

## **HONORS DEGREE**

	Semester-VA											
S.No	Sub Code	Subject Name	L	Т	Р	Hrs.	Credits					
1.	HDEC-611	AI & Machine Learning	3	1	0	04	4					
2.	HDEC-612	Optoelectronics Devices & Circuits	3	1	0	04	4					
		Total	06	02	00	08	08					

	Semester-VI-A												
S.No	Sub Code	Subject Name	L	Т	Р	Hrs.	Credits						
1.	HDEC-621	Circuit Design for Electronics system	3	1	0	04	4						
		Total	03	01	0	04	04						

	Semester-VII												
S.No	Sub Code	Subject Name	L	Т	Р	Hrs.	Credits						
1.	HDEC-711	Internet of Things & its applications	3	1	0	04	4						
		Total	03	01	0	04	04						

	Semester-VIII												
S.No	Sub Code	Subject Name	L	Т	Р	Hrs.	Credits						
1.	PHEC-721	Project Hon's	0	0	08	08	4						
		Total	0	0	0	08	04						



	HDEC-611 A Lond Moshing Learning													
		1	<b>.</b>		A	I and N	<u>Machin</u>	e Learn	ing				<u>a</u> 14	
			<u>L</u> 2				<u>l</u> `			<u>P</u>			Credit	<u>s</u>
		0	3	1			L			U			4	
		Session	nal Ma	rks	• .•								50	
		End S	emeste	r Exam	ination	Marks	5						50	
Course Object	<u>e</u> tives	Artifici only fe how to	al Intel asible f make d	ligence for hum lecision	(AI) is ans. W s or cari	concern ithin A ry out ta	ied with I, Mach isks wit	i getting ine Lea hout bei	g compu arning a ing expl	iters to tims to licitly to	perform build c old how	n tasks t ompute to do se	hat curr rs that o o.	ently are can learn
		This co the fiel learning	ourse pro ld of M g.	ovides a Iachine	a broad Learni	introdu ng, foc	ction to using o	Artifici n the c	al Intel	ligence. cepts o	This co f super	ourse way	ill also i nd unsu	ntroduce pervised
		Upon completing the course, students will acquire the knowledge of applying Machine Learning techniques to solve various real-life problems. To develop skills of using recent machine learning software for solving practical problems. To gain experience of doing independent study and research.												
Course Outcomes1. Understand the strengths and weaknesses of many popular Artificial Intelligence approachesOutcomes2. Understand the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.3. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.4. Design and implement various machine learning algorithms in a range of real-world applications										aches lection, ning				
			Μ	apping	of Cou	irse Ou	tcomes	with P	rogram	Outco	mes			
	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	2	1	1	1	1	0	2	2	3	2
CO2	3	3	2	1	1	1	2	1	1	0	3	2	3	2
CO3	3	3	3	3	2	2	2	1	1	0	3	2	3	3
004	3	3	3	1	3	<u> </u>	2		1	U	3	2	<u> </u>	j hm
Inter du		40 AT. 1	Definiti		<u></u>	<u>Unit-i</u>	tiona 1	Dania E	1	of AT	Chara	ataniati	ð	
algorith	hm, AI	applica	tion Are	ons, Hi eas.	storical	Tounda	ations,	Basic E	lements	S OF AI	, Chara	cteristic	cs of in	temgent
						Unit-Il							14	hrs
The M	Iachine	Learni	ng Lan	dscape,	Super	vised/U	nsuperv	vised Le	earning	setup.	Main (	Challeng	ges of 1	Machine
Learning, LMS, Linear Algebra Review, Linear Algebra, Multivariable Calculus and Modern Applications.														
Weighted Least Squares. Logistic regression. Newton's Method, Regularization, Decision Boundary,														
Optimization Techniques, Gradient Descent and its variants, Batch Optimization, Momentum Optimizer,														
KMSProp, Adam.														
Unit-III 14 hrs														
The Pro	oblem	of Over	rfitting,	Probab	oility T	heory F	Review,	Python	/Nump	y introd	luction,	Kernel	s. SVM	I, Neural

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Networks, Multilayer Perceptron, Backpropagation, Applications of Backpropagation, Deep Neural Networks, Effective training in Deep Net- Early stopping, Dropout, Batch Normalization, Instance Normalization

	Unit-IV		12 hrs								
Convolutional Neural Network: CNN Oper	ations, Building blocks of CNN, Tra	nsfer Learning,	Discriminative								
Training, Transfer Learning Applications, Unsupervised Learning with Deep Network, Autoencoders,											
Generative Adversarial Networks.											
Recommended Books											
Title Authon Dublishen											
11110	Aumor	I UD	1151101								
1. Artificial Intelligence	Rich and K. Knight	Tata Mc	Graw Hill								
2. Neural networks and learning machinesS. Haykin.Pearson 2008.											
3. Pattern Recognition and Machine	Christopher M. Bishop	Spring	er 2007.								

Learning		
4. Hands-On Machine Learning with	Aurelien Geron	O'Reilly. (2019).
Scikit-Learn, Keras, and TensorFlow		



	HDEC-612 Ontoelectronics Devices & Circuits													
				т	Opto	belectro	<u>nics L</u> T	Devices	& Circ	D			Cradita	
				<u>L</u> 3			<u> </u>			<u> </u>				
		S	ession	J al Mar	ks		1			U			50	
		F	nd Ser	nester	<u>Exami</u>	nation	Mark	5					<u> </u>	
Cours	0	т Т	he obi		$\frac{1}{2}$	COURSE	is to a	et famil	liar wit	h the de	sign con	cent of c	ntoelec	tropics
<u>Cours</u> Objec	<u>tives</u>	d	ne obje evices	and	or uns v	by u	sing (	lifferen	t desig	n nic uc m tech	nologies	used f	for des	ion of
optoelectronics devices Implementation approach of optoelectro										oelectron	ics devi	ces in r	nodern	
communication system. To study the design and evaluation of modern optoele												optoelec	tronics	
integrated systems.														
<b><u>Course</u></b> 1. Use principles of physics to analyze the fundamental concepts of various optoelectronic												ctronic		
Outcomes components.														
2 Describe the characteristics of optoelectronic devices														
3 Familiarize with tools and processes used in fabricating ontoelectron											ronic co	mnoner	nts	
	4. Utilize knowledge to implement optoelectronic communication systems											1.5.		
		-	N	Ionnin	a of Co	urso (					teomos	y stems.		
	PO1	PO2	PO3	PO4	<b>PO5</b>	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	PSO2
	101	102	100	104	105	100	107	100	107	1010	1011	1012	1	1502
CO1	2	2	3	3	3	0	2	1	0	2	3	0	2	3
CO2	3	3	3	3	3	2	0	1	2	2	3	0	2	3
CO3	3	3	2	2	3	0	1	1	2	2	3	0	2	3
CO4	3	3	3	3	2	1	2	1	2	2	3	0	1	3
						U	nit-I						12	hrs
Introd	luctior	: Sem	icondu	ctors.	optical	waves.	photor	gener	ation. o	ptoelect	ronics. n	eed of o	ptoelect	ronics.
advant	tages, a	pplica	tions-n	etwork	, milita	ry, civi	l, indu	strial, s	ensors (	etc.			p	
Unit-II 12 hrs														
Optoe	lectro	nic sou	irces: ]	Introdu	ction, b	asic co	ncepts	, optica	l emiss	ion from	n semicor	ductor,	semicor	nductor
injecti	on lase	er &	its vari	ious st	ructures	s, injec	tion la	aser cha	aracteri	stics, th	reshold	conditio	n, wave	elength
tunabl	e lase	rs, Ll	ED po	wer a	nd effi	ciency	, heter	rojuncti	on, Ll	ED stru	icture de	signs, o	characte	ristics,
modul	ation r	espons	e of an	LED.										
Ontoe	Ontoelectronic detectors: Introduction device types besic principle of optoelectronic detection													

**Optoelectronic detectors:** Introduction, device types, basic principle of optoelectronic detection, absorption, quantum efficiency, responsivity, wavelength cut-off, types of photodiodes with and without internal gain, mid-infrared photodiode, phototransistors, photo conducting detectors, noise considerations

J.S. Ubhi



<u>U</u>	nit-III		12 hrs									
Passive network components & senso	ors: Introduction, couplers/	splitters, WDM mul	ltiplexers,									
demultiplexers, filters, isolators, circulators, a	ttenuators, electro-optic modu	lators, acousto-optic m	odulators									
and their application areas, optical sensors:	classification-point, distribute	ed, intensity, phase &	spectral.									
smart structures & applications												
Optical amplifiers and integrated optics: Introduction, semiconductor optical amplifiers (SOA), erbium-												
doped fiber amplifiers (EDFA), fiber Raman amplifiers (FRA), application areas of optical amplifiers, some												
integrated optical devices, OEICs, optical bi-stability and digital optics, optical computation.												
Unit-IV 12 hrs												
Optoelectronic integrated circuits: Introduc	ction, hybrid and monolithic	integration, application	n of opto									
electronic integrated circuits, integrated transm	nitters and receivers, guided w	ave devices.										
RECO	MMENDED BOOKS											
Title	Author	Publisher										
1. Semiconductor Optoelectronic Devices	Pallab Bhattacharya	Pearson Education In	IC									
2. Photonics - Optical Electronics in Modern	A. Yariv and P. Yeh,	Oxford University Pr	ess									
Communications												
3.Opto Electronics – As Introduction to     Jasprit Singh     McGraw-Hill International												
materials and devices												
4.Opto Electronics – An Introduction	J. Wilson and J. Haukes	Prentice Hall, 1995										



HDEC-621 Circuit Design for Electronics Systems																							
				L	Circu	n Desig	<u>n ior i</u> T	Liectro	mes sy	P			Credits										
				3			1			0			Credits45050practical knowledgeocus is to get studenand amplifierss like power supply.erand op-amps.PO12PSO1PSO1PSO23332212 hrsmplifier, problems iution, use of op-am12 hrsop amp, selection oflinear power supplyer supply with SMP12 hrssign of temperatureuse of pulse width										
		S	ession	al Mar	·ks								50										
		E	nd Sei	nester	Exam	ination	n Mark	KS					50										
Cours	e	Т	he obj	ective	of this	course	is to p	orovide	adequa	te theorem	retical an	d practi	cal kno	wledge									
<u>Objec</u>	<u>tives</u>	al	Sout th	e com	ponent	s requir	ed for	electron	nic circ	uit desig	gn. Next	focus is	to get s	tudents									
Cours	0	1	Evelo	ize wit	h the c	oncepts	of des	1gn of p	power s	upply, I	neat sink,	and am	plifiers	unnlu									
Outcomes amplifiers etc																							
<u>outco</u>	mes	2.	Desig	n linea	r and v	ariable	power	supply	in pow	er effic	ient manı	ner											
		3.	Read	data sh	eets, d	esign ai	nd deve	elop am	plifiers	s using t	ransistors	s and op	-amps.										
	1. Design different base drive circuits																						
			M	lappin	g of C	ourse C	<u>Dutcon</u>	nes witl	n Progi	ram Ou	tcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO12	PSO1	PSO2									
CO1	3	2	1	1	1	3		l	1	3	3	3	3	3									
CO2	3	3	3	1	2	2	2	1	1	3	2	3	3	2									
CO3	3	1	3	2	1	1	1	1	3	3	1	3	3	3									
CO4	CO4         3         1         3         3         1         1         1         1         1         3									3	3	2	2										
				•		U	nit-I	•					12	2 hrs									
INTR	ODUC	CTION	I: Revi	iew of	transis	tor basi	is-trans	sistor as	s a swit	ch, tran	sistor as	amplifie	er, probl	lems in									
the tra	nsistor	· ampli	fier, te	mpera	ture dr	ift and	device	to devi	ce vari	ation an	d their so	olution,	use of o	op-amp									
for dif	ferent	applica	ations a	and bas	sic issu	es in us	se of op	o-amps.															
						Ur	nit-II						12	2 hrs									
POW	ER SU	PPLY	<b>DES</b>	IGN: I	Design	ing a lii	near po	ower su	pply us	ing tran	sistor an	d op am	ip, selec	tion of									
compo	onents,	design	n of he	eat sinl	c, desig	gn of ir	nductor	, desig	n of tra	nsform	er for the	e linear	power s	supply,									
selecti	on of o	core m	aterial	, insula	ating n	naterials	s and w	vires, co	omparis	son of li	inear pov	ver supp	oly with	SMPS									
and de	sign of	f low d	rop ou	t regul	ators.																		
	DEG		<b>a</b> 1			Un	it-III		<u> </u>		• •		12	2 hrs									
SMPS	DES	IGN:	Study	of PV	VM co	ontrol I	Cs, de	sign of	t base	drive c	errcuits, o	design o	of temp	erature									
indicat	tor usi	ing IC	sense	ors, th	yristor	and t	ransist	or-base	d drive	e circui	t design	, use o	f pulse	width									
modulation circuits and short circuit protection techniques.																							
			ID CIT		arasi	<u>Ur</u>	<u>nt-IV</u>	11.0					1	2 hrs									
<b>ELECTRONIC CIRCUIT DESIGN:</b> Design of an amplifier, design of an on/off temperature controller,																							
offset current drift importance of grounding high frequency ground method low frequency ground																							
offset	curren	t drift	, impo	ortance	of gr	ounding	g, high	treque	ency gi	round n	nethod, l	ow free	luency	ground									
metho	method and error budgeting.																						

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RECOMMENDED BOOKS											
Title	Author	Publisher									
1. The Art of Electronics	Paul Horowitz	Cambridge University Press									
2. Design with Operational Amplifiers and Analog Integrated Circuits	Sergio Franco	McGraw Hills									

D. K. Goyal

A. K. Khosla



	HDEC-711 Internet of Things and its Applications													
				<u>r.</u>	Inter	net of	<u>1 nings</u> T	and its	Аррі	<u>ication</u>	<u>s</u>			
				3			0			0			3	3
			Sessio	nal M	Iarks								5	0
			End S	Semest	er Exa	minati	on Mark	KS					5	0
Cours	se	This	s cour	se foc	cuses	on har	ds-on	Internet	of T	Things	(IoT) c	oncep	ts such	as sensing,
Objec	ctives	actu	ation,	and co	ommu	nication	n. It cov	ers the	devel	opment	of prot	otypes	—includ	ling devices
		is go	oing to	g, actu witne	ess. To	proces	e live in	an era	of cor	nnected	devices	s the fi	iture is o	f connected
		thin	gs. Tl	nerefo	re, it	is ver	y impo	ortant t	o lea	rn the	fundar	nentals	s of this	s emerging
		tech	nolog	у.										
Cours	se	1	. To	unders	stand t	he fund	lamenta	ls of lo'	Г.					
Outco	omes	2	. Cho	oose b	etween	n availa	ble tech	nologie	es and	devices	s for sta	ted Io	T challen	ige
		3	3. To learn to implement secure infrastructure for IoT											
		4	4. To learn real world application scenarios of IoT along with its societal and											
			economic impact using case studies											
		5. Implement an architectural design for IoT for specified requirement												
			Mapping of course outcomes with program outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	3	1	2	1	2	2	0	0	1	3	1	1
CO2	3	1	2	0	2	1	3	1	0	0	0	2	2	1
CO3	2	0	3	3	2	1	2	0	2	0	0	2	2	2
C04	<u> </u>	3	2	2	3	3	1	3	1	1	3	3 1	1	3
0.05	T	5	5	5	5	Unit.	-I	5	I	I	4	L	I	
Intro	duction	n: De	finitio	n and	Chara	acteristi	ics of I	oT. Ph	vsical	Design	n of Io	T – I	oT Proto	cols. IoT
comn	nunicati	ion m	odels,	IoT	Comn	nunicat	ion AP	Is, IoT	enat	oled Te	chnolo	gies –	Wireles	ss Sensor
Netw	orks, C	loud (	Compi	ıting,	Big d	ata ana	lytics, (	Commu	nicati	on prot	ocols, I	Embed	lded Syst	tems, IoT
Level	ls and 7	Fempl	ates, I	Domai	n Spe	cific Io	Ts – H	ome, C	City, E	Inviron	nent, E	hergy,	Retail,	Logistics,
Agric	culture,	Indust	ry, hea	alth an	d Life	estyle.								
	-					Unit-	II						~	10 hrs.
Intro	duction	n to P	ython	: Lan	guage	feature	es of Py	thon, I	Data t	ypes, d	ata stru	ictures	, Control	l of flow,
funct	ions, m	odules	s, pack	aging,	, file h	andling	g, data/t	ime op	eration	ns, class	ses, Exe	ceptior	handlin	g. Python
раска	ages					T	TT							0 hmg
ЬТ	Dhuaia		rioog	and 1	Endna	Unit-I	II Introduce	tion to	And	ino on	d Door	abanny		ð NFS.
	Physica	a Dev		and I	Devel			uon lo vith Do	Aru		iu Kasj	berry	PI - A interfecti	renneeture,
Progr	ammi	g and	Аррп	cation	, Pyu	ion pro	ogram w	iiii Ka	spberi	y PI w	IIII IOC	us of	meriacii	ig external
gaugets, controlling output, reading input from plus.														
Unit-IV 8 hrs.														
IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication														
APIs. Webserver – Web server for IoT, Cloud for IoT, Various IoT security issues and need, challenges														
and a	lgorithr	ns												
	-													

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RECOMMENDED BOOKS		
Title	Author	Publisher
1. Internet of Things with Raspberry Pi and Arduino	Rajesh Singh, Anita Gehlot	CRC Press
<ol> <li>Raspberry Pi for Arduino Users: Building IoT and Network Applications and Devices</li> </ol>	James Strickland	Apress
3. Internet of Things: Architecture and Design Principle	Raj Kamal	McGraw Hill Education
4. "Internet of Things (A Hands-on- Approach)",	Vijay Madisetti and Arshdeep Bagha	1stEdition, VPT, 2014. (ISBN: 978- 8173719547)