2C, SPI, and UART capabilities. Circuits to the RPi that interface to its I2C bus, Linux I2C-tools. Communicate between UART devices using both Linux tools and custom C or Python code. Interface to sensors using a serial communication protocol.								
I	<ul> <li>Threading and Hardware Access</li> <li>Threads and processes, Multithreaded C programming. EL hardware design issues, Logic-level translation circuitry. Case studies of hardware of frequently used interfaces, Communication with EL board through network, EL GPIO control using sysfs, wiringPi and python. Python libraries</li> </ul>								
I	Π	Linux File System, Permissions, CLI and Linux Shells, Linux Commands, Linux concepts, Shell Script, Basic Linux system administration tasks on the RPi. Linux commands for file and process management. Linux Programming, Multi-file C programming Using make utility, Makefile, GNU debugger. Transferring Files Between Systems, Kernel, building kernel image							

	1	2	3	4	5	6						
CO1			2									
CO2				2								
CO3						2						
	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High											
	Each CO of the course must map to at least one PO.											

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
			AY 202	2-23	,					
Course Information										
Programme M.Tech. (Electronics Engineering)										
Class,	Semo	ester	First Year B. Tech., Sem II							
Cours	e Coo	le	6EN512							
Cours	e Nai	ne	Professional Elective 1 : Optical Communication							
Desire	ed Re	quisites:	Communication Engineer	ring						
T	eachi	ng Scheme	Ex	amination Sch	eme (Marks)					
Lectu	re	3 Hrs/week	MSE	ISE	ESE	Total				
Tutor	ial	-	30	20	50	100				
Practi	ical	-			· · ·					
Intera	ction	-		Credits	: 2					
		·	·							
			Course Ob	jectives						
1	To understand the different kind of losses, signal distortion in optical wave guides and other signalDegradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.									
2	2To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.									
3	To l rece	earn the fiber op iver operation a	tical receivers such as PIN nd configuration.	APD diodes, no	vise performance in p	hoto detector,				
4	To l WD	earn fiber slicing M and solutions	g and connectors, noise effe	ects on system p	erformance, operatio	nal principles				
		Cou	rse Outcomes (CO) with	Bloom's Taxor	omy Level					
At the	end c	of the course, the	students will be able to,		• •	D 1				
	Rela Dot	te light waves in	nto small optical component	its with high pre	cision model and intremode	Kemember				
CO2	dist	ortion	uation and signal degradati	ion due to miter						
CO3	Det fibe	ermine power co r numerical aper	upling losses due to connec ture	tors, splices, sou	arce output pattern an	d Evaluate				
CO4	Ider	tify the modes in	n step index fiber and grade	ed index fiber		Apply				
Modu	ıle		Module Con	ntents		Hours				
I	] ]         	Introduction Introduction, Ra angle, Numeric propagation, EM cylindrical fibers	ay theory transmission, al aperture, Skew rays, Ele waves, modes in Plana s, SM fibers.	e ll /, 6						

П	Attenuation, Material absorption losses in silica glass fibers, Linear and Non linear Scattering losses, Fiber Bend losses, Midband and farband infra red transmission, Intra and inter Modal Dispersion, Over all Fiber Dispersion, Polarization, non linear Phenomena. Optical fiber connectors, Fiber alignment and Joint Losses, Fiber Splices, Fiber connectors, Expanded Beam Connectors					
III	<b>Optical Sources :</b> Semiconductor Physics background, Light emitting diode (LEDs)- structures, materials, Figure of merits, characteristics & Modulation. Laser Diodes -Modes & threshold conditions, Diode Rate equations, resonant frequencies, structures, characteristics and figure of merits, single mode lasers, Modulation of laser diodes, Spectral width , temperature effects, and Light source linearity.					
IV	<b>Optical Detectors</b> : PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise -Noise sources, Signal to Noise ratio, Detector response time					
v	<b>Transmission Systems :</b> Point –to-point link –system considerations, Link power budget and rise time budget methods for design of optical link, BER calculation.					
VI	VIOptical Receiver Operation : Receiver operation, Preamplifier types, receiver performance and sensitivity, Eye diagrams, Coherent detection, Specification of receivers					
	Toyt Books					
	Gerd Keiser "Optical Fiber Communications" Ath Edition Tata Mc Graw Hill 201	3 ISBN:				
1	9781259006876	5, <b>ISD</b> N.				
2	Jamro, M. Yousif, and Senior, John M. Optical Fiber Communications: Principles a United Kingdom, Financial Times/Prentice Hall, 2009, ISBN: 9780130326812	nd Practice.				
3						
4						
	References	1 • 1				
1	Singal, I. L., "Optical Fiber Communications: Principles and Applications", India, Ca	ambridge				
	Agrawal Govind P Fiber-Ontic Communication Systems Cormany Wiley 2	012 ISBNI				
2	9780470922828,	012, ISDIN.				
3						
4						
	Heaful I inke					
1	http://nptel.ac.in/					
2						
3						
4						
	Assessment					

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College	of Engineering	, Sangli					
			(Government Aide	d Autonomous Institut	e)					
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Close	Somostor		First Vaar M. Ta	ah Sam I						
Class,	Semester		FIIST FEAT WI. TEC	ch., Sem I						
Cours			OENJJI Drafa se i se al Elas	Care 1 I als Darks 1	1. 1 T ' T .1.					
Cours	$\frac{1}{1}$		Protessional Elective 1 Lab -Embedded Linux Lab							
Desire	d Requisi	tes:	Basic Computer	Programming, Embe	edded System Design					
Tea	iching Sch	eme (Hrs)	T 4 1	Examination So	cheme (Marks)					
Lectur	re	-			ESE	100				
I utori		-	30	30	40	100				
Practi		2Hrs/week		~ ~ ~						
Intera	ction	-		Cred	its: 1					
			~							
	<b>T 0</b> 111		Course	Objectives						
1	To facilit	ate the students	s to learn the funda	mentals of Linux.	6	) 1				
2	System.	system Archite	cture, configuration	n and Programming	for Embedded Linux I	Based				
3	To facilit	ate the complet	te a mini-project in	volving embedded I	Linux hardware contro	/access				
	maastria	Course	Outcomes (CO) w	vith Bloom's Taxor	omv Level					
At the	end of the	course, the stud	dents will be able to	0,						
<b>CO1</b>	Write pro	ograms using Li	inux operating syst	ems.		Apply				
CO2	Write p Embedde	orograms / scri d Linux Board	pts to configure a	and use internal /	external peripherals of	of Apply				
CO3	Develop	and Demonstra	te small Embedded	l Linux based syster	n	Create				
			List of Experim	ents / Lab Activitie	es					
List of Experiments: Experiments to revise an Embedded System Design Experiment to study Linux distribution installation, configuration and basic commands of it. Experiment to study Linux distribution installation, configuration for an Embedded Linux Board. Experiment to configure and use network setup of an Embedded Linux Board Experiment to access GPIO of an Embedded Linux Board to control components / devices interfaced to it. Mini project implementation and demonstration.										
			Tex	t Books						
1	"Mas	tering Embedde	ed Linux Programm	ning", Second Editio	n, Chris Simmonds.					
2	"Explo Derek	oring Raspberr Mollov	y Pi: Interfacing to	o the Real World w	ith Embedded Linux"	first Edition,				
3	"Explo	oring Beagle Bo	ne: Tools and Tech	niques for Building v	vith Embedded Linux"	Derek Molloy				
			Dat	onon oog						
1	https://	//www.engine	ersgarage com/em	bedded-linux-tutor	ial-hasics/					
1	Inces	// www.engine	cisgalage.com/en							

2	https://www.geeksforgeeks.org/web-technology/						
3	https://www.w3schools.com/						
	Useful Links						
1	https://www.linux.org/						
2	https://www.raspberrypi.org/						
3	https://www.raspberrypi.com/						
4	https://www.coursera.org/						

	CO-PO Mapping														
		Programme Outcomes (PO)													
	1	1 2 3 4 5 6													
CO1			2												
CO2				2											
CO3	CO3 2 2														
	1:Low, 2:Medium, 3:High														

		Assessment									
There are three IMP: Lab ESE	components of la is a separate head	b assessment, LA1, LA2 an of passing.(min 40 %), LA	id Lab ESE. 1+LA2 should be min 40%								
Assessment	Based on	Conducted by	Typical Schedule	Marks							
	Lab activities,		During Week 1 to Week 8								
LA1 attendance, Lab Course Faculty Marks Submission at the end of 30											
	journal		Week 8								
	Lab activities,		During Week 9 to Week 16								
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30							
	journal		Week 16								
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19								
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40							
	performance	applicable	Week 19								
Week 1 indicate	Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing										
experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the											
nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and											
related activitie	es if any.										

Walchand College of Engineering, Sangli												
	(Governmen	at Aided Autonomous	Institute)									
	0	AY 2022-23										
D	U M.Tash (Flag	burse Information	<u>)</u>									
Programme	M. I ech. (Elec	tronics Engineering	)									
Class, Semester	First M. Tech.	, Sem I										
Course Code     OEN352												
Course Name Professional Elective 1 - Optical Communication Lab												
Desired Requisites: Communication Engineering												
Teaching Scheme         Examination Scheme (Marks)												
Lecture -	ture - LA1 LA2 Lab ESE Total											
Tutorial -	orial - 30 30 40 100											
Practical 2 Hrs/Week												
Interaction -		С	Credits: 1									
	1											
	C	Course Objectives										
1 To learn the basic ele structures.	ements of optical	l fiber transmission	link, fiber modes configu	rations and								
2 To understand the di	fferent kind of lo	osses, signal distorti	on, SM fibers.									
3												
4	<b>2</b>	~~~										
Cou	rse Outcomes (	CO) with Bloom's	Taxonomy Level									
At the end of the course, the	students will be	able to,	mmunication link atm	atura								
CO1 Demonstrate all un	smission propert	ties of an optical fib	er	icture,								
Estimate the losses a	nd analyze the p	ropagation characte	ristics of an optical signa	l in								
different types of fib	ers											
CO3												
CO4												
List of Experiments / Lab Activities												
List of Experiments :												

- 1. Measurement of numerical aperture of a fiber after preparing the fiber ends.
- 2. Study of losses in optical fiber
- 3. Setting up of fiber optic digital link
- 4. Preparation of splice joint and measurement of splice loss
- 5. Power vs. current (P-I) characteristics and measure slope efficiency of laser diode.
- 6. Voltage vs. current(V-I) characteristics of laser diode
- 7. Power vs. current (P-I)characteristics and measure slope efficiency of
- 8. Voltage vs. current(V-I) characteristics of LED
- 9. Characteristics of photodiode and measure the responsivity
- 10. Characteristics of avalanche photodiode [APD] and measure the responsivity.

**Text Books** 

1	Gerd K 978125	eiser, "Optical Fil 9006876	ber Communications", 4th	Edition , Tata Mc Graw Hill , 2013,	ISBN:						
2	Jamro, United	M. Yousif, and Se Kingdom, Financ	enior, John M Optical Fibe ial Times/Prentice Hall, 200	er Communications: Principles and I 09, ISBN: 9780130326812	Practice.						
3		<b>.</b>									
4											
			References								
1	Singal, Univers	T. L "Optical Fi sity Press, 2016, I	ber Communications: Princ SBN: 9781316610046	iples and Applications", India, Can	nbridge						
2	Agrawa 978047	al, Govind P Fibe 0922828,	er-Optic Communication Sy	ystems. Germany, Wiley, 2012, ISB	N:						
3											
4											
	1		Useful Links								
1	http://nptel.ac.in/										
$\frac{2}{2}$											
<u> </u>											
4			Assessment								
Thora	ara thraa	components of la	h accossment I A1 I A2 on	d Lab ESE							
IMP·1	lab ESE	is a separate head	of passing (min 40 %) LA	1+LA2 should be min 40%							
Asse	ssment	Based on	Conducted by	Typical Schedule	Marks						
11000	sincin	Lab activities	Conducted by	During Week 1 to Week 8	IVIAI KS						
I	A 1	attendance	Lab Course Faculty	Marks Submission at the end of	30						
		iournal	Luo Course i acarty	Week 8	50						
		I ab activities		During Week 9 to Week 16							
T	Δ2	attendance	Lab Course Faculty	Marks Submission at the end of	30						
	1112	iournal	Luo Course i acuity	Week 16	50						
		I ab activities	Lab Course Faculty and	During Week 18 to Week 19							
Lah	FSF	iournal/	External Examiner as	Marks Submission at the end of	40						
Luc		performance	annlicable	Week 19							
Week	1 indicat	es starting week o	f a semester. I ab activities/	L ab performance shall include perfo	rming						
experi	ments. m	ini-project. preser	tations, drawings, program	ming, and other suitable activities, a	s per the						
nature	and requ	irement of the lab	course. The experimental	lab shall have typically 8-10 experim	nents and						
	l activitie	es if anv	*								

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)											
		AY	2022-23	,								
		Course	Information									
Programme		MTech. (Electronics eng	gineering)									
Class, Seme	ster	First Year MTech., Sem	I									
Course Code	e	6EN514										
Course Nam	e	Professional Elective 2 :	Digital VLSI Design	l								
Desired Req	uisites:	Digital Techniques										
		1										
Teaching	g Scheme	Examination Scheme (Marks)										
Lecture	3 Hrs/week	ISE	MSE	ESE	Total							
Tutorial	-	100										
Practical	-		Nil									
Interaction	-		Credits:	3								
		Cours	e Objectives									
1	To explain the	e relevance of CMOS tech	nnology in implement	ing digital circuits								
	To discuss in	details various logic style	es (static, dynamic) in	implementing CMOS cir	rcuits and the							
2	effect of choosing a particular style on device performance from delay, power and area point of											
	view.											
3	To develop the architectures of few data-path designs (system building blocks) and an insight into											
	extracting the	functionality of displayed	d CMOS circuit									
4	To motivate t	the students to develop life	elong/self-learning att									
After the con	poletion of the	course the student should	be able to	omy Level								
	ipiction of the	course the student should										
CO1	Apply the an	alytical expressions invol-	ving physical parame	ters, process parameters	Illustrate							
	and electrical	parameters to characteriz	e the MOS transistors	3								
CO2	Analyze stati	c CMOS circuits numerica	ally to compute the va	arious device parameters	Develop							
	<b>Analyze</b> dyr	namic CMOS circuits n	umerically to comp	ute the various device	Analyze							
CO3	parameters ar	nd circuit performance par	ameters		T mary 20							
CO4	Select an app	propriate logic style to des	ign submicron MOS	transistor based circuits	Design							
04	using logical,	analytical and computation	onal skills.									
Module		Modu	lle Contents		Hours							
т	MOS Transi MOS transist	stor or theory MOS under stat	tic conditions Second	lary effects. Technology	4							
1	Scaling	Scaling 4										
	CMOS Inve	CMOS Inverter										
II	CMOS inve	erter, Static and Dynamic	e behaviour of CMC	OS inverter, Power and	6							
	Energy-Delay	y, Impact of technology sc	aling on inverter									
	Combination	nal Static Logic Design	MOS CMOS (Invia	tar and Complex setes)								
III	pseudo-nmos	an static logic designs in C	insmission gate logic	and design aspects for	8							
	optimizing th	e performance	Succession Succession	and design appeels for								

IV	<b>Combinational Dynamic Logic Design</b> Combinational dynamic logic designs using pre-charge evaluate logic, domino logic, np-CMOS logic , design aspects for optimizing the performance, Comparison of static and dynamic designs	
v	Sequential Logic Design Timing metrics of sequential circuits, Sequential logic designs in CMOS, Static and dynamic latches and registers	8
VI	<b>Timing Issues in Digital Circuits</b> Timing Classification, Synchronous Design (Clock skew, Jitter, Clock Distribution), Self-Timed Circuits Design, Synchronizers and arbiters, Using PLL for clock synchronization	7

	Text Books														
1	Jan M.	Rabae	y, Ana	ntha C	handra	kasan,	Borive	oje Nik	tolic, "	Digita	Integr	rated C	Circuit	s, A Sy	vstem
1	Perspe	ctive",	Pearse	on Edu	cation	, Secor	nd Edit	ion, Fi	rst Ind	ian Rej	orint, 2	003.			
2	Neil W	este, K	lamran	Eshra	ghian '	'Princi	ples of	CMO	S VLSI	Desig	n", Ad	ldison	Wesle	y/Pear	son
Z	Education, 2010														
References															
Kamran Eshraghian, Pucknell and Eshraghian "Essentials of VLSI Circuits and Systems", , Prentice-Hall															
1	(India)	, 2008													
2	Sung-N	/lo Kan	ıg, Yus	uf Leb	lebici '	'CMO	S Digit	al Inte	grated	Circui	ts: An	alysis c	and De	esign",	McGraw Hill
2	Educat	Education (India), Third Edition, 2003													
3	Neil Weste, David Harris, Ayan Banerjee "CMOS VLSI Design", Pearson Education, 2008														
					-		Usef	ul Linl	KS						
1							NI	PTEL I	Lecture	es					
						(	CO-PO	) Map	ping						
				Р	rograi	nme C	<b>Jutcom</b>	nes (PC	))					P	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1				2											
CO2						1									
CO3						1									
CO4			2												
		The stro	ength c	of map	oing is	to be	written	as 1,2	3; Wh	ere, 1:1	Low, 2	:Mediu	ım, 3:1	High	1
			0	Each		f the co	ourse n	nust m	ap to a	t least	one PC	).	,	0	

The assessment is based on MSE, ISE, ESE.MSE

shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage onmodules 4 to 6.

		Walc	hand College ( (Government Aided	of Engineering Autonomous Institute	, Sangli						
			AY 2	2022-23	/						
			Course I	nformation							
Progra	amme		M. Tech. (Electron	nics Engineering)							
Class,	Seme	ster	First Year M. Tech	., Semester I							
Cours	e Cod	e	6EN513								
Cours	e Nan	ne	PE 2- Mobile Communication								
Desire	d Rec	uisites:									
			1								
T	eachir	g Scheme		<b>Examination Sch</b>	eme (Marks)						
Lectur	re	3 Hrs/week	ISE	MSE	ESE	Total					
Tutor	ial	-	20	30	60	100					
Practi	ctical - Nil										
Intera	ction	-		Credits	: 3						
		1	1								
			Course	Objectives							
1	To i	ntroduce the co	oncepts and technic	ques associated w	ith Wireless Cell	lular					
1	Con	nmunication sy	stems.								
2	To f	amiliarize with	state of art standa	rds used in wirele	ess cellular syste	ms.					
3		<u> </u>			- · ·						
At the	and a	Course	Outcomes (CO) w	ith Bloom's Taxon	omy Level						
At the	Δnn	l ule course, ule ly fundamental	s of cellular system design to improve performance Apply								
CO1	of c	ellular network	is of certain system	n design to impro	ve periormanee	Apply					
CO2	Dist	inguish betwee	n different multip	le access technolo	gv	Analvze					
CO3	Stuc	ly evolution of	mobile communic	ation generation s	standards	Analyze					
COA	Ana	lyze the differe	ent internetworkin	g challenges to pr	ovide solutions	Analyze					
C04	in w	rireless mobile	networks.			_					
Modu	le		Μ	lodule Contents							
	]	The Cellular C	oncept – System	Design Fundamer	itals Introductio	on of 5					
		Cells, Channel	Reuse, SIR Calc	culations, Traffic	Handling Capa	city:					
I	1	triang Perform	ance, Cellular sys	stem design, Co	channel interfer	ence					
	r	atio, Co chani	hel interference r	eduction techniqu	les and method	s to					
		oncents of cell	splitting handove	management and	m	lent,					
		Aultinle Acces	s Technologies-	Frequency Divis	un. sion Multiple ac						
		FDMA). Time	Division Multiple access (TDMA). Code Division								
II	Ň	Aultiple access	(CDMA), spectral efficiency calculations, comparison of								
	]	C/F/CDMA tec	hnologies based of	on their signal se	paration technic	jues,					
	a	dvantages, disa	dvantages and app	plication areas.	-	- ·					

III	<b>GSM Architecture and Interfaces</b> -Introduction to GSM subsystems, GSM Interfaces, GSM architecture, details of following blocks in GSM (Mobile station, Base station systems, Switching subsystems, Home location registers, Visiting location registers, Equipment identity register, Echo canceller), Mapping of GSM layers onto OSI layers, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM. Mobile Management: Handoff, Location and Paging, Evolution of mobile technologies 1G to 4G.	5
IV	<b>Overview of 5G technology-</b> An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G, Channel modeling requirements, Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM)	4
V	<b>Mobile Ad-hoc Network (MANET)-</b> Introduction, properties, applications, architecture, routing in MANET, proactive and reactive routing protocols, hybrid protocol	4
VI	<b>Mobile Security</b> - Introduction, security in wireless network, information security, security techniques and algorithms, Security protocols.	5
1	T.S.Rappaport,"Wireless Communications Principles and Practice", II Ed Publications, 1995	d. PHI,
2	Prashant Kumar Patra, Sanjit Kumar Dash, "Mobile Computing", 2nd Scitech, 2014	Edition,
3	V.K.Garg, J.E.Wilkes, "Principle and Application of GSM" Pearson Education	n, 1999.
	References	
1	William C. Y. Lee, "Mobile Communication Engineering: Theor Applications",2nd Edition, McGraw Hill Publication, 1997	ry and
2	Mischa Schwartz, "Mobile Wireless Communication", 1st Edition, Car University Press, 2009.	nbridge
3		
	Useful Links	
1	https://www.coursera.org/	
2		
4		

	CO-PO Mapping													
		Programme Outcomes (PO)												
	1	1 2 3 4 5 6												
CO1		2												
CO2			2										2	
CO3		2				2								
CO4			1										2	

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.

## Assessment

The assessment is based on MSE, ISE,

ESE.MSE shall be typically on modules 1

to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage onmodules 4 to 6.

	Walchand College of Engineering, Sangli         (Government Aided Autonomous Institute)										
		AY	2022-23								
		Course	Information								
Programme		MTech. (Electronics eng	gineering)								
Class, Seme	ster	First Year MTech., Sem	Ι								
Course Code	e	6EN554									
Course Nam	ie	Professional Elective 2 :	Digital VLSI Design	1 Laboratory							
Desired Req	uisites:	Digital Techniques									
Teaching	g Scheme		<b>Examination Sche</b>	me (Marks)							
Lecture	-	ISE	MSE	ESE	Total						
Tutorial	<b>Tutorial</b> - 30 30 40 100										
Practical	2 Hrs/week Nil										
Interaction - Credits: 2											
	•	·									
		Cours	e Objectives								
1	Demonstrate	e the use of EDA tools f	or designing digital	circuits							
2	Demonstrate	e Cadence flow (Sche	matic entry to sin	nulation) for implemen	ting CMOS						
2	digital circui	its									
3	Prepare the s	students for executing a	n individual or grou	p problem of medium of	complexity						
4	To explain the	he relevance of CMOS	technology in imple	ementing digital circuits							
		Course Outcomes (CO)	with Bloom's Taxon	omy Level							
After the con	npletion of the	course the student should	be able to								
CO1	Design and S	Simulate MOSFET circ	uits using Cadence	tools	Illustrate						
CO2	Design and S	Simulate CMOS circuit	s using Cadence to	ols	Develop						
	Formulate a	research a problem, des	ign, build and simul	ate either a researched	Create						
CO3	CO3 problem or assigned by the supervisor in Digital VLSI Design area										
	independent	ly.									
		List of Experiments / Lab Activities									

A: Using cadence Design Tools:

- 1. NMOS and PMOS characterization
- 2. Implementation of CMOS inverter and its characterization for VTC and power
- 3. Implementation of 2-inpout NAND and NOR

. Finding out rise time, fall time of the output and propagation

4. Implementation of 1-bit full adder using carry-out of the stage to drive the sum output (28 transistor implementation)

5. Implementation of 2-input NAND and NOR gates using different logic styles and compare the performance parameters with complementary CMOS logic style a. Pseudo logic style b. Pass Transistor logic style c. Transmission gate logic style d. Differential cascade voltage switch logic e. Dynamic (pre-charge and evaluate) logic style

6. Implementation of transmission gate based full adder circuit

7. Implementation of four bit Manchester carry chain

8. Implementation of 4-bit barrel shifter using pass transistors

B. Task/miniproject/research problem: For the last lab session which students will have to carry out a task for a period of at least six weeks it is recommended that: 1. Student can search or teacher can assign a course related medium complexity task to a group of student not exceeding two by defining the problem statement suitably

							Tex	t Book	s						
1	Jan M.	Rabae	ey, Ana	ntha C	handra	akasan,	Boriv	oje Nil	kolic, "	Digita	l Integ	rated (	Circuit	s, A Sy.	stem
1	Perspe	ctive",	Pears	on Edu	cation	, Secor	nd Edit	ion, F	irst Ind	ian Rej	print, 2	2003.			
2	Neil W	'este, k	Kamran	Eshra	ghian	"Princi	iples of	f CMO	S VLSI	Desig	n", A	ddison	Wesle	y/Pears	son
2	Educat	ion, 20	)10												
<b>References</b>															
1	Kamra	Kamran Eshraghian, Pucknell and Eshraghian "Essentials of VLSI Circuits and Systems", , Prentice-Hall													
	(India)	, 2008													
2	Sung-N	Ao Kai	ng, Yus	suf Leb	lebici	"CMO	S Digit	al Inte	grated	Circui	ts: An	alysis a	and De	esign",	McGraw Hill
2	Education (India), Third Edition, 2003														
3	3 Neil Weste, David Harris, Ayan Banerjee "CMOS VLSI Design", Pearson Education, 2008														
Useful Links															
1 NPTEL Lectures															
						(	CO-PC	) Map	ping						
				Р	rogra	mme C	Outcon	nes (P	<b>O</b> )					Р	SO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
COI	L			2											
CO2	2					1									
CO3	3					1									
CO4	L		2												
		The str	ength o	of map	ping is	to be	written	as 1,2	,3; Wh	ere, 1:	Low, 2	:Mediu		High	
			C	Each	n CO o	of the co	ourse n	nust m	ap to a	t least	one PC	).		C	
									•						
								Asses	sment						
	There ar	e three	compo	onents	of lab	assessr	nent I	A1 L	A2 and	l Lah F	SE				

There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks			
	Lab activities,		During Week 1 to Week 8				
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30			
	journal		Week 8				
	Lab activities,		During Week 9 to Week 16				
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30			
	journal		Week 16				
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19				
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40			
	performance	applicable	Week 19				
Week 1 indicate	Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing						
experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the							
nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and							
related activities if any.							

	Walchand College of Engineering, Sangli						
	(Government Aided Autonomous Institute)						
	AY 2022-23						
			Co	ourse Information			
Progra	amme		M.Tech. (Elect	tronics Engineering)			
Class,	Semes	ster	First B. Tech.,	Sem I			
Cours	e Code	9	6EN553				
Cours	e Nam	e	Professional E	lective 2 - Mobile Co	ommunication Engineerin	g Lab	
Desire	d Req	uisites:	Communicatio	n Engineering			
			1				
T	eachin	g Scheme		Examination	n Scheme (Marks)		
Lectur	re	-	LA1	LA2	Lab ESE	Total	
Tutor	ial	-	30	30	40	100	
Practi	cal	3 Hrs/Week					
Intera	ction	-		Cı	redits: 1		
			C	ourse Objectives			
1	To in	troduce the cond	cepts and technic	ques associated with	Wireless Cellular Comm	unication	
2	To fa	miliarize with s	tate of art standa	rds used in wireless	cellular systems.		
3							
4							
		Cou	rse Outcomes (	CO) with Bloom's T	<b>Saxonomy Level</b>		
At the	end of	the course, the	students will be	able to,			
CO1	Analy perfo	yze the performation yze the performation of the performance measure measure the performance measure t	ance of different	t mobile generation s	standards in terms of diffe	rent Analy	/se
CO2	Estin	nate the perform	ance of different	t mobile ad-hoc netw	orks and security standar	ds Evalua	ate
CO3							
<b>CO4</b>							
<b></b>		• .	List of Ex	periments / Lab Act	tivities		
List of	f Expe	riments :					
1. Stuc	iy of G	SM system	• ,• ,				
2. Und	erstand	ling 3G commu	nication system				
3. Und	erstand	4G/LIECC	ommunication sy	/stem.			
3. Intro		on to NetSim	£	I N. (C'			
4. MOC	lenng a	and Simulation (	of simple networ	rk using NetSim			
5. Stuc	19 01 G	SM network for	f L TE as terror	mance measure para	meters		
	iy now	the throughput	of LTE network	varies as distance be	etween ENB and UB vari	28.	
/. Stu	7. Study how the throughput of LTE network varies as the channel bandwidth changes.						
$\delta$ . Ana	19818 O	the norferment					
9. Ana	ıyzıng	the performance	E OF MANE I				

**Text Books** 

1	T.S.Rappaport, "Wireless Communications Principles and Practice", II Ed. PHI, Publications, 2010.		
2	Prashant Kumar Patra, Sanjit Kumar Dash, "Mobile Computing", 2nd Edition, Scitech.2013.		
3	V.K.Garg, J.E.Wilkes, "Principle and Application of GSM" Pearson Education, 2007		
4			
	References		
1	William C. Y. Lee, "Mobile Communication Engineering: Theory and Applications", 2nd Edition,		
1	McGraw Hill Publication. 2014		
2	2 Mischa Schwartz, "Mobile Wireless Communication", 1st Edition, Cambridge University Press,		
2	2009.		
3	NetSim online resources		
4			
	Useful Links		
1			
2			
3			
4			

	Assessment						
There are three	components of la	b assessment, LA1, LA2 an	d Lab ESE.				
IMP: Lab ESE	is a separate head	of passing.(min 40 %), LA	1+LA2 should be min 40%				
Assessment	Based on	Conducted by	Typical Schedule	Marks			
LA1	Lab activities,		During Week 1 to Week 8				
	attendance,	Lab Course Faculty	Marks Submission at the end of	30			
	journal		Week 8				
	Lab activities,		During Week 9 to Week 16				
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30			
	journal		Week 16				
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19				
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40			
	performance	applicable	Week 19				
Week 1 indicate	es starting week o	f a semester. Lab activities/	Lab performance shall include perfor	ming			
experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the							
nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and							
related activitie	es if any.						

Walchand College of Engineering, Sangli							
			AY 2	2022-23	•		
Course Information							
Programme M. Tech. (Electronics Engineering)							
Class,	Seme	ester	First Year M. Tech	., Semester II			
Cours	e Cod	le	6EN521	,			
Cours	e Nar	ne	Design and Analys	sis of Algorithm			
Desire	d Ree	uisites:	Data Structure and	Algorithms			
		<b>A</b>	<u> </u>				
Те	eachi	ng Scheme		<b>Examination Sch</b>	eme (Marks)		
Lectur	re	3 Hrs/week	ISE	MSE	ESE		Fotal
Tutori	ial	-	20	30	60		100
Practi	cal	-		Nil			
Intera	ction	-		Credits	: 3		
			1				
			Course	Objectives			
1	Top	provide differen	t algorithm approa	aches like static, c	lynamic, iterativ	e and	
1	reci	rsive technique	es.		-		
2	То	explain Compar	ative features of a	lgorithms on the l	basis of space, ti	me	
	con	putational com	plexities,				
3	To	explain the sele	ction criteria for id	lentifying, formul	ating and applyi	ng a t	ypical
	algo	orithm for giver	n problem.				
At the	anda	Course	Outcomes (CO) w	ith Bloom's Taxon	iomy Level		
At the	Inte	rpret different	algorithm approact	ew, hes like static dy	namic iterative	Apply	
CO1	and	recursive techr	iques.	lies like statie, dy	namie, nerative	Appi.	y
	Cor	npare the diff	Ferent algorithms	on the basis of	of space, time	Analy	vze
CO2	con	putational com	plexities				,20
CO3	Ideı	tify the optimu	im algorithm for g	iven problem.		Analy	yze
<b>CO4</b>	Exp	lore and learn ab	out categories of pr	oblems		Analy	yze
Modu	le		Μ	odule Contents			
I	]	ntroduction-	Static and dynami	c structures, stac	ks, queues, dyn	amic	4
	1	nemory allocat	tion and pointers,	linked stacks ar	nd queues, trees	and	
	1	ecursion, Hash	ning:- Sparse-table	e, hash function,	collision resolu	ution	
	<u> </u>	with open addre	essing and collision	n resolution by ch	aining		
II		Searching and	Sorting Algorith	ms -Sequential se	earch, Binary se	arch,	4
Comparison of trees, Insertion sort, Selection sort (Heap sort), Shell sort.							
		computational	Complexity, lowe	r bound, & com	parison of searc	hing	
	3 1	ind sorting algo	onguor Marca	out quials gant	(nortionina) M	otriv	1
III		nultiplication	algorithm I im	itation of div	ide and con	aulX	4
		Computational	complexity of divi	de and conquer al	loorithms	quei.	
	Computational complexity of divide and conquer algorithms.						

IV	Dynamic Programming & Greedy Approach- Binomial Coefficients, Floyd's algorithm for shortest path, Chain matrix multiplication, optimal binary search trees and the traveling salesperson problem, Dynamic programming approach to 0-1 knapsack problem, Minimum spanning traces algorithms and their Comparison.Back Tracking & Branch and Bound-Back tracking techniques, the n-						
V Back Tracking & Branch and Bound-Back tracking techniques, the n- queens problem, Back tracking algorithm's efficiency using Monte Carlo algorithm. Graph coloring, the Hamiltonnian circuits' problem. Backtracking Algorithm for 0-1 Knapsack problem and its comparison							
VITheory of NP - The three general categories of problems. The sets P & NP. NP complete problems, NP-Hard, NP-easy, NP – Equivalent problems, NP Hard problems							
1	"Fundamentals of Computer Algorithms", Ellis Horowitz, Sartaj Sahani, Sang Rajasekaran., Galgotia Pubication Ltd, 2010	gutherar					
2	2 "Design and Analysis of Algorithms", I. Chandra Mohan, PHI Publication, 20127						
3	"Analysis of Computer Algorithms", Horowitz and Sahni, Galgotia Publishe	ers., 200					
	References						
1	Foundation of Algorithms", Richard E. Neapolita & Kumarss Nat	imipour					
1	(Northeastern Illinois University), D.C. Heath and Company, Publication, 19	96.					
2	2 "Data Structures and Program Design in C", Robert L. Kruse & Brunce P. Leung et. Al, PHI Publication, 1984.						
3	"Introduction to Algorithms" Coremn, Leiserson, Rivest, PHI Publication, 20	012.					
	Useful Links						
1	https://www.coursera.org/						
2							
3							
4							

	CO-PO Mapping											
				P	rograr	nme C	<b>)</b> utcon	nes (P	0)		PS	60
	1	2	3	4	5	6					1	2
CO1		1										
CO2	2											2
CO3		2				2						
The stren	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High											

Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	Walchand College of Engineering, Sangli									
			(Government Alde	2022_23	)					
	Course Information									
	Programme M Tech (Electronics Engineering)									
		ogramme s Somostor	First Vear M Tech	First Vasr M Tash Sam II						
		urse Code	FIIST TEAL WILTEEN.							
		urse Coue	UEINJ22	twombra and IoT						
		urse Name	Where Nore							
	Desire	ed Requisites:	None							
	-									
	Teac	hing Scheme	ICE	Examination Sc	cheme (Marks)					
Leo	cture	3 Hrs/week	ISE	MSE	ESE	Total				
Tut	orial	-	20	30	50	100				
Pra	ctical	-		Ni	il					
Inter	action	ı –		Credi	its: 3					
			Course	e Objectives						
1	Toex	plain the Wireless Se	ensor Network and its	s applications						
2	To de	evelop understanding	of the Sensor node a	rchitecture						
3	Tou	nderstand WSN conne	ectivity with Internet							
4	4 To compare various MAC protocols for Wireless Sensor Network									
5	5 To explain in a concise manner how the general Internet as well as Internet of Things work.									
Cours	Course Outcomes (CO) with Bloom's Taxonomy Level									
	At the end of the course, the students will be able to,									
<b>CO1</b>	Iden	t <b>ify</b> various challenge	s and applications of	Wireless Sensor Net	work	Apply				
CO2	Deve	lop knowledge about	Wireless Sensor Net	work Architecture	Apply					
CO3	Inve	stigate various MAC	protocols for Wirele	Analyze						
<u>CO4</u>	Expl	ore and learn about In	nternet of Things and	Cloud		Apply				
	•			<u> </u>		TT				
NIOd	ule		Modul	e Contents		Hours				
т.		Module 1 : Introduc	tion of WSN	multicotions and Chal	lanana Mahila ad haa	4				
1		overview of wireless	s Sensor Networks, A	Applications and Chai	lenges, wiodile ad noc	4				
		Module 2 Wireless S	ensor Node Archite	octure						
II II		Hardware component	s. Energy consumption	on. Operating system	ns and execution	5				
		environments, examp	oles of sensor nodes	, <u>r</u>						
		Module 3 Wireless S	ensor Network Arc	hitecture						
тт	.	Types of sources and	sinks, Optimization	Goals and Figures of	Merit, Design principle	s 5				
for WSNs, Gateway C			Concepts, Need for g	ateway, WSN and Int	ernet Communication,	5				
		WSN Tunneling								
		Module:4 WSN (Me	dium access control	l) 	. d					
IV Fundamentals of MA			togols Schedula has	ad protocols SMAC	BMAC Traffic	5				
		adaptive medium acco	ess protocol (TRAM							
		Module 5 IoT		(1), (10, 100, 002, 13)						
		IoT definitions: overv	view, applications. po	tential & challenges.	and architecture. M2M					
		Protocols for Sensor I	Networks. IoT CASE	E Study.		5				
				-						

	Module 6 Cloud and SDN					
VI	Introduction to Cloud Computing including benefits, challenges, and risks Cloud					
V I	Computing Models. SDN: Introduce software defined networking: the background, the	4				
	development, and the challenges.					
	Text Books					
1	Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks Technology Pro	tocols and				
1	Applications", John Wiley & Sons Inc. Publication ,2007					
2	"Internet of Things Applications and Protocols", Wiely publication 2nd Ed.					
	References					
	Edgar H. Callaway, Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures	s and				
1	Protocols" ,CRC Press, August 2003					
2	Akyildiz, Mehmet Can Vuran,"Wireless Sensor Networks", John Wiley & Sons Ltd. 2010	)				
Δ						
3	William Stallings "Foundations of Modern Networking : SDN, NFV, QoE, IoT and Cloud	l" Pearson				
5	Education					
	Useful Links					
1	https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/					
2	https://online.courses.pptel.ac.in/noc21_cs17/preview					

	CO-PO Mapping														
	Programme Outcomes (PO) PSO														
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2	3											
CO2				1		3									
CO3			3			2									
CO4				2		2									
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
	Each CO of the course must map to at least one PO.														

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)						
	AY 2022-23						
	Course Information						
Progra	amme		M. Tech. (Elect	ronics Engineering)			
Class,	Semes	ster	First Year M. To	ech., Semester II			
Cours	e Code	9	6EN591				
Cours	e Nam	e	Design and Ana	alysis of Algorithm La	boratory		
Desire	ed Req	uisites:	Data Structure	and Algorithms			
Te	eachin	g Scheme		Examination Sch	eme (Marks)		
Lectur	re	3 Hrs/week	LA1	LA2	ESE	Total	
Tutor	ial	-	30	30	40	100	
Practi	cal	-		Nil			
Intera	ction	-		Credits	:3		
			~				
	T	. 1 1:00		se Objectives	<b>1 · ·</b> , , ·	1	
1	lo p	rovide differen	t algorithm app	roaches like static, c	lynamic, iterativ	ve and	
	To ex	xplain Compa	ative features o	f algorithms on the l	basis of space, t	ime	
2	com	putational com	plexities,		1		
3	To ex	xplain the sele	ction criteria for	r identifying, formul	ating and apply	ing a typical	
	algoi	Course	Outcomes (CO)	with Plaam's Taxon	omy Loval		
At the	end of	the course, the	students will be a	able to.			
	Inter	pret different a	algorithm appro	aches like static, dy	namic, iterative	Apply	
COI	and	ecursive techr	iques.	, <b>j</b>	,	11.5	
CO2	Com	pare the diff	erent algorithr	ns on the basis of	of space, time	Analyze	
	com	putational com	plexities	· 11		A 1	
<u>CO3</u>	Iden	tify the optimu	m algorithm to	r given problem.		Analyze	
04							
		Lia	t of Exporimon	te / Lob Activities/	Fonios		
Eve		LIS	t of Experimen	its / Lab Activities/			
	k sort	t List.	C	anh travaraala			
More	K SUIL			apii ii aveisais	m		
Wars	shall's	algorithm		avelling sales person	n problem		
Knar	sack 1	problem	M	inimum cost spannir	ng tree		
Shor	test na	ths algorithm		l pairs shortest paths			
Minimum cost spanning tree			ree N	queens problem	5		
Tree	traves	rsals		<u>1</u> providin			
			I				
1	"Fun Raja	damentals of ( sekaran., Galg	Computer Algor otia Pubication	ithms", Ellis Horowi Ltd, 2010	itz, Sartaj Sahan	i, Sangutherar	
2	"Des	sign and Analy	sis of Algorithn	ns", I. Chandra Moh	an, PHI Publica	tion, 20127	
3	"An	alysis of Com	outer Algorithm	s", Horowitz and Sa	hni, Galgotia Pı	ublishers., 200	

	References						
1	Foundation of Algorithms", Richard E. Neapolita & Kumarss Naimipour						
-	(Northeastern Illinois University), D.C. Heath and Company, Publication, 1996.						
"Data Structures and Program Design in C", Robert L. Kruse & Brunce P. Leun							
2	Al, PHI Publication, 1984.						
3	"Introduction to Algorithms" Coremn, Leiserson, Rivest, PHI Publication, 2012.						
	Useful Links						
1	https://www.coursera.org/						
2							
3							
4							

	CO-PO Mapping													
		Programme Outcomes (PO)										PSO		
	1	2	3	4	5	6							1	2
CO1		1												
CO2	2	2										2		
CO3		2				2								
The stren Each CO	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.													

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)The assessment is based on 2 in-semester evaluations (ISE) of 10 marks each, 1 mid-sem examination (MSE) of 30 marks and 1 end-sem examination (ESE) of 50 marks.

MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE.

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)										
			AY	2022-23	- )						
	Course Information										
	Prog	gramme	M.Tech. (Electroni	cs Engineering)							
	Class,	Semester	First Year M.Tech.	, Sem II							
	Cour	se Code	6EN592								
	Cour	se Name	Wireless Sensor Ne	etworks and IoT Lab							
	Desired	Requisites:	None								
		-									
	Teachi	ng Scheme		Examination S	cheme (Marks)						
Lee	Lecture -		LA1	LA2	ESE	Total					
Tut	torial	-	30	30	40	100					
Pra	ctical	2 Hrs/week	fil								
Interaction - Credits: 1											
			Course	e Objectives							
1	To und	erstand the Product	Development Proces	ss through Mini Proj	ect.						
2	To und	erstand budgeting t	hrough Mini project								
3	To use	Wireless Sensor N	letwork protocols								
4	To lear	n IoT sensors inter	facing								
5	To und work ca	erstand the importa arried out.	nce of document des	ign by compiling Te	chnical Report on the Min	i Project					
Cours	se Outco	mes (CO) with Blo	oom's Taxonomy Le	evel							
001		At	the end of the course	e, the students will be	e able to,						
<u>CO1</u>	Identif	y various challenge	es and applications of	Wireless Sensor Ne	twork	Apply					
C02	Develo	$\mathbf{p}$ knowledge about	Wireless Sensor Net	work Architecture		Apply					
C03	Fynlor	gate various MAC	protocols for wireles	Cloud		Analyze					
			internet of Things and			Парріу					
		I	list of Experiment	s / Lab Activities/'	Topics						

Experiments based on :

WSN simulations in cisco packet tracer /Netsim

- 1. Network Implementation in Cisco Packet tracer involving switch, router and gateway
- 2. Wireless Sensor Network Implementation in Cisco Packet tracer
- 3. Temperature, humidity and pressure detection using WSN sensors
- 4. Level detection using WSN sensors
- 5. Distance /Proximity detection using WSN sensors
- 6. Smoke/fire detection using WSN sensors
- 7. Hardware Mini project based on above list

	Text Books									
1	Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks Technology Protocols and Applications", John Wiley & Sons Inc. Publication ,2007									
2	"Internet of Things Applications and Protocols", Wiely publication 2nd Ed.									
References										
1	Edgar H. Callaway, Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols" ,CRC Press, August 2003									
2	Akyildiz, Mehmet Can Vuran,"Wireless Sensor Networks", John Wiley & Sons Ltd. 2010									
3	William Stallings "Foundations of Modern Networking : SDN, NFV, QoE, IoT and Cloud" Pearson Education									
Useful Links										
1	https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/									
2	https://onlinecourses.nptel.ac.in/noc21_cs17/preview									

	CO-PO Mapping														
		Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2	3											
CO2				1		3									
CO3			3			2									
CO4				2		2									
	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														
			Ea	ich CO	of the	course	e must	map to	o at lea	st one	PO.				

		Asses	sment							
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.										
Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks						
LA1	Lab activities,	Lab Course	During Week 1 to Week 6	20						
	attendance, journal	Faculty	Marks Submission at the end of Week 6	50						
1.4.2	Lab activities,	Lab Course	During Week 7 to Week 12	20						
LAZ	attendance, journal	Faculty	Marks Submission at the end of Week 12	50						
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40						
Lab ESE	attendance, journal	Faculty	Marks Submission at the end of Week 18							
Week 1 indic	ates starting week of a	semester. The typ	bical schedule of lab assessments is shown,							
considering a	26-week semester. Th	e actual schedule	shall be as per academic calendar. Lab activit	ties/Lab						
performance	shall include performi	ng experiments, n	nini-project, presentations, drawings, program	nming						
and other suit	table activities, as per	the nature and req	uirement of the lab course. The experimental	lab						
shall have typ	oically 8-10 experiment	its.								

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)								
AY 2022-23								
Course Information								
Programme	M. Tech. (Electronics Engineering)							
Class, Semester	First Year M. Tech., Semester II							
Course Code	6EN631							
Course Name	Professional Elective 3 - Embedded Linux System Design							
Desired Requisites:	Embedded Linux Programming							

Teaching S	cheme		Examinatio	on Scheme (Marks)							
Lecture	3 Hrs./wee	ek MSE	ISE	ESE	Total						
Tutorial	-	30	20	50	100						
Practical	-		•	·							
Interaction	-			Credits: 3							
		Co	ourse Objective	S							
1	To facilita	te students to learn th	e web technolog	gy on embedded Linux platforn	1.						
2	To help th embedded	e students to design s Linux and web frame	tatic and dynam ework.	ic website for solving social pro-	oblems using						
3	To help th	e students to develop	embedded Linu	ix based system							
Course Outcomes (CO) with Bloom's Taxonomy Level											
At the end of the course, the students will be able to,											
CO1	<b>Design</b> a v framework	website using a fronte k.	nd, backend lan	guages/ scripts and	Understand						
CO2	Connect e	embedded system with	h front end / bac	ck end using Embedded Linux	Apply						
CO3	<b>Design</b> an Embedded	ld <b>develop</b> web based d Linux.	solution for soc	cial problems using the	Create						
CO4	Implement solution for social problems using the Embedded Linux.										
Module		Ν	Iodule Content	s	Hours						
	Introduction to web technology: - Fundamentals of Web technology, Web										
I	server, We	4									
	on EL boa	ards and accessing the	m over intranet.								
	Web Prog	gramming: - Fronte	end design, usi	ing HTML and CSS, Backend							
II	design usi	8									
	Responsiv	ve site basics and desi	gn.								
	Web Des	sign Framework: -	PHP Framew	orks Code igniter / Python							
III	Framewor	ks Flask, Basics of	database and up	pdating database directly from	8						
	Embedded	d Linux based system,	, dynamic webp	age for web based system.							
IV	System C Controllin peripheral handling h	Configuration: - Configuration: - Configuration: - Configuration of the constant of the consta	onfigure Netwo equired package etc. to Embedo n.	ork Setup & Remote access, s / libraries, Interfacing various ded Linux Board, accessing /	8						
	System D										
V	platform,	Web based system d	esign for real v	world problem, Introduction to	8						
	device driv	ver, architecture, type	s of it and prog	ramming example.							
VI	Application	ons: - Case study on	embedded Linu	x system design for web based	1						
	Applicatio	ons, IoT Applications,	Image Processi	ng based Applications.							

	Text Books								
1	Robin Nixon, Learning PHP, MySQL & JavaScript, O'Reilly publication, 4th Edition,								
1	2015,ISBN: 9789352130153								
2	Kogent Learning Solutions Inc, Web Technologies: HTML, JAVASCRIPT, PHP, Dreamtech								
	Press(2009) ISBN: 978-8177229974								
3	Carlos de la Guardia, "Python Web Framework", O'Reilly Media, Inc.								
4	John Madieu, "Linux Device Drivers Development", Ed. 1 2017, ISBN: 9781785280009								
References									
1	"Web Technology", https://www.geeksforgeeks.org/web-technology/#beginning								
2	Dr. Sudip Misra, NPTEL Course: "Introduction to Internet of Things", IIT Kharagpur.								
	Useful Links								
1	https://www.edx.org/								
2	https://www.udacity.com/								
3	https://www.coursera.org/								
4	https://www.kernel.org/								
5	https://www.raspberrypi.org/								

	CO-PO Mapping											
Programme Outcomes (PO)												
	1	2	3	4	5	6						
CO1	2											
CO2	2											
CO3				2		2						
CO4			2			2						
		1:Lo	w, 2:Medium, 3	:High								

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		V	Valchand Co	ollege of Enginee ent Aided Autonomous I	<b>ring, Sangli</b>							
			, , , , , , , , , , , , , , , , , , ,	AY 2022-23	,							
				<b>Course Information</b>								
Progr	amme		M. Tech. (Elec	ctronics Engineering)								
Class,	Seme	ster	First Year M.	Fech., Semester II								
Cours	e Cod	e	6EN632									
Cours	e Nan	ne	Professional E	lective 3-Advanced Er	nbedded Programming							
Desire	ed Rec	uisites:	Embedded Sys	Embedded System Design								
		-		-								
T	eachir	ig Scheme		Examination Scheme (Marks)								
Lectu	re	3Hrs/week	MSE	ISE	ESE	Total						
Tutor	ial	-	30	20	50	100						
Practi	cal	-										
Intera	redits: 3											
		·										
				Course Objectives								
1	To il	lustrate Real Ti	me operating sys	stem with multi-taskin	g							
2	2 To illustrate task synchronization of various tasks											
3	3 To develop student in latest Buses Like USB, Ethernet											
4	4 10 develop student to design GUI Applications											
At the	At the end of the course, the students will be able to											
<b>CO1</b>	Deve	elop RTOS con	cepts and multit	asking to embedded sy	vstems	Apply						
CO2 Distinguish RTOS to flags, messages etc			based systems with Process Synchronization using semaphore, mutex									
CO3	Desi	<b>gn</b> embedded G	UI based system	Create								
Modu	ile			Module Contents		Hours						
I	F N 7	<b>RTOS Progra</b> Aultitasking, Pr Timer Requiren	mming:- Nee riority inversion nent, Memory 1	d and Requiremen n, RTOS structure, T Requirement for eac	ts of RTOS, Concept o CB block design, Repetitive h Task	f 2 6						
II	F S V	<b>RTOS Proces</b> ynchronization with Messages	s Synchroniz with Flags, Se queue/ Mail Be	ation:- System even emaphore, Mutex. Ir ox	ents and interrupts. Tasl ter process communication	6						
III	N C P	Aulti core pro ommunication processors.	ocessors:- Prog , interrupts ha	gramming on Multi andling, software a	core processors, inter-core rchitecture for multi core	e 7						
IV	GUI and USB :- Graphical Display Interface, Touch Screen Interface, Graphic           Display drivers, GUI API calls for Windows,           USB Programming: USB 2.0 specifications, USB block diagram, Device, Host           Interface, concept of endpoint. Data transfer on USP, bus											
v	I a i	Embedded Sof nd Target macl n Hardware So	<b>tware Develo</b> hines, Getting e ftware Design	pment Process and embedded software in	<b>Tools</b> : Introduction, Hosnoto the target System, Issue	t 5 6						
VI		Case study of F of RTOS Applie	Program Mode cations	elling and RTOS: D	esign Examples, case Stud	6						

	Text Books								
1	The Real-Time Kernel by Micrium								
2	Real-time Operating Systems: Book 1 - The Theory (The engineering of real-time embedded systems) by Jim Cooling								
3	Embedded Systems: Introduction to Arm® Cortex <sup>TM</sup> -M Microcontrollers, Fifth Edition (Volume 1) by Jonathan W Valvano								
	References								
1	http://www2.keil.com/mdk5/cmsis/								
2	User Guide and Reference Guide of LPC 2148, LPC 1768, STM32F7								
3	www.usb.org > Developers > Documents								
4	https://www.segger.com/								
	Useful Links								
1	https://www.edx.org/ https://www.udacity.com/								
2	https://www.coursera.org/ https://www.kernel.org/								
3	https://community.arm.com/								

	CO-PO Mapping														
		Programme Outcomes (PO)											PSO		
	1	2	3	4	5	6									
CO1			2												
CO2				2											
CO3						2									
The streng	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High														
Each CO	of the o	course	must n	nap to a	at least	one PO	Э.								

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

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Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)					
AY 2022-23					
Course Information					
Programme	M. Tech. (Electronics Engineering)				
Class, Semester	First Year M. Tech., Sem. I				
Course Code	6EN571				
Course Name	PE3 Lab - Embedded Linux System Design Lab				
Desired Requisites:	Embedded Linux Programming				

Teaching Sc	heme		Examination Scheme (Marks)						
Lecture	-		LA1	LA2	ESE	Total			
Tutorial	-		30	30	40	100			
Practical	2 Hrs./w	veek			-				
Interaction	-			Cr	edits: 1				
Course Objectives									
1	To use E	mbed	lded Linux.						
	To learn system Architecture, configuration and Programming for Embedded Linux								
2	<sup>2</sup> Based System.								
2	To facilitate the students to learn the fundamentals of Linux as applied to embedded								
3	hardware.								
	To under	rstand	the importance of o	document design	by compiling Technical Re	eport on the			
4	Mini Pro	ject v	vork carried out.						
	C	ourse	Outcomes (CO) w	vith Bloom's Ta	xonomy Level				
At the end of the	e course, tl	he stu	dents will be able to	),					
CO1	Apply p	rogra	mming skills to inte	egrate hardware	peripherals for Embedded	Apply			
	Linux Bo	oard							
CO2	Write programs / scripts to o			o configure and use internal / external peripherals					
	of Embe	edded Linux Boards							
CO3	Develop and demonstrate small Embedded Linux based systemC					Create			

# List of Experiments / Lab Activities/Topics

List of Experiments:

- 1. Experiment 1 : Introduction to the development tools and kit
- 2. Experiment 2 : Web Page design using HTML and CSS
- 3. Experiment 3 : Responsive Web page design
- 4. Experiment 4 : Web page design using PHP
- 5. Experiment 5 : Configure web server for an Embedded Linux board
- 6. Experiment 6 : Implement and access dynamic web page / web site
- 7. Experiment 7 : Database configuration and updating
- 8. Experiment 8 : Control / read GPIO pins through web page
- 9. Experiment 9 : Control LCD / DC Motor through web page
- 10. Experiment 10 : IOT based application implementation
- 11. Experiment 11 : Image / Video based application implementation / demonstration
- 12. Experiment 12 : Program to demonstrate device driver
- 13. Mini-Projects and Demonstration

	Text Books											
1	Robin 2015,I	Robin Nixon, <i>Learning PHP, MySQL &amp; JavaScript</i> , O'Reilly publication, 4th Edition, 2015,ISBN: 9789352130153										
2	Kogen Press(2	Kogent Learning Solutions Inc, <i>Web Technologies: HTML, JAVASCRIPT, PHP</i> , Dreamtech Press(2009) ISBN: 978-8177229974										
3	Carlos	de la Guard	lia , "Pytho	on Web Fran	nework", O	Reilly Med	lia, Inc.					
4	John M	Iadieu, " <i>Lii</i>	ux Device	Drivers Dev	velopment",	Ed. 1 201	7, ISBN: 97	81785280009				
References												
1	"Web Technology", https://www.geeksforgeeks.org/web-technology/#beginning											
2	Dr. Su	dip Misra, N	<b>IPTEL</b> Cou	urse: "Introd	uction to In	ternet of T	hings", IIT k	Kharagpur.				
Useful Links												
1	https://	www.edx.o	<u>rg/</u>									
2	https://	/www.udaci	ty.com/									
3	https://	www.cours	era.org/									
4	https://	/www.kerne	l.org/									
5	https://	/www.raspb	errypi.org/									
			C	<b>D-PO Map</b>	oing							
			Program	nme Outco	mes (PO)							
		1	2	3	4	5	6					
	CO1	2						]				
	CO2				2			]				
	CO3					2	2	]				
		•	1: Low	, 2: Medium	, 3: High	•		1				

Assessment									
There are three components of lab assessment, LA1, LA2 and Lab ESE.									
IMP: Lab ESE	IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.								
Assessment	Based on	Conducted by	Typical Schedule	Marks					
LA1	Lab activities, attendance, journal		During Week 1 to Week 6	30					
LA2	Lab activities, attendance, journal	Lab Course Faculty	Marks Submission at the end of Week 6	30					
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12	40					
Week 1 indica	tes starting week of a	semester. The typical s	chedule of lab assessments is show	/n,					

considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

	Walchand College of Engineering, Sangli								
	AY 2022-23								
Course Information									
Progra	Programme M. Tech. (Electronics Engineering)								
Class, S	Semest	er	First Year M. Tec	ch., Sem II					
Course	Code		6EN572						
Course	Name		Advanced Embe	dded Linux Program	ming Lab				
Desire	ed Req	uisites:	Embedded Syste	em Design					
T	eachin	g Scheme		Examination Sch	eme (Marks)				
Lectu	re	-	LA1	LA2	ESE	Total			
Tutor	ial	-	30	30	40	100			
Practi	ical	2 Hrs/week							
Intera	nctio	-		Credits	:1				
n									
			Course	a Ohiaatiwaa					
1	Тол	nderstand the Pr	Cours	nt Process through M	ini Project				
2		nderstand budge	ting through Mini	project	ini i iojeci.				
3	Tod	esign RTOS bas	ed systems	project					
4	To le	arn GUI based	system design						
_	To u	nderstand the in	portance of docur	ment design by compi	ling Technical Rep	ort on the			
5	Mini	Project work ca	arried out.						
		Course	Outcomes (CO)	with Bloom's Taxon	omy Level				
At the	end of	the course, the	students will be al	ble to,					
CO1	Designment	gn RTOS based x , flags, messag	systems with Proc ges etc.	cess Synchronization	using semaphore,	Apply			
CO2	Expl	ain Advanced	l multi-core pr	rocessing systems	and inter	Apply			
	proce	essor communic	ation.	ADI for LICD		Create			
CO3	Desi	gn embedded G	UI based system, A	API IOF USB		Create			
CO4	Create embedded system using various IO peripheral Create								
	List of Experiments / Lab Activities/Topics								

List of Experiments:

- 1. Demonstration of RTOS based application for creating desired signals on digital I/O.
- 2. Writing of RTOS based application for creating given signals on digital I/O.
- 3. Proving that uCOS-II is a pre-emptive RTOS
- 4. Semaphore for managing shared resource and task synchronization
- 5. Assigning Mini-project problems. Demonstration of Clock tick and its effect of event timing in RTOS based systems.
- 6. Semaphore for event synchronization
- 7. Using mail box facility in RTOS
- 8. Using queue facility in RTOS
- 9. Avoiding dead-lock in RTOS
- Building a small embedded application using an RTOS (Mini-Project) (Solving given problem by writing relevant program, Simulation, documentation, Demonstration, Period is around 3 weeks as a part of Lab ESE)

	Text Books							
1	The Real-Time Kernel by Micrium							
2	Real-time Operating Systems: Book 1 - The Theory (The engineering of real-time embedded systems) by Jim Cooling							
3	Embedded Systems: Introduction to Arm® Cortex <sup>TM</sup> -M Microcontrollers , Fifth Edition (Volume 1) by Jonathan W Valvano							
	References							
1	http://www2.keil.com/mdk5/cmsis/							
2	User Guide and Reference Guide of LPC 1768, STM32F7							
3	www.usb.org > Developers > Documents							
4	https://www.segger.com/							
	Useful Links							
1	https://www.edx.org/ https://www.udacity.com/							
2	https://www.coursera.org/ https://www.kernel.org/							
3	https://community.arm.com/							

CO-PO Mapping													
Programme Outcomes(PO)													
	1	2	3	4	5	6							
CO1			2										
CO2			2										
CO3			2										
CO4				2									
CO5				2		2							
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High													
Each CO	of the	course	e must	map to	o at lea	st one	PO.						

Assessment								
There are three components of lab assessment, LA1, LA2 and Lab ESE.								
IMP: Lab ESE	is a separate head	of passing.(min 40 %), LA	1+LA2 should be min 40%					
Assessment	Based on	Conducted by	Typical Schedule	Marks				
	Lab activities,		During Week 1 to Week 8					
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30				
	journal		Week 8					
	Lab activities,		During Week 9 to Week 16					
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30				
	journal		Week 16					
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19					
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40				
	performance	applicable	Week 19					

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)								
	AY 2022-23								
			Course I	nformation					
Progra	amme		M. Tech. (Electron	nics Engineering)					
Class,	Seme	ster	First Year M. Tech	n., Semester II					
Cours	e Cod	e	6EN633						
Cours	e Nam	ne	Professional Elect	ive – 4 Image Proce	essing and Pattern	Recognition			
Desire	ed Req	uisites:	Signal Processing						
		-	1						
Т	eachin	g Scheme		<b>Examination Sch</b>	eme (Marks)				
ISI	E <b>2</b>	2 Hrs/week	T1	T2	ESE	Total			
10	)	-	20	20	60	100			
Practi	cal	-				·			
Intera	ction	-		Credits	: 2				
			Course	Objectives					
1	To in	mparts knowled	dge in the area of	image and image	processing				
2	To le	earn the fundan	nentals of Pattern	recognition and to	choose an appr	opriate			
3	Teatt								
		Course	Outcomes (CO) w	ith Bloom's Taxon	omv Level				
At the	end of	f the course, the	students will be abl	e to,	- J				
CO1	Use filter prob	foundational te ring, segmenta lems of real we	echniques of imag tion and local fea orld application	e processing and a tures to solve im	nalysis such as age processing	Apply			
CO2	App obje	ly image proce cts and activition	essing and pattern es in images	recognition techr	iques to detect	Apply			
CO3	Con reco	pare and para gnition	meterize different	t learning algorith	nms.for pattern	Analyze			
<b>CO4</b>									
Modu	ıle		Μ	lodule Contents					
I	Fundamentals of Image Processing: Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local pre-processing image smoothening, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multi spectral images, local pre-processing and adaptive neighbourhood pre-processing; image restoration								
II	In th d th	mage Segme nresholding, m ata structures nresholding, ed	entation: Thresh nultispectral thresh ; edge based ge relaxation, bor	hold detection holding, threshold image segmenta der tracing, border	methods, opt ding in hierarcl ntion- edge in r detection	imal <b>3</b> nical nage			

III	Mathematical Morphology: Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation –particles segmentation and watersheds, particle segmentationIIIImage Textures: statistical texture description, methods based on spatial									
IV	IVImage Textures: statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method, applications Image representation and description- representation, boundary descriptors, regional descriptorsEundamentals of Pattern Recognition: Basic concepts of pattern									
V Fundamentals of Pattern Recognition: Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model										
VI	Pattern Classification Algorithms: Pattern classification by distancefunction: Measures of similarity. Clustering criteria. K means algorithm.Pattern classification by like hood function: Pattern classification as aStatistical decision problem. Bayes classifier for normal patterns	5								
	Text Books									
1	Earl Gose and Richard Johnsonbaugh Steve Jost, "Pattern Recognition and Ir Analysis", PHI publication.									
2	Sing Tze Bow, M. Dekker, "Pattern Recognition and Image Processing", Sp 1992	pringer,								
3										
	References									
1	Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Addinson – Wesley.									
2	M. A. SID – AHMED, "Image Processing Theory Algorithms and Archite McGraw Hill Inc.	ecture",								
3										
	Useful Links									
1	https://www.coursera.org/									
2										
3										
4										

	CO-PO Mapping													
Programme Outcomes (PO)														
	1 2 3 4 5 6													
CO1	3													
CO2			2											
CO3						2								
CO4														
The stren Each CO	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.													

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)The assessment is based on 2 in-semester evaluations (ISE) of 10 marks each, 1 mid-sem examination (MSE) of 30 marks and 1 end-sem examination (ESE) of 50 marks.

MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE.

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)								
	AY 2022-23								
Course Information									
Programme		M.Tech. (Electronics Engineering)							
Class. Semest	er	First Year MTech., Sem II							
Course Code	•-	6EN634							
Course Name		Professional Elective 4-Biomedical Signal Processing							
<b>Desired Requ</b>	isites:	Signals and Systems, Digital Signal Processing							
Teaching	Scheme	Examination Scheme (Marks)	Examination Scheme (Marks)						
Lecture	3 Hrs/week	T1 T2 ESE	Total						
Tutorial	-	20 20 60	100						
Practical	-	Nil	I						
Interaction	-	Credits: 3							
	1								
		Course Objectives							
1	To study ori	gins and characteristics of some of the most commonly used bio	medical signals						
1	including ECG, EEG, evoked potentials, and EMG								
2	2 To explore application of established engineering methods to complex biomedical signals								
		ourse Outcomes (CO) with Bloom's Taxonomy Level							
After the comp	oletion of the c	course the student should be able to							
CO1	Apply signal	l processing techniques to biomedical signals	Applying						
CO2	Analyze ECO points	G and EEG signal with characteristic feature	Analyzing						
CO3	Model a bior	medical system	Creating						
	1								
Module		Module Contents	Hours						
Ι	Introduction to Biomedical Signals           Introduction to Biomedical Signals           Introduction to Biomedical Signals, The nature of Biomedical Signals, Examples           of Biomedical Signals, Objectives and difficulties in Biomedical analysis,           Signal Conversion Systems, Conversion requirements for biomedical signals,           Signal conversion circuits. Application areas of Bio -Signal analysis – EEG,           ECC. Dispersion Spins Creme Fuels of Signals								
II	Signal Aver Basics of sig software for Turning poin	<b>ignal Averaging and Data Compression Techniques</b> asics of signal averaging, signal averaging as a digital filter, a typical averager, oftware for signal averaging, limitations of signal averaging.							
III	Adaptive N Adaptive intr filters - IIR a - steepest des - cancellation electrocardio	<b>Toise Cancellation</b> erference / Noise cancellation: Types of noise in biosignals; Digit and FIR - Notch filters - Optimal and adaptive filters. Weiner filte scent algorithm - LMS adaptive algorithm - Adaptive noise cancell n of 50 Hz signal in ECG - Cancellation of maternal ECG in foet ography	al rs 6 er 6 al						

	¥1 6 17 • 1							
2	Bronzino J D "The Biomedical Engineering handbook", CRC and Free press, Flor	rida, 1995.						
1	1. Akay M. "Biomedical Signal Processing", Academic press. California.19	94.						
	References							
2	Publication JOHN WILEY & SONS, INC							
1	Reddy D C. "Modern Biomedical Signal Processing – Principles and Techniques" New Delhi, 2005 Fugene N. Bruce "Biomedical Signal Processing and Signal Modeling" A Wiley	, TMH,						
	Text Books							
VI	Motor unit firing pattern, Cardiac rhythm, Formants and pitch of speech, Point process, Parametric system modeling, Autoregressive model, Autocorrelation method, Application to random signals, Computation of model parameters, Levinson-Durbin algorithm, Computation of gain factor, Covariance method, Spectral matching and parameterization, Model order selection, Relation between AR and Cepstral coefficients	8						
V	<b>Neurological signal processing</b> Neurological signal processing: The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics (EEG rhythms, waves, and transients), Correlation. Analysis of EEG channels: Detection of EEG rhythms, Template matching for EEG, spike and wave detection	6						
IV	IVBasic Electrocardiography, ECG data acquisition, ECG lead system, ECG signal characteristics (parameters and their estimation), Analog filters, ECG amplifier, and QRS detector, Power spectrum of the ECG, Bandpass filtering techniques, Differentiation techniques, Template matching techniques, A QRS detection algorithm, Realtime ECG processing algorithm, ECG interpretation, ST segment analyzer, Portable arrhythmia monitor.Neurological signal processing							

CO-PO Mapping															
		Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2												
CO2				2											
CO3						1									
CO4															
CO5															
CO6															
The strer	The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High														
		Eacl	n CO o	of the o	course	must	map to	o at lea	ast one	e PO.					

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)The assessment is based on 2 in-semester evaluations (ISE) of 10 marks each, 1 mid-sem examination (MSE) of 30 marks and 1 end-sem examination (ESE) of 50 marks.

MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE.

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)								
	AY 2022-23								
			Cours	e Information					
	Prog	ramme	M.Tech. (Electron	ics Engineering)					
	Class,	Semester	First Year M.Tech	., Sem II					
	Cour	se Code	6EN573						
	Cours	se Name	Professional Elect	ive 4 Image Processin	ng and Pattern Recognit	ion Lab			
]	Desired	Requisites:	Digital Image Proc	cessing					
	Teachir	ng Scheme		Examination S	Scheme (Marks)				
Leo	cture	-	LA1	LA2	ESE	Total			
Tut	orial	-	30	30	40	100			
Pra	ctical	2 Hrs/week		Ν	Jil				
Inter	action	-		Cree	lits: 1				
			Cour	se Objectives					
1	To und	erstand the Product	Development Proc	ess through Mini Pro	ject.				
2	To und	erstand budgeting t	hrough Mini projec	t					
3	To use	Image Processing	and Pattern Recogn	ition Algorithms					
4	To und	erstand the importa	nce of document de	sign by compiling Te	echnical Report on the N	Aini Project			
-	work ca	arried out.							
Cours	se Outco	mes (CO) with Blo	oom's Taxonomy I	Level	11.				
	Decemin	At At	the end of the cours	se, the students will b	e able to,	Understanding			
CO1	CO1 Describe different techniques used for image analysis Understanding								
CO2	CO2 Apply both supervised and unsupervised clasification methods to detect and characterize Applying patterns in real-world data								
CO3	Implem recogni	ent simple patter zers.	n classifiers, class	ifier combinations,	and structural pattern	Creating			
		I	ist of Experimen	ts / Lab Activities/	Topics				

- 1. The students must should learn following concepts before planning Mini Project
  - a. Basic point processing operations in MATLAB
  - b. Image Transformation Methods
  - c. Spatial Filtering on images
  - d. Edge detection algorithms
  - e. Morphological image processing algorithms and its applications
  - f. Object Detection Algorithms
  - g. Classification and Clustering Algorithms
  - h. Introduction to Computer Vision Toolbox
- 2. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis
- 3. The progress of work and discussion must be documented.
- 4. Testing of final system, Preparation, Checking & Correcting be done in discussion with faculty
- 5. The Student must submit a brief project report(25-30 pages) that must include the following a. Introduction
  - b. Literature survey
  - c. Hardware & Software Requirements
  - d. System Design Architecture
  - e. Implementation (screenshots to be included)
  - f. Testing
  - g. Conclusion
  - h. Future enhancements.
  - j. Bibliography

							Text Books					
1	Earl	Gose	and Ri	chard	Johnso	onbaug	h Steve Jost, "Pattern Recognition and	Image Analysis",				
1	PHI	PHI publication										
2	Sing	Sing Tze Bow, M. Dekker, "Pattern Recognition and Image Processing", Springer, 1992										
3												
							References					
1	1 Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Addinson – Wesley.											
2	C.N	1.Bishc	op, "Pa	ttern F	Recogn	ition &	& Machine Learning", Springer, 2006					
3												
							Useful Links					
1	http	s://ww	w.cou	rsera.o	rg/							
2												
3												
4												
						CO-l	PO Mapping					
				Pr	ogran	nme O	utcomes (PO)	PSO				
	1	2	3	4	5	6						
CO1	3											
CO2												
CO3				2		3						
The streng	gth of	mappir	ng is to	be wr	itten a	s 1,2,3	; Where, 1:Low, 2:Medium, 3:High					
			-									

Each CO of the course must map to at least one PO.

Assessment									
There are three components of lab assessment, LA1, LA2 and Lab ESE.									
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.									
Assessment Based on Conducted by Typical Schedule (for 26-week Sem) Marks									
ТАТ	Lab activities,	Lab Course	During Week 1 to Week 6	20					
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50					
T A 2	Lab activities,	Lab Course	During Week 7 to Week 12	20					
	attendance, journal	Faculty	Marks Submission at the end of Week 12	50					
Lab ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40					
Labese	attendance, journal	Faculty	Marks Submission at the end of Week 18	40					
Week 1 indica	ates starting week of a	semester. The typ	ical schedule of lab assessments is shown,	1					
considering a	26-week semester. Th	e actual schedule	shall be as per academic calendar. Lab activi	ities/Lab					
performance	performance shall include performing experiments, mini-project, presentations, drawings, programming								
and other suit	able activities, as per t	the nature and req	uirement of the lab course. The experimental	l lab					
shall have typ	oically 8-10 experiment	its.							

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
AY 2022-23									
Course Information									
Progra	Programme M.Tech. (Electronics Engineering)								
Class,	Semes	ter	First M. Tech.,	Sem II					
Cours	e Code	e	6EN574						
Cours	e Nam	e	Professional E	lective 4 – Biomedic	al Signal Processing La	b			
Desire	d Req	uisites:	Communicatio	n Engineering					
			L						
Т	eachin	g Scheme		Examination	n Scheme (Marks)				
Lectur	re	-	LA1	LA2	Lab ESE	Total			
Tutori	ial	-	30	30	40	100			
Practi	cal	2 Hrs/Week		·					
Intera	ction	-		Cı	redits: 1				
			L						
			С	ourse Objectives					
1	To ga	in the practical	knowledge abou	It the various bio sig	nals and its characteristi	cs			
2	2								
3									
4		Com							
At the	and of	the course, the	<u>rse Outcomes (C</u> students will be	<b>CO) with Bloom's I</b>	axonomy Level				
At the	Use	knowledge of	math. engineeri	ng and science to	understand the princip	ple of			
CO1	biom	edical signal pro	cessing.						
CO2	Appl signa	y specific mathe	ematical techniq	ues to solve probler	ns in the areas of biom	edical			
CO3									
CO4									
		]	List of Experin	nents / Lab Activi	ities/Topics				
1.	Acqu	ire and Obtain t	he Limb Lead E	CG Signal and Disp	lay				
2.	Desi	gn a Notch Filte	er of 50 Hz to Re	emove the Power Lin	e Interference in Acquin	red ECG Signal			
3.	Desi	gn a Low Pass I	Filter of Defined	Cut-Off Frequency	to Remove the High Fre	quency Noises			
in Acq	uired E	ECG Signal							
4.	Desig	gn a High Pass F	Filter of Defined	Cut-Off Frequency	to Remove the Low Free	quency Noises			
in Acq	uired E	ECG Signal							
5.	Com	pare Different	Types of FIR Filt	ter for LPF of ECG S	Signal				
6.	Com	pare Different 7	Types of IIR Filt	er for LPF of ECG S	Signal				
7.	To P	erform a Spectr	al Analysis of E	CG Signal					
8.	Detec	ction of R Peak	and R-R Interval	l from Acquired ECO	G Signal				
9.	Acqu	uire and Obtain	the 20-20 Lead I	ECG Signal and Disj	play				
10	10. To Perform a Spectral Analysis of ECG Signa								

	Text Books						
1	Reddy D C. "Modern Biomedical Signal Processing – Principles and Techniques", TMH,						
1	New Delhi, 2005						
2	2 Eugene N. Bruce, "Biomedical Signal Processing and Signal Modeling", A Wiley-Interscience						
	Publication JOHN WILEY & SONS, INC.						
3							
4							
	References						
1	Akay M. "Biomedical Signal Processing", Academic press, California, 1994.						
2	Bronzino J D "The Biomedical Engineering handbook", CRC and Free press, Florida, 1995.						
3							
4							
	Useful Links						
1							
2							
3							
4							

Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ES	IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.									
Assessment	Assessment Based on Conducted by Typical Schedule (for 26-week Sem) Marks									
ТА1	Lab activities,	Lab Course	During Week 1 to Week 6	20						
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 6	50						
Ι Δ 2	Lab activities,	Lab Course	During Week 7 to Week 12	20						
	attendance, journal	Faculty	Marks Submission at the end of Week 12	50						
Lob ESE	Lab activities,	Lab Course	During Week 15 to Week 18	40						
	Lab ESE     attendance, journal     Faculty     Marks Submission at the end of Week 18     40									
Week 1 indic	Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown,									
considering a	26-week semester. Th	e actual schedule	shall be as per academic calendar. Lab activit	ties/Lab						
performance	shall include performi	ng experiments, n	nini-project, presentations, drawings, program	nming						

considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.

Walchand College of Engineering, Sangli									
	AY 2022-23								
Course Information									
Progr	Programme M.Tech. (Electronics Engineering)								
Class,	Semes	ster	First Year M. Tech., Se	em II					
Cours	e Code	9	6EN593						
Cours	e Nam	e	Pre-dissertation Work a	and Seminar					
Desire	ed Req	uisites:							
			1						
Т	eachin	g Scheme	E	Examination Scheme (	Marks)				
Lectu	re	-	LA1	LA2	ESE	Total			
Tutor	ial	-	30	30	40	100			
Practi	cal			· · · · · · · · · · · · · · · · · · ·					
Intera	ction	1 Hr/Week		Credits: 1					
			Course O	bjectives					
1	To ur	nderstand indust	rial problems.						
2	To su	iggest engineering	ng solutions to the define	ed problem.					
3									
		Сош	rse Outcomes (CO) with	h Bloom's Taxonomy	Level				
At the	end of	the course, the	students will be able to,						
CO1	Chos	e, Formulate a c	lear problem.			Apply			
CO2	Carry	v out detail litera	ture review in the area o	f the problem		Create			
CO3	Selec	t and apply app	ropriate engineering metl	hods and tools for solvi	ng the problem.	Evaluate			
<b>CO4</b>	Prese	ent the results of	work done.			Analyze			
		]	List of Experiments / 1	Lab Activities/Topic	2S				
Pre-dissertation Work : The Industry project will involve the selection of appropriate real time industry problem by understanding the working of particular industry application. Formulate the problem, select design and methodology to find the solution. Construct an electronic system by using appropriate hardware software tools. Each student should conceive, design and develop the idea leading to a project/product. The student should submit a soft bound report at the end of the semester. The final product as a result of Industry project should be demonstrated in phases at the time of examination. This will help student to understand structured management in industry , sustainable development, with consideration to both scientific and ethical aspects and its presentation with technical report.									
Toxt Dooks									

		Text Books
1	To be used based on selected project	
2		
3		
4		
		References

1	Industry 4.0 : fourth Industrial Revolution guide to Industry 4.0
2	
3	
4	
	Useful Links
1	
2	
3	

	CO-PO Mapping											
		Programme Outcomes (PO) PSO										
	1	2	3	4	5	6						
CO1	3	2										
CO2				2		2						
CO3			2									
CO4		2										
The streng	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High											
Each CO	of the	course	must r	nap to	at leas	t one P	0.					

Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation										
Assessment	Based on	Conducted by	Typical Schedule	Marks						
LA1	Pre-dissertation work, Seminar/Demo	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30						
LA2	Pre-dissertation work, Seminar/Demo	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30						
Lab ESE	Pre-dissertation work, Seminar/Demo, Report	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40						
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments.										

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)												
AY 2022-23												
Course Information												
	Pro	ogramme	M.Tech. (El	ectronics Engi	neering)							
Class, Semester			First Year M.Tech., Sem II									
	Cou	irse Code	6OE508									
	Cou	rse Name	Open Elective - Introduction to Embedded Systems									
D	esire	d Requisites:	None									
		-	1									
]	<b>Feach</b>	ing Scheme	Examination Scheme (Marks)									
Lec	ture	2 Hrs/week	ISE	Tota	otal							
Tut	orial	-	20	30	50	100	00					
Prac	ctical	-		Nil								
Intera	actio	1 -	Credits: 2									
Course Objectives												
1	To i	ntroduce Embedde	d Systems and	their applicat	tions							
1		······································										
2	Too	levelop understand	ing about Mic	rocontrollers	-							
3	To i	ntroduce hardware	components of	of Embedded S	Systems							
4	4 To explain fundamentals of Arduino											
5	Тое	explore Arduino ba	sed applicatio	ns and program	nming							
Course Outcomes (CO) with Bloom's Taxonomy Level												
<u>CO1</u>	Ind	A Langtond Embadda	t the end of th	e course, the s	tudents will be able to,		Apply					
C01	O1         Understand Embedded Systems and Identify their applications           O2         Develop Impulation shout hardware and activate of Fight data for the second secon											
C02	Ans	lvze Arduino base	d systems and	their program	ming		Analyze					
CO4	Exp	lore and learn Ard	uino based sy	stems applicat	ions		Apply					
				11			11.2					
Modu	ule			Module Co	ntents		Hours					
Module 1 Introduction												
		Embedded Systems and general purpose computer systems, history, classifications,										
I		applications and purpose of embedded systems Characteristics and Applications of										
		embedded systems: operational and non-operational quality attributes. Embedded										
		Systems Applications-Application specific – washing machine, domain specific –										
		Module 2 Core of embedded systems										
		Microprocessors and microcontrollers, RISC and CISC controllers. Big endian and										
II		Little endian processors, Application specific ICs, Programmable logic devices,										
		COTS, sensors and actuators, communication interface, embedded firmware, other										
		system component	S.									
		Nonaue 5 Embedded Hardware										
п		- RAM ROM types of RAM and ROM memory testing CRC Flash memory										
		Peripherals: Cont	rol and Status	Registers. De	vice Driver, Timer Driver	- Watchdog						
		Timers										

	Module 4 Introduction to Arduino	
IV	Arduino device,Features of Arduino, Components of Arduino board,Description of Microcontrollers, Installation of Arduino IDE on Ubuntu Linux OS Run the arduino executable file, Using IDE to prepare Arduino sketch, Uploading and running the sketch,Program notation: variables, functions, control flow, Arduino conventions.The concept of a program variable.Numerical values and basic numerical operators.if/then/else Iteration using for loops.Real world timing and the delay() function	5
v	<ul> <li>Module 5 Input/Ouput Programming</li> <li>Sensor Inputs:- Definition, Types. Interfacing arduino to different sensors- light</li> <li>sensor, temperature sensor, humidity sensor, pressure sensor sound sensor, distance</li> <li>ranging sensor, water/detector sensor, smoke, gas, alcohol sensor, ultrasonic range</li> <li>finder</li> <li>Displays: Basics of LED's and LCD's. Interfacing arduino to LED's- blinking single</li> <li>LED, blinking multiple LED's, 7 segment display , traffic light ,LED flashes ,LED</li> <li>dot matrix ,pulsating lamp. Interfacing to LCD's- Basic LCD control, LCD</li> <li>temperature control, display a message on LCD screen, scrolling of text Touch</li> </ul>	5
	screens, Reading and writing to SD card	
VI	Module 6 Arduino Applications Case studies : Arduino based robot car , Arduino based PLC, industrial application	4
	Text Books	
1	Shibu K V, "Introduction to embedded systems", Tata Mcgraw-Hill, 1st edition	
2	"Arduino Cookbook,"Michael Margolis	
	References	
1	"Embedded Systems", Rajkamal, Tata Mcgraw-Hill	
2	"Beginning Arduino", Michal Mc Roberts, Second Edition	
3	Michal Mc Roberts "Beginning Arduino" Second Edition, Technology in Action	
	Useful Links	
1	NPTEL Lectures	
2		

CO-PO Mapping							
	Programme Outcomes (PO)	PSO					

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2										3		
CO2						3								3	
CO3			3			2							3		
CO4				2		2								3	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															
Each CO of the course must map to at least one PO.															

The assessment is based on MSE, ISE, ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment canbe field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)The assessment is based on 2 in-semester evaluations (ISE) of 10 marks each, 1 mid-sem examination (MSE) of 30 marks and 1 end-sem examination (ESE) of 50 marks.

MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE.