Master of Technology ECE (Wireless Communication)

Department of E

Ref. No. 132 | Dato 09/09/202) MTWC-101-18- Wireless Communication Sent to: Focus on Assessment Tools to Skill PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 Employability / Course Outcome Measure Attainment of CO1: Implement physical Entrepreneurship CO models of wireless Implementation channels V V V MSTs, Class Tests, Quizes, V V yes CO 2: Gain knowledge of key concepts of wireless Understanding communication V V MSTs, Class Tests, Quizes, V V CO 3:Measure capacity of no ESE AK Gujral Punjab Technical University
Main Campus Kapurthala (Punjab).144603 AWGN channel, LTI Gaussian channels and Analysis various fading channels V V V V MSTs, Class Tests, Quizes, V yes ESF CO4: Study uplink and downlink model of AWGN Understanding channel, fading channels and multiuser diversity MSTs, Class Tests, Quizes, ν Yes ESE MTWC-102-18- Information Theory & Coding Focus on Assessment Tools to Skill PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 Course Outcome Employability / Measure Attainment of CO1: Understand the Entrepreneurship CO fundamentals of Understanding information theory. ٧ ٧ V V V MSTs, Class Tests, Quizes, ٧ V Yes ESE CO 2: Encode text, audio, speech, image and video signals through various Implementation coding and compression techniques. MSTs, Class Tests, Quizes,

codes	٧	٧	٧	٧	٧	٧	V		No	MSTs, Class Tests, Quizes, ESE
signals through error detecting and correcting								Analysis		
errors in the received	1	1			130	1)		
CO 3: Detect and correct				TE MIN		I			ASSESSED FOR THE PARTY OF THE P	

MTWC-PE1-18- Wireless Sensor Networks

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Gain insights of Wireless Sensor Network(WSN) background, its challenges, constraints along with its advantages and applications.		V	٧	V	v	V		v	V	V	Understanding		MSTs, Class Tests, Quizes,
CO 2: Know the									•	V		no	ESE
architecture of WSN and ts sub-systems.	٧	v	٧	٧	٧					٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
CO 3: Explain node structure along with the echnologies used in WSN.	٧ ,	v	٧		,		v	٧	v	٧	Learning	No	MSTs, Class Tests, Quizes,
CO 4: Study various Wireless Propagation Models and discuss the arious MAC protocols, ommunication protocols nd routing protocols	,	,	,								Discussing		MSTs, Class Tests, Quizes,

MTWC-PE1B-18- RF MEMS FOR WIRELESS COMMUNICATION SYSTEM

0 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10	Skill	Employability / Head	Assessment Tools to Measure Attainment of
	0 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10	0 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10	0 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 Employability / Lead

COL: 1. Understand the key concepts in RF based MEMS wireless communication system.	٧	٧						v	V	V	V	Understanding		MSTs, Class Tests, Quizes
CO 2: Design RF based circuits through modelling.	٧	v	v	V	٧	V	,				V	Implementation	no	MSTs, Class Tests, Quizes,
CO 3: Understand the usage of RF based circuit elements to reconfigure the circuit design.	٧	v	v		V					V		Understanding	yes	MSTs, Class Tests, Quizes,
O 4: Study various scillators and filters.	٧	V	٧	٧	٧						V	Understanding	No no	MSTs, Class Tests, Quizes,

MTWC-PE1C-18- ADVANCED DIGITAL SIGNAL PROCESSING

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability /	Assessment Tools to Measure Attainment of
Lb.1 million									1.03	PO 10		Entrepreneurship	co
transform techniques on signals.	٧		٧		٧	v	7	V			Implementation		MSTs, Class Tests, Quizes,
CO 2: Design digital FIR						•	V	V	٧	٧		no	ESE
and IIR filters.	٧		٧	٧	٧	٧	٧			٧	Implementation	yes	MSTs, Class Tests, Quizes, ESE
CO 3: Predict and estimate errors in digital signal processing systems.	٧										Analysis		
O 4: Handle multirate								V	٧	٧		yes	MSTs, Class Tests, Quizes, ESE
OSP and use adaptive ilters.	٧	١,	,	,	,	,					Understanding		MSTs, Class Tests, Quizes,
V										V		no	ESE

MTWC-PE1D-18- AUDIO AND VIDEO SIGNAL PROCESSING

Focus on Assessment Tools to Skill PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 Employability /k G Employability / Gujra Measure Attainment of Entrepreneurship Can CO anuther Development Course Outcome

CO1: Learn the audio and video signal processing systems.	v				1	V				Understanding		MCT. Cl.
CO 2: Code and decode					-	-	-	V	V		no	MSTs, Class Tests, Quizes, ESE
the image, audio and video										Implement		LOE
signals.	٧	-			 ٧	٧	-		V	Implement		MSTs, Class Tests, Quizes,
CO 3: Modulate and											yes	ESE
demodulate digital signal										Learning		
processing systems.	٧	٧	٧	V					V			MSTs, Class Tests, Quizes,
									10		no	ESE

MTWC-PE2A-18-ADVANCED COMMUNICATION SYSTEM

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Differentiate between analog and digital communication systems.	٧				v	v		V	٧	V	Understanding		MSTs, Class Tests, Quizes,
CO 2: Transmit data												no	ESE FOSTS, Quizes,
through various digital modulation techniques	٧				٧	v				٧	Understanding	no	MSTs, Class Tests, Quizes,
CO 3: Understand optical and satellite communication systems.	٧			,	,			,	v .	V	Understanding	no	MSTs, Class Tests, Quizes,
CO 4: Recognize mobile communication systems, access techniques and cransmission protocols.	v	, ,		,							Analysis	no no	ESE
ransmission protocols.	V	v ,	v \	/ v	v				v			no	MSTs, Class ESE

MTWC-PE2B-18-DETECTION	AND ESTIMATION THEORY	Y

Focus on Head Assessment Tools to Skill Employability / K Gu Entrepreneurship PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 Course Outcome Measure Attainment of comab Technical University

CO1: Know the background of the signals, variables and processes.	v					V			V	v	Understanding		MSTs, Class Tests, Quizes
CO 2: Test the data through statistical tools.	V		v	V		V			1		Analysis	no	MSTs, Class Tests, Quizes,
CO 3: Learn the ways to									-	- V		no	ESE ESE
detect non-parametric, andom and deterministic signals.	٧						V	,	,		Understanding		MSTs, Class Tests, Quizes,
CO 4: Familiarize with the							Ť	-	1	lv -		no	ESE ESE, Quizes,
estimation of signal parameters	V	٧	٧	٧	v	v				V	Understanding	yes	MSTs, Class Tests, Quizes,

MTWC-PE2C-18- MOBILE ADHOC NETWORKS

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO1: Know the features, applications, models and characteristics of adhoc networks.	v	٧	٧	٧					٧	٧	Understanding		MSTs, Class Tests, Quizes,
CO 2:Learn the protocols followed in MAC layer, Network layer, Transport ayer, Security layer and Cross layer design.	٧			,	/	, ,	v	v ,	٧	V	Understanding	No	MSTs, Class Tests, Quizes,
O 3: Learn how to ntegrate adhoc networks with mobile-IP networks.	٧	٧ .	v	,						,	Understanding	yes	MSTs, Class Tests, Quizes,

MTWC-PE2D-18- OPTICAL NETWORK AND PHOTONIC SWITCHING



Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO	B PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Know the optical transmission and reception	٧	٧	٧	V					٧	٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
CO 2: Apply the compensation techniques to the lost data/signals.	٧	v	v	V	V	v	V	V	V	V	Implementation		MSTs, Class Tests, Quizes,
CO 3:Learn the architecture and protocols of passive optical networks.	V	v	J.	٧					V	V	Learning	yes	MSTs, Class Tests, Quizes,
	•		V	V				٧	٧	٧		No	ESE
	٧	٧	٧	٧		Har		٧	٧	٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
/TRM-101-18 RESEARCH N	TETHO	DOLO	GY & IP	R									
Ourse Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: 1. Understand research, research process, define and redefine research problem through literature survey.		٧	٧	٧	٧	٧	٧	٧	٧	V	Understanding	Yes	
CO 2: Know the primary and secondary sources of data collection and select sample size based on the requirement.	v	v	v	,	,						Implementation	103	MSTs, Quizes, ESE
O 3: Utilize the resources				•	V	v	V .	V	V	V		yes	MSTs, Quizes, ESE
fficiently.	٧	٧ .	V .	V .	/	/	٧ ,	/	v	/	Implementation	no Head	MSTs, Quizes, ESE

Department of Electronics & Communication Engineering

IK Gujral Punich Technical University

Main Campus, Kapurthala (Punjab)-144603

CO 4: Critically analyse the data through various statistical measures, perform experiment, gather data and reach to a conclusion based on some hypothesis.		V	\ \ \	V	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	V	V				Implementation		
205.5 1/					1	V	V	V	V	V	-	Yes	MSTs, Quizes, ESE
CO5:5. Know the ntellectual property rights									V	v	Understanding	Vos	
O6:6. Write up the report												Yes	MSTs, Quizes, ESE
nd research article.			٧	٧	٧	٧		V	V	V	Implementation	Yes	MCT
MTAC-AO1-18-English for re	esear	ch pan	er wri	ting								1 163	MSTs, Quizes, ESE
		Г	1	7		Name of Street	100000	1					
								Children and all	1	THE RESERVE AND ADDRESS OF THE PARTY AND ADDRE	The second secon	Focus on	

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	000	-	PO 10		Focus on Employability /	Assessment Tools to Measure Attainment of
CO1: Understand that how						100	ru /	PU 8	PU 9	PO 10	Skill	Entrepreneurship	co
to improve your writing skills and level of readability	V	٧	v	V									MSTs, Class Tests, Quizes,
CO 2: Learn about what to									٧	٧	Understanding	No	ESE
write in each section	٧	٧	٧	V	V	y.	,	.,					MSTs, Class Tests, Quizes,
CO 3:Understand the skills					•	V	V	V	ν	٧	Understanding	No	ESE
needed when writing a Fitle	٧	٧	V	v				,		90			MSTs, Class Tests, Quizes,
O 4: Ensure the good								V	٧	٧	Understanding	No	ESE
juality of paper at very													
and Alman . I	٧ .	٧	٧	v ,	,	,	v h	v	v	,	Implementation	No	MSTs, Class Tests, Quizes, ESE

Course Outcome	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 Skill	100	Assessment Tools to Measure Attainment of CO

ATWC-103-18 Advanced W	/ireles	s Com	munic	ation										Focus on	4	Head Assessment Tools to Linging
CO 4: Critically understand he strengths and veaknesses of disaster nanagement approaches, planning and programming in different countries, particularly their home country or the countries they work in.	٧	V	٧	V	V	V		v	V	V		V	Understanding	No		MSTs, Class Tests, Quizes,
CO 3:Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.	٧	٧	V	V					V		,	V	Implementation			MSTs, Class Tests, Quizes,
CO 2: Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.	٧	v	V	v	,	v	V	V	V		٧	V	Analysis		No	MSTs, Class Tests, Quizes,
demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.	V	V	V	N							V	V	Understandir	og	No	MSTs, Class Tests, Quizes,

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
/ITWC-104-18- Soft Comp	uting T	echniq	ues										
pplications.	 √	IV.	V	٧	٧					٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
CO 4: Describe OFDMA ystem, its operation and											pierrentation	yes	ESE
ystem and data ransmission through nulticarrier modulation.	v	٧	v	٧	V	v	v	V	v	V	Implementation		MSTs, Class Tests, Quizes,
performance of different digital modulation techniques over wireless channels.	٧	٧	٧	٧	٧	٧		V			Understanding	No	MSTs, Class Tests, Quizes,
communication CO 2: Compare the	V	V	٧	V	V	-	-	+	+	V	Understanding	No	MSTs, Class Tests, Quizes, ESE
CO1: Review the fundamentals of wireless						1)	

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Study basic concept of soft computing and differentiate between supervised, unsupervised and reinforced learning methods.	v	V	V	,	V								MSTs Class T. J. S.
CO 2: Learn various				•	v					٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
artificial neural network techniques, fuzzy sets, fuzzification and defuzzification.	v	,	v .	ν ,	v		,			1	Understanding	Ves	MSTs, Class Tests, Quizes,
CO 3: Optimize solutions using Genetic Algorithm	V	,	,	/	, ,	,	, ,		. V		mpementation		MSTs, Class Tests, Quizes,

the

W

Department of Electronics & Communication Engineering

5

CO 4: Use hybrid soft			T		131	T		_				
computing techniques.	V	V	٧	٧	V		٧	V	V	Impementation	Yes	MSTs, Class Tests, Quizes, ESE
												ESE

MTWC-105-18- SIMULATION OF WIRELESS COMM. SYSTEMS

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	CL:II	Focus on Employability /	Assessment Tools to Measure Attainment of
CO1: Study the role of									.03	10 10	SKIII	Entrepreneurship	co
simulation in communication system													
and random processes	٧	٧	٧	٧	٧								Practical File, Internal Viva
CO 2: Review stochastic										V	Understanding	No	Semester End External Viva
processes and parameter estimation	V	٧	٧	٧	v	,	v	v	,				
CO 3:Model wireless communication systems								V	V	V	Understanding	yes	Practical File, Internal Viva Semester End External Viva
through numerical													
methods.	٧	٧	٧	V	V 1	/ \	,	v ,	,	/	Impementation	yes	Practical File, Internal Viva,
CO 4: Study communication channel												yes	Semester End External Viva
nodels and perform													
Monte Carlo Simulation. MTWC-PE3A-18- Smart Ant	V	/	/ /	/ v			V	V	V	l	Inderstanding	Yes	Practical File, Internal Viva, Semester End External Viva

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the													
significance of smart antennas and its historical													
development.	٧	٧									Understanding		MSTs, Class Tests, Quizes,
CO 2: Know the architecture of Smart antennas, types,											onderstanding	No	ESE
applications	٧	٧	٧	v	, ,	,			,	,	Learning		MSTs, Class Tests, Quizes,

CO3: Learn antenna array undamentals criteria and peam forming basics		٧					v	V	V	Undown		MSTs, Class Tests, Quizes,
CO 4: Explain the Spatial									1	Understanding	no	ESE ESE
Processing techniques for												
CDMA Smart Antennas	٧	٧	V	٧	٧			٧	٧	Understanding	no	MSTs, Class Tests, Quizes, ESE

MTWC-PE3B-18 Wireless Network Planning, Optimization and Management

	PO 1	PO 2	PO 3	PO 4	PO 5 PO 6	PO 7 PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO 1: Understand the Radio Network planning											
and optimization	٧	٧									MSTs, Class Tests, Quizes,
CO 2: Know the						HE			Understanding	No	ESE
technologies of WCDMA and GSM	v	V	٧	V	V						MSTs Class T
CO 3: . Learn the			HUN		Witness .		V	٧	Understanding	Yes	MSTs, Class Tests, Quizes, ESE
undamentals of Radio	TANG.					B.H.M.					
Resource Management		٧					,	v	Understanding	No	MSTs, Class Tests, Quizes, ESE

	PO 1	PO 2	PO 3	PO 4	PO 5 PO 6	PO 7	PO 8 PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO1: Understand the											
significance of Microwave and RF designs	V	V	V								MST. Cl. T
CO 2: Know the								٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
fundamentals behind											LJL
Microwave								-			
Amplifiers/Oscillators										Files	
designs.	٧			V	V		SCALE .		Understanding	Head	MSTs, Class Tests, Quizes, In Electronics & Communication Engineering ESE Trunjab Technical University

CO 3: Technical know-how of Microwave and RF					7		
antennas concepts. v	VV	VV	V	, ,	Under the		MSTs, Class Tests, Quizes,
				<u> </u>	Understanding	yes	ESE

MTWC-PE3D-18- Multimedia Comunication and Technologies

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO1: Learn multimedia system design techniques. CO 2: Implement	٧	٧	v	٧	V	٧	٧			٧	Understanding	No	MSTs, Class Tests, Quizes,
compression and decompression techniques on data.	٧	٧	٧	٧	٧	٧	v	٧	v	v	Implementation		MSTs, Class Tests, Quizes,
CO 3: Understand the concepts of storage and retrieval technologies.	V	٧	v	٧	V				,			yes	MSTs, Class Tests, Quizes,
CO 4: Learn multimedia								-	V	٧	Understanding	No	ESE
lesign application.	V .	v -	٧	٧	٧		,	/	v ,	/	Understanding	No	MSTs, Class Tests, Quizes, ESE

Course Outcome CO1: Understand the	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
ignificance of Cryptography.	٧	٧	٧	٧	٧	٧	٧			V	Understanding		MSTs, Class Tests, Quizes,
CO 2: Know its Integrity, Authentication and Management.	v	٧	٧	V	٧	٧	v	,				No	MSTs, Class Tests, Quizes,
O 3: Learn the concepts f Security and threats to vireless systems.	V	v	٧	y .					V	V	Understanding	No	ESE MSTs, Class Tests, Quizes,

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO	8 PO 9	PO 10) Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO1: Understand the fundamental concepts of software defined radio and cognitive radio networks. CO 2: Develop the		v		٧						V	Understanding	No	MSTs, Class Tests, Quizes,
cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.	v	v .	v	v		,		v	V			NO	MSTs, Class Tests, Quizes,
CO 3: Understand fundamental issues regarding dynamic spectrum access, the radioresource management and trading, as well as a number of optimisation techniques or better spectrum exploitation.			V				V		/	V	Implementation Juderstanding	yes No	MSTs, Class Tests, Quizes,
O 4: Apply SDR principles o smart antennas.	٧	v	V	٧	V	V	V		,		Application		MSTs, Class Tests, Quizes,

PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 Skill **Course Outcome**

Focus on Employability / Entrepreneurship

Assessment Tools to Measure Attainment of CO Department of Electronics & Communication E

IK Gujral Punjab Technical University

Main Ost Punjab Technical University

Main Ost Punjab Technical (Punjab) 144603

CO 3: Explain their applications	V	V	V		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Understanding Understanding	No	MSTs, Class Tests, Quizes,
network components of Wireless and Optical Networks.	v	V	V						MSTs, Class Tests, Quizes,
CO1: Learn Wireless Communication Network layers/technology. CO 2: Understand basic	V	v	V	v	V	v	Understanding	No	MSTs, Class Tests, Quizes,

MTWC-PE4D-18- MIMO Systems

Course Outcome CO1: Understand Basic	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability /	Assessment Tools to Measure Attainment of
MIMO communication												Entrepreneurship	СО
systems.	٧			٧	٧		٧		V	v	Understanding		MSTs, Class Tests, Quizes,
CO 2: Explore Space-time											onderstanding	No	ESE
block codes & Space-time trellis codes.	٧	٧	٧	v	J								MCTa Class T
CO 3: MIMO systems for				•	V					٧	Understanding	yes	MSTs, Class Tests, Quizes, ESE
requency-selective (FS)													LJL
ading channels.	٧	٧				٧		٧	٧	v	Understanding	No	MSTs, Class Tests, Quizes, ESE

MTWC-PE5A-18- Millimeter Wave Communication Technology

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Employability /	Assessment Tools to Measure Attainment or
CO1: Familiarization with	1											Entrepreneurship	CO
the concept of Millimeter													
wave communication.	٧	٧	٧	٧	٧				v	J			MSTs, Class Tests, Quizes,
					•				٧	٧	Understanding	No	ESE

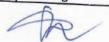
CO 2: Calculate the performance parameters in millimeter wave antennas.	v		V								MSTs Class Toots O
CO 3: Model the			1	-	- V	V	V	V	Analysis	yes	MSTs, Class Tests, Quizes, ESE
millimeter wave link										,	LJE
budget.	V	V									MST- Class
CO 4: Analyze the			-	+	+	-	٧	٧	Implementation	No	MSTs, Class Tests, Quizes,
millimeter wave with											ESE
multiple antennas.	V	V									NAST. GI -
		1 0					٧	V	Implementation	No	MSTs, Class Tests, Quizes, ESE

MTWC-PE5B-18- Space Time Wireless Communication

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	POS	POO	PO 10		Focus on Employability /	Assessment Tools to Measure Attainment of
								100	103	PO 10	Skill	Entrepreneurship	co
Time Channel													
Characterization.	V	٧	V	V									MSTs Class T
CO 2: Explain Capacity of				-					٧	٧	Understanding	No	MSTs, Class Tests, Quizes,
Multiple Antenna													ESE
Channels.	V	V	V	v	-	.,							MCT- CI -
CO 3: Learn ST OFDM,				•		V	٧	٧	٧	٧	Understanding	yes	MSTs, Class Tests, Quizes,
pread Spectrum.	V			1									ESE
•	1-			V				٧	٧	٧	Learning	No	MSTs, Class Tests, Quizes, ESE

MTWC-PE5C-18- Advanced Techniques for Wireless Reception

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO1: Understand Wireless												T	
Signaling Environment.	٧		V	V	v					1			MSTs Class To a
CO 2: Explain the usage of									٧	٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
Multiuser detection.	V		V	V	v								The state of the s
CO 3: Learn CDMA, OFDM,					V			٧	٧	٧	Explain	No	MSTs, Class Tests, Quizes, ESE
MIMO systems	v	v I	V			.,	.,						MSTs, Class Tests, Quizes,



MTWC-PE5D-18- Emerging	Technologie	s of	Wireles	s Communication
				DESCRIPTION OF THE PARTY OF THE

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability /	Assessment Tools to Measure Attainment of
CO1: Understand the									1	1010	SKIII	Entrepreneurship	co
concept of cellular/wireless													
communication	V	V	V	v	v						1344 - LX		NCT of
				•	V				٧	٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
CO 2: Explain the Mobile													EJE
Radio Propagation and													
Multiuser systems.	٧	٧		٧	√ .	V			v	٧	Evoluin		MSTs, Class Tests, Quizes,
CO 2: Leave to de la .		-									Explain	No	ESE Care Care Care Care Care Care Care Care
CO 3: Learn technologies of GPRS, UMTS, WiFi,													
WiMAX, Ultra Wideband													
communications, 4G and						- 1							
peyond 4G.	v .	v					,						MCT- Cl
							1	1	1	/	Learning	Ni	MSTs, Class Tests, Quizes, ESE

MTWC-PE5E-18- Microstrip Antennas

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	CLIN	Focus on Employability /	Assessment Tools to Measure Attainment of
										FO 10	SKIII	Entrepreneurship	со
basic concept of micro- strip antennas, methods of analysis and configurations.	٧	v	V	v	v								MCT
CO 2: Explain micro-strip				•	v				٧	٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
antennas arrays.	٧				v	v	v I	v	v	,			MSTs, Class Tests, Quizes,
O 3: Understand the						1		•	-	V	Explain	No	ESE
hysical significance of liscontinuities	٧				,	,			v ,	,	Understanding	no	MSTs, Class Tests, Quizes,
O 4: Learn coupled micro-												no	ESE
trip line with multiband nd broadband behavior	v			V							earning.		MSTs, Class Tests, Quizes,

MTOE-301A-18- Cost	Management of	Engineering	Projects

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO S	PO 0	PO 10		Focus on Employability /	Assessment Tools to Measure Attainment o
CO1: Understand the cost calculation for decision-making about an engineering research								100	103	PO 10	Skill	Entrepreneurship	со
project CO 2: Able to define Role	V	٧	V	٧	٧				٧	٧	Understanding	No	MSTs, Class Tests, Quizes, ESE
of each member in the project team	٧					٧	٧	٧	٧	٧	Describe	No	MSTs, Class Tests, Quizes,
CO 3:Manage the project by applying Quantitative echniques for cost management	v			,	,								MSTs Class Texts 0
				1				1	V 1	/	Management	Yes	MSTs, Class Tests, Quizes, ESE

Course Outcome CO1:To design Path-	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
Loss models	V	v	.,	.,								Littleprelieursnip	CO
CO2:To investigate	•	V	V	V	٧	٧			٧	٧	Implementation	Yes	Practical File, Internal Viva
Fading environments in												1	Semester End External Viva
wireless channels	٧	٧		٧	٧	٧	٧	٧	٧	V	Understand		Practical File, Internal Viva,
CO3:To develop											Onderstand	No	Semester End External Viva
MATLAB codes for Block codes, Cyclic													
odes and Convolutional													
odes.	٧	V	-	v 1	,	V		,	v	,	Coding		Practical File, Internal Viva,
												Yes	Semester End External Viva

IK Gujral Punjab Technical Universit

(_	
-	1	
	ر	
- 1		
M	١	

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	POG	PO 10	Chill	Focus on Employability /	Assessment Tools to Measure Attainment of
CO1:To understand the								, 00	103	PO 10	Skill	Entrepreneurship	CO
programming of Entropies and Mutual		1											
Information	.,				1								
CO2:To learn and	V	٧	٧	٧	٧	٧				٧	Understand	No	Practical File, Internal Viva,
practice programming												110	Semester End External Viv
or generation and											11 - 1= -		
evaluation of various													
codes	٧	v		v	v	v	,	.,					Practical File, Internal Viva,
CO3:To develop	-				•	v	v	V		٧	Implementation	Yes	Semester End External Viva
MATLAB codes for				- 1									
Block codes, Cyclic													
codes and Convolutional		100											
odes	٧	/	V	/ 1	,	,	,	, ,	, .	,	Codina		Practical File, Internal Viva,
										-	Coding	Yes	Semester End External Viva

MTWC-105-18- SIMULATION OF WIRELESS COMM. SYSTEMS Laboratory

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
To understand the programming of OFDM based Transmitter & Receiver.	٧	v	v	V	v								Practical File, Internal Viva
To learn and practice										٧	Understanding	No	Semester End External Viva
MATLAB programming for mplementing Digital modulation techniques. To find the vacant	٧	۷ ,	٧	٧	V	v	ν ,	٧	٧	v	Implementation	yes	Practical File, Internal Viva, Semester End External Viva
paces for secondary										Val.			
sers in Cognitive Radio													
CONOLAS	V	1	/	/	1 1	/	/ \	/	V /	/	mpementation	yes	Practical File, Internal Viva, Semester End External Viva



MTWC-MP1	-18-Mini	Project
		Contract to the contract of th

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
	٧	٧	v	٧	٧	٧	٧		v	v	Acquire	No	Report,Internal viva-voce
co2 Identify, analyze, formulate & handle programming projects with systematic approach.	v	٧	٧	٧	٧	v	V	٧	٧	V	Analysis		Report,Internal viva-voce
cos: Contribute as a team eader in the levelopment of echnical projects.	, ,	V	۷ ,	۷ ,	,			V			Implementation	yes	and external viva-voce. Report,Internal viva-voce
Develop communication skills for the presentation of project related activities.	,	, ,	v	,				1			Implementation	yes	Report,Internal viva-voce and external viva-voce

MTWC-DS1-18 DISSERTATION PHASE I

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Assessment Tools to Measure Attainment of
CO1: Critically analyse and evaluate existing knowledge about the chosen problem	٧	v	v	٧	v	٧	V		v	v	Understanding	Report,Internal viva-voce and external viva-voce.

A u

Head

K Gujral Punjab Technical University
Main Campus, Kacurthala (Punjab) 14 14 1666

-	•		
	C	7	١

CO 2: Find the gaps and motivation through literature survey.	V	V	J	V	V								Report,Internal viva-voce
		Ť		V	V	-V	V	٧	V	٧	Analysis	yes	and external viva-voce.
CO 3:Design the framework to optimize the solution for the problem	٧	V	٧	٧	V			v		V	Implementation	yes	Report, Internal viva-voce and external viva-voce.
CO 4: Construct the esearch proposal.	٧	v	٧	٧	V			٧		V	Implementation	yes	Report,Internal viva-voce and external viva-voce.

MTWC-DS2-18- DISSERTATION PHASE II

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of
CO1: Implement the proposed framework practically or through simulation	٧	٧	v	٧	٧	v	٧		٧	٧	Implementation	yes	Report, Internal viva-voce
CO 2: Gather the results and publish in the research articles.	٧	٧	٧	٧	٧	٧	٧	٧	٧		Implementation	yes	Report,Internal viva-voce and external viva-voce.
CO 3: Write-up the proposed work, results with conclusion and future work in the form of thesis	٧	v	v	v	v			v		v	Implementation	yes	Report,Internal viva-voce and external viva-voce.



Hear

Department of Electronics & Communication Engineering

Author Punjab Technical University

Main Campus Kansuthala (Punjab) 44460

Maria de							()		
CO4: Present the research work before a committee.	٧	٧	٧	V	v	V	Presentation	yes	Report,Internal viva-voce and external viva-voce.

An e

Signature of Head of Department

Plead
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

		Nan	ne of	the	Dep	artm	lete:	B.7	ech.	Ele	ctro	nice	and	63	0		THE
		Subj	ect: N	и Ларр	ing o	f Cou	rse C	outco	mac	with	Dros	liies	anu	omes of I	inication l	Engineering	Ref. No.: 1323 Date: 04/0
0.00	Ref No				T	T			liles	VVICII	Prog	ram	Outc	omes of	8 7	Date:	Ref. No. 1322 Date: 09/0
		Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long Learning				Sent to :
	Devices)	PO 1	PO 2	PO 3	PO 4					Real Property				Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of	
CO1	Understand physics of semiconductors and behavior of charge carriers within semiconductors	V	٧			٧								Analyze	No	MSTs, ESE, Class/Quiz Tests	
C02	Understand the working of semiconductor diodes supported with mathematical explanation.	٧	٧		٧	v								Apply	No	MSTs, ESE, Class/Quiz Tests	
CO3	Understand the working of BJT and MOSFET with their equivalent small signal models.	•	٧		٧								V A	inalyze	No	MSTs, ESE, Class/Quiz Tests	

Re

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Campus, Kasuthola (Punjab) 144603

CO4	Understand the chemical processes used in fabrication of integrated circuits.	٧	V		v	٧							V	Apply	No	MSTs, ESE, Class/Quiz Tests	
CO No.	Design)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	2 Skill	Focus on Employability	Measure	
CO1	Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.	٧	V			٧								Understand	hip	Attainment of CO MSTs, ESE, Class/Quiz Tests	
CO2	To understand and examine the structure of various number systems and its application in digital design.	٧												Understand	No	MSTs, ESE, Class/Quiz Tests	
	The ability to understand, analyze and design various combinational and sequential circuits.	V	V			V							A	Analyze	No (MSTs, ESE, Class/Quiz Tests	
C04	Ability to identify basic requirements for a design application and propose a cost effective solution.	٧	V										U	nderstand	No C	ISTs, ESE, lass/Quiz ests	

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kacurthala (Punjab)-144603

CO5	The ability to identify and prevent various hazards and timing problems in a digital design.	1	v			V								Understand	No	MSTs, ESE, Class/Quiz Tests
CO No.	(BTEC-303-18: Electromagneti c Waves)	PO 1	PO 2	PO	3 PO 4	PO 5	PO	PO	PO 8	POS	PO 1	0 PO 1	1 PO 1	2 Skill	Focus on Employability Entrepreneurs	Attainment of
CO1	Understand characteristics & wave propagation through transmission lines	٧	V											Analyze	No	MSTs, ESE, Class/Quiz Tests
CO2	understand Maxwell's equations for electromagnetic waves	v	V		V	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \							V	Apply	No	MSTs, ESE, Class/Quiz
CO3	Characterize uniform plane wave	٧	٧		V	V							٧	Analyze	No	Tests MSTs, ESE, Class/Quiz
CO4	Calculate reflection and transmission of waves at media interface	٧	٧		v	V										MSTs, ESE, Class/Quiz Tests MSTs, ESE, Class/Quiz Tests
CO No.	(UC-BTAM-303- 18: Engineering Mathematics- III)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	V PO 12	Skill	Employability / Entrepreneurs	Assessment Fools to Measure Attainment of
CO1	The mathematical tools needed in evaluating multiple integrals and their usage	4	1		1								4	Apply	lo n	MSTs, ESE, Blass/Quiz ests

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kacurthala (Punjab News)

troduce the													Apply	No	Class/Quiz Tests			
tion nodologies econd order al rential tions with cations in	٧	1		1									Understandin	No	MSTs, ESE, Class/Quiz Tests			
ovide an view of ability and tics to eers	1	١		1									Understandin	No				
EC-304-18: rork ry)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Employability / Entrepreneurs	Tools to Measure			
ze linear orks using ork ems	٧	V		,,			5-1							No	MSTs, ESE, Class/Quiz			
re tic ca new rie ab tic ee	dologies ond order nitial ons with tions in ering vide an w of illity and is to ers	dologies ond order ntial ons with tions in ering ride an w of illity and ss to ers -304-18: rk PO 1	dologies ond order Intial ons with tions in ering ride an w of illity and sto ers -304-18: rk PO 1 PO 2	dologies ond order Intial ons with tions in ering ride an w of illity and ss to ers PO 1 PO 2 PO 3 e linear ts using	dologies ond order Intial ons with tions in ering ride an w of illity and sto ers 3-304-18: rk PO 1 PO 2 PO 3 PO 4	dologies ond order Intial ons with tions in ering ride an w of lility and st to ers -304-18: rk PO 1 PO 2 PO 3 PO 4 PO 5	dologies ond order Intial ons with tions in ering ride an wo of illity and is to ers -304-18: rk PO 1 PO 2 PO 3 PO 4 PO 5 PO 6	dologies ond order Intial ons with tions in ering ride an wo of lility and st to ers 3-304-18: rk PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7	dologies ond order Intial ons with tions in ering ride an wo of illity and is to ers 3-304-18: rk PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8	dologies ond order Intial ons with tions in ering ride an wo of illity and is to ers 3-304-18: rk PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9	dologies ond order Intial ons with tions in ering ride an wo of illity and is to ers -304-18: rk PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 elinear is using it	dologies ond order Intial ons with tions in ering ride an wo of lility and is to ers -304-18: rk PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 elinear is using in ering ride and restrict the restrict of the	dologies ond order Intial ons with tions in ering ride an w of illity and is to ers PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PO 12 ellinear is using it is using it.	dologies ond order Intial ons with tions in ering ride an w of lility and is to ers PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PO 12 Skill P linear is using in the standard results and the standard results are suing in the standard results and the standard results are standard results are standard results and the standard results are standard results are standard results and the standard results are standard results and the standard results are standard results and the standard results are standard result	dologies ond order Initial Ini	dologies ond order nitial ons with tions in ering ride an w of distributions in ering ride an w of distributions in ering ride and distr	dologies ond order Intial ons with tions in ering ride an wo of sis to ers PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PO 12 Skill Focus on Employability and to so to Measure Attainment of Co as using a susing a su	Understandin No MSTs, ESE, Class/Quiz Tests Understandin No MSTs, ESE, Class/Quiz Tests Understandin No Understandin No Understandin No Assessment Tools to Measure Attainment of CO Analyze No MSTs, ESE, Class/Quiz Tests

Department of Electronics Communication Engineering
HK Guiral Punjab Technical University

CO	analyze two ponetworks.	ort		v		v									Ana	ılyze	No	MSTs, ESE, Class/Quiz	
CO4	Realize one pointworks using Foster's and Cauer's methods.	ort I		٧		٧									Appl	ly	No	MSTs, ESE, Class/Quiz Tests	
CO No	(BTEC-311-18 Electronic Devices Laboratory)	PO	1 PC) 2 P	O 3 P	04 F	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 1	PO	12 Skill		Focus on Employabilit Entrepreneu	rs Measure	
CO1	Realization using resistors and diodes in circuits with proper understanding to their working		V			v	v											co	
CO2	Understand characteristics & working of transistor in different configurations.	٧													Implen	mentati	Yes	Practical notebooks,Internal viva,End sem external	viva
CO3	Understand characteristics & working of MOSFET in circuits		V				V							٧	Underst	tanding r	10	Practical notebooks, Internal viva, End sem external	viva
C04	Think and design working circuits based		V				V							٧	Understa	anding n	0	Practical notebooks,Internal viva,End sem external v	riva
004	on resistors,diodes, transistors and MOSFETs	٧	٧		V	v													
· ·													+	٧	implemer	ntatio Ye	S	Practical notebooks, Internal viva, End sem external viva	va
CO No.	(BTEC-312-18: Digital System Design Laboratory)	PO 1	PO 2	PO :	PO 4	PO	5 PO	6 PC	7 P	O 8 F	PO 9 P	O 10 PC) 11 P	0 12	Skill	En	e chicuenta	Assessment Tools to Measure Attainment of	

Department of Electronics & Communication Engineeri
IK Guira: Puri ab Yechinical Universit
Main Campus, Kapudhala (Pusitable American)

CO1	combinational circuits using						1									T	
	logic gates Realize	٧	٧	+	V	V	-	+					V	Implementat	tio no	Practical natabase	
CO2	sequential circuits using logic gates	V														Practical notebooks,	nternal viva,End sem external vi
CO3	Write & simulate VHDL programs for combinational & sequential				٧	V								Implementat	io no	Practical notebooks,	nternal viva,End sem external viv
_	circuits. Think and	٧	V		٧	V							V	line in the			
CO4	design working projects using												V	Understandin	g Yes	Practical notebooks,In	ternal viva,End sem external viva
	digital 74XX Ics	٧	٧	٧	٧									Implementation	Yes	Practical notebooks,in	ternal viva,End sem external viva
CO No.	Societies)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11			Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of	
CO1	Understand the Origin of Family, Clan and Society.								1						No	MSTs, ESE, Class/Quiz	
	Understand the Forms of Government, like Democracy, Monocracy, Dictatorship and others								٧				٧	Understand	No	MSTs, ESE, Class/Quiz Tests	
C03	Understand the Basic concepts of Economic, Barter system and Jajmani system : Socialism, Capitalism, and Marxism								1				√ A	Analyze N	10	MSTs, ESE, Class/Quiz Fests	
CO4	Know about the Development process before, during and after British Rule in								1				٧ U	nderstand	C	MST,s ESE, class/Quiz ests	

The like

quainent of Electronics & Communication Engineering
& Gujral Publish Jeahnieal University
lain Communication (Publish)

33

CO No	Training)	P	01	202	PO 3	PO 4	PC	5 P	06	PO 7	PO 8	PO	9 PO 1	0 PO	11 PC	12	Skill	Focus on Employabl Entreprene	lity /	Assessme Tools to Measure			
CO1	Exposure to Practical Aspects of the Discipline			٧		٧										1	Analyze	hip		Attainmen CO	t of		
CO2	Realization of common and simple circuits with proper					v	V					٧				٧		Yes	-	Practical not	ebook	s,Inte	ernal viva,End sem external viva
	understanding to their working Think and	V		v		٧	V					٧					pply						
CO3	design working circuits based on common Electronic														,		nalyze	Yes	P	ractical note	books	s,Inter	rnal viva,End sem external viva
	components	V		V		٧	٧					٧			٧	+		Yes	Pr	actical notel	ooks,	,Interr	nal viva,End sem external viva
CO No.	(BTEC-331-18: Mentoring and Professional Development)	PO	PO	2 P	03 F	204	PO 5	PO	6 PC) 7 Pi	08	PO 9	PO 10	PO 11	PO 1:	2 Ski	11	Focus on Employability Entrepreneur	/ To	sessment ols to asure			
CO1	Development of Overall Personality and Aptitutde															Ana	lyze	hip Yes	CO				
CO2	General Awareness both Current affairs & GK							V			٧	٧	V		٧	Exa	mine	Yes	+	iitude Skills			
CO3	Development of Communication Skills								l'		V	٧	٧		٧	Anal	yze	Yes	+	ude Skills			
CO4	Development of Presentation Skills							٧	V			v	v v		v v	Apply	,	Yes	-	ude Skills T			V
	(BTEC-401-18:																				H		
	Analog Circuits)	PO 1	PO 2	PO	3 PO	4 P	05	PO 6	PO 7	PO	8 PC	9 PC	10 PO	11 P	0 12 5	Skill	E	mployability /	Tools Meas	ssment to ure ment of	H		

Do

IK Gujral Punjab Technical University
Main Camput Control (Punjab) 144502

C01	Understand the biasing of transistors and analyze BJT/FET amplifiers	v	٧		٧	٧								Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO2	Analyze various rectifier and amplifier circuits				V	V								Apply	No	MSTs, ESE, Class/Quiz Tests	
СОЗ	Analyze sinusoidal and non-sinusoidal oscillators	٧	V		V	V							٧	Analyze	No	MSTs, ESE, Class/Quiz	
CO4	Understand various types of Power Amplifiers	٧	٧			V							V	Apply	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(BTEC-402-18: Microprocesso rs and Microcontroller s)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of	
CO1	Understand architecture &functionalities of different building block of 8085 microprocessor.	٧												Analyze		MSTs, ESE, Class/Quiz Tests	
CO2	Understand working of different building blocks of 8051 microcontroller.	V	V		٧	٧								Apply	No	MSTs, ESE, Class/Quiz Fests	
СО3	Comprehend and apply programming aspects of 8051 microcontroller.												v ,	Analyze	No (//STs, ESE, Class/Quiz ests	
		٧	٧		V								V				

Hr Der

Department of Electronics & Communication Engineering
HK Gujral Punjab Technical University
Main Campus, Kacurthala (Punjab), 144602

0

CO4	interface & interact with different peripherals and devices.		v	V				ľ							Apply	,	No	MSTs, ESE, Class/Quiz	
						V								-				Tests	
CON	Systems)	PO)1	PO 2	PO 3	P0 4	PO 5	PO 6	PO 7	POE	PO 9	PO 11	PO 1	11 PC) 12 Skill		Focus on Employability Entrepreneur	measure	
CO1	Mathematically characterize different types of signals and systems.														Unders		hi p	Attainment of CO MSTs, ESE, Class/Quiz	
CO2	Analyze the behavior of linear-shift invariant	V		V		٧									Analyze		lo	Tests MSTs, ESE, Class/Quiz	
CO3	Apply concepts of Fourier and Laplace Transforms to analyze continuous-time signals and systems.	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		٧		٧									Apply	Ne	0	Tests MSTs, ESE, Class/Quiz Tests	
CO4	Investigate discrete-time signals and systems using Discrete-Time Fourier and Z-Transforms and simple Probability concepts.	٧		٧		٧									Analyze	No		MSTs, ESE, Class/Quiz Tests	
	(HSMC-122-18: Universal Human Values- 2)	P0 1	PO)2 P	PO 3 P	104 p	05 P	06 P	07 P	08 F	PO 9 PO	O 10 P	O 11 F	PO 12	Skill	Em	ployability / repreneurs	Assessment Cools to Reasure	
COI	Understand the core of Universal Human Values.									v				1	Understand	d No	M	ISTs, ESE, lass/Quiz	

AM

Head
Department of Postorial Communication Engineering
IK Gujral Punjab Technical University

CO2	Understand the Harmony and Self Exploration. Understand the								1				1	Understand	No	MSTs, ESE, Class/Quiz Tests	
CO3	Basic Human Aspiration.								1				1	Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO4	Know about the Professional Ethics.								1				1	Understand		MST,s ESE, Class/Quiz Tests	
CO No.	(EVS-101- 18:Environmen tal Sciences)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	LILL WAS ALSO	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of CO	
	Students will enable to understand environmental problems at local and national level through literature and general awareness							V					1		No	MSTs, ESE, Class/Quiz Tests	
CO2	The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental issues							4					٧	Undertsand	No (MSTs, ESE, Class/Quiz Fests	

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

соз	The students wil apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems							1					1		No	MSTs, ESE, Class/Quiz Tests	
CO4	Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world							٧					1	Apply	No	Tests	
CO No.	(BTEC-411-18: Analog Circuits Lab)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P0 7	P08	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure	
C01	Study and verify the characteristics of BJTs in circuits with proper understanding to their working.	V	V		٧	٧										co	
CO2	Understand frequency response & working of various types of Oscillators	٧			٧								٧	Understanding	no	Practical notebooks,In	iternal viva,End sem external viva
CO3	Understand characteristics & working of different types of Power amplifiers		v		V	٧							l	Understanding	no j	Practical notebooks,Int	ternal viva,End sem external viva



Department of Electronics & Communication Engineering

IK Guiral Palish Technical University

CO4	Design working circuits of oscillators,emitt er follower circuit and power amplifier		٧		٧	٧								√ Implement	atio Yes	Practical not	ebooks,Internal viva,End sem external vi
CO No.	(BTEC-412-18: Microprocesso rs and Microcontroller s Lab)	PO 1	PO 2	PO 3	PO 4	PO 5	P0 6	PO	7 PO	8 PO 9	PO 1	0 PO 1	1 PO	12 Skill	Focus on Employabili Entreprener	Assessment Tools to	
CO1	Understanding the architecture &functionalities of different building blocks of 8085 microprocessor.		V			٧											
CO2	Programming for controlling stepper and DC motors using 8085 Microprocessor(s).	٧	٧			v								Understandi		Practical noteboo	oks,Internal viva,End sem external viva
C03	Programs to generate waveforms and interface ADC and DAC using 8051 Microcontroller.	٧	٧		V	٧							٧	Implementati			ks,Internal viva,End sem external viva
00 No.	(UC-BTEC-501- 18: Analog and Digital Communication)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10 F	°O 11 F	°O 12	Skill	Focus on Employability / Entrepreneurs hip		s,Internal viva,End sem external viva



CO1	Analyze and compare different analog modulation schemes for their efficiency and bandwidth		V											Understar	nd No	MSTs, ESE, Class/Quiz Tests	
CO2	Analyze the behavior of a communication system in presence of noise.	V	V			V								Understan	d No	MSTs, ESE, Class/Quiz Tests	
соз	Investigate pulsed modulation system and analyze their system performance.	٧	V			V								Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO4	Analyze different digital modulation schemes and can compute the bit error performance.	٧	V			v							V	Understand	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(UC-BTEC-502- 18: Digital Signal Processing)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs	Assessment Tools to Measure	
C01	Represent signals mathematically in continuous and discrete time and frequency domain	٧	٧			٧								Understand	No	Attainment of CO MSTs, ESE, Class/Quiz Tests	
C02	Get the response of an LSI system to different signals	٧	٧										٧	Understand	No	MSTs, ESE, Class/Quiz Tests	
С03	Design of different types of digital filters for various applications	v	V			V							V	Analyze	No	MSTs, ESE, Class/Quiz Tests	Head

IK Guiral Punjab Teehnical University
Main Campus, Kacurthala (Punjab)-144603

CO No	Circuits)	PO 1	PO 2	PO	3 PO 4	PO 5	PO 6	PO 7	POS	PO	9 PO	10 PO	11 PO) 12	Skill	Focus on Employability Entrepreneurs	Assessment Tools to Measure Attainment of	
CO1	Represent signals mathematically in continuous and discrete time and frequency domain	٧	٧			V									Understand	No	MSTs, ESE, Class/Quiz Tests	
CO2	Get the response of an LSI system to different signals	٧	V											V	Inderstand	No	MSTs, ESE, Class/Quiz	
соз	Design of different types of digital filters for various applications	٧	V			v v							V	Ai	nalyze	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(UC-BTEC-504- 18: Control Systems)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	207	PO 8	PO 9	PO 10	PO 11	PO 1:	2 Sk	ill	Employability / Entrepreneurs	Assessment Fools to Measure Attainment of	
	Characterize a system and find its steady state behaviour	٧	V	٧										Une		10	MSTs, ESE, Class/Quiz	
CO2	Investigate stability of a system using different tests	٧	٧	V	V									Ana	ilyze N	lo n	ests ISTs, ESE, lass/Quiz	
	Design various controllers Solve linear,	v	v	٧	٧								٧	Ana	lyze N	o C	STs, ESE, lass/Quiz ests	
004	non-linear and optimal control oroblems	v	٧	V	٧								v	Appl	y N	M	STs, ESE, ass/Quiz ests	

Department of Electronics & Communication Engineering
IK Gurat Assign Technical University

CO No.	DC Motors)		PO	2 PC	3 PO	4 PO 5	PO 6	PO 7	PO 8	РО	9 PO 1	PO 1	1 PO 1	12 Skill	Focus on Employability Entrepreneur	Assessment Tools to Measure Attainment of	
CO1	Understand the principle of energy conversion	V				V								Analyze	hip No	MSTs, ESE, Class/Quiz	
CO2	Explain the working principle, construction and applications of DC motors		V			V								Apply	No	MSTs, ESE, Class/Quiz Tests	
CO3	Explain the working principle, construction and applications of AC motors				V									Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO4	Gain knowledge about the fundamentals of Special motors	٧	٧		٧	V								Apply	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(UC-BTEC- 901C-18: Satellite Communicatio n)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	207 P	1 80	PO 9	PO 10 P	O 11 F	PO 12	Skill	Employability /	Assessment Tools to Measure	
CO1	Interpret & define basics of Satellite communication, understand the complete link design along with and the interference effects on it		٧										U	Inderstand	No C	ISTs, ESE, lass/Quiz	

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kacurthala (Punjab), 144603

CO2	Understand various fixed and demand assignment multiple access techniques	v	v			V								Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO3	Understand the special purpose communication satellites.	V	V											Analyze	No	MSTs, ESE, Class/Quiz	du la la
CO4	Have knowledge of laser satellite communication and CATV system.	٧				V								Apply	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(UC-BTEC- 901F-18: JAVA Programming)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of	
CO1	Apply the concepts and basics of JAVA	٧	v			٧							,	Analyze	No	MSTs, ESE, Class/Quiz	
CO2	Demonstrate the knowledge of operators and control statements													Apply	No	MSTs, ESE, Class/Quiz Tests	
CO3	Ability to learn about Inheritance, Interface, Applets		٧			V								Analyze	No	MSTs, ESE, Class/Quiz Tests	
004	Learn about JAVA database connectivity	v				٧								Apply		MSTs, ESE, Class/Quiz	77.



Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kacurthala (Punjab)-144603

CO No.	(UC-BTEC-511 18: Analog and Digital Communicatio n Laboratory)	PO	PO	2 PO	3 PO 4	PO	5 PO	6 PO	7 PO	8 PO	9 P(0 10	PO 11	PO 12	2 Skill	Focus on Employability Entrepreneurs	s Attainment of
CO1	Study the characteristics and output waveforms of AM, FM, PCM	v	V		V	v											co
CO2	Study and compare noise in AM and FM systems	٧	٧		V	٧									Understandin		Practical notebooks,Internal viva,End sem external viv
CO3	Investigate the output responses of PAM, PCM, PSK, FSK, MSK and QAM.	٧	v												Understanding		Practical notebooks,Internal viva,End sem external viva
CO4	Digital link simulation & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.	٧			٧	٧									mplementatio		Practical notebooks,Internal viva,End sem external viva Practical notebooks,Internal viva,End sem external viva
	(UC-BTEC-512- 18: Digital Signal Processing Laboratory)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P0 7	PO 8	PO 9	PO 1	0 PO	11 PC) 12 S	kill E	ocus on	Assessment Tools to Measure
CO1	Develop a MATLAB program to generate standard sequences and various signals	٧	٧		V	٧											Attainment of
002	Configuring Audio Codec of C6xxx Boards	,	٧		V	V								√ im	plementatio no) Pi	ractical notebooks,Internal viva,End sem external viva

Department of Electronics & Communication Engineering
IK Gujral Hanjab Technical University

cor	Develop programs to verify						1	9		T				T			-1>		
CO3	convolution and design FIR & IIR filters.	v				V	V		1										
CO4	Implementation of Audio Delay Line, Echo and Audio Reverberation	٧	v				v				V			1		implementat		Practical noteb	ooks,Internal viva,End sem external vi
			-	-	-						V			+	V II	mplementation	Yes	Practical notebo	oks,Internal viva,End sem external viva
CO No.	Circuits Laboratory)	PO 1	PO 2	PO	3 PO	4 PO	5 PO	6 PO	7 PO	8 PC) 9 P	O 10	PO 11	PO	12 S	kill	Focus on Employabilit Entrepreneu	Assessment Tools to Measure	Wish, and self-external vivi
CO1	Study the configurations of Differential amplifiers	V	V		V	V											hip	Attainment of CO	
CO2	Determine the performance parameters of an OP-Amp	٧	V			V				'				V	/ Un	derstanding	no	Practical notebool	ks,Internal viva,End sem external viva
CO3	Design various applications using Op-Amps				V	v										derstanding r		Practical notebook	s,Internal viva,End sem external viva
CO4	Examine the operation of a Phase lock loop									V				٧	Imp	lementatio y	es	Practical notebooks	i,Internal viva,End sem external viva
	Phase lock loop			٧	٧	٧						-	-	٧	Unde	erstanding no)	Practical notebooks,	Internal viva,End sem external viva
CO No.	(UC-BTEC-601- 18: Wireless Communicatio n)	PO 1	P0 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 1	0 PO) 11 P	0 12	Skill	En	ocus on nployability / trepreneurs	Assessment Tools to Measure Attainment of	
CO1	Understand the basic elements of Cellular Radio Systems and its design	٧	٧		٧	V									Analy			MSTs, ESE, Class/Quiz Tests	

A

Department of Electronics & Communication Engineering IK Gujral Punjab Technical University Main Carlass, Kacurinala (Punjab)-144603

CO2	Learn about the concepts Digital communication through fading multipath channels	٧	v		V	V								Aį	pply	No	MSTs, ESE, Class/Quiz Tests	
CO3	Understand various Multiple Access techniques for Wireless communication	٧	V		\ \ \	V								Ana	alyze	No	MSTs, ESE, Class/Quiz Tests	
CO4	Know about the Wireless standards and systems	٧	٧		٧								V	Арр	ly	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(BTCS-504-18: Computer Networks)	PO 1	PO 2	PO 3	PO 4	PO 5	P0 6	P0 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill		Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of	
CO1	Explain the functions of the different layer of the OSI Protoco																MSTs, ESE, Class/Quiz	
C02	Describe the function of each block of widearea networks (WANs), local area networks (LANs) and Wireless LANs (WLANs)													Unders		No No	ISTs, ESE, lass/Quiz ests	
C03	Develop the network programming for a given problem related TCP/IP protocol												A	nalyze	N	Ms	STs, ESE, ass/Quiz sts	

Department of Ele

Department of Electronics & Communication Engineering
IK Guin Authral Technical University
Main Campus, Kecurthala (Puniab)-144603

CO4	Learn about DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.													Understand	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(UC-BTEC-602- 18: OpticsI Fibres and Communicatio n)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability Entrepreneurs	Assessment Tools to Measure Attainment of	
CO1	Recognize and classify the structures of Optical fiber and types.	٧	٧			٧								Understand	hip No	MSTs, ESE, Class/Quiz	
CO2	Discuss the channel impairments like losses and dispersion and analyze various coupling losses.	V	٧										V	Understand	No	MSTs, ESE, Class/Quiz Tests	
CO3	Classify the Optical sources and detectors and to discuss their principle.	V	v										V	nalyze	No	MSTs, ESE, Class/Quiz	
CO4	Familiar with Design considerations of fiber optic systems and sources and detectors	v	4	v	V	٧							v U	nderstand N	No C	MSTs, ESE, class/Quiz ests	
	detectors	٧	4	٧	٧			-		-			٧			ests	

Head Department of Ele HK Gujral Punjab Technical University

CO No.	Engineering)	PO 1	PO	2 PO	3 P	04	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 1	2 Skill	Focus on Employable Entreprene	ility /	Assessment Tools to Measure		
CO1	Understand the working and operation of various Microwave Tubes and Microwave Solid-state devices.	v					v								Analyze	No		Attainment of CO MSTs, ESE, Class/Quiz Tests		
CO2	Learn about various important Microwave Components and the Microwave measurements that can be carried out	٧	٧		V									V	Apply	No	C	ISTs, ESE, lass/Quiz ests		
CO3	Explain the basic concepts and types of Antennas and its regions.	٧			٧									A	nalyze	No	MS Cla	GTs, ESE, ass/Quiz		
	Describe the important concepts of Antenna Arrays and Antenna Aperture	V	٧	٧	V	v							V	Ap	ply	No	MS	Ts, ESE,		
CO NO.	(UC-BTEC- 902B-18: Power Electronics)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	POS	PO	0 PO 1	1 PO 1:	2 Skil	ı E	mployability /	Tools Meas	essment s to sure nment of		

Head
Department of Electronics & Communication Engineering
IK Guiral Punjab Technical Univers

C01	Understand the principles of mobile ad hoc networks, and their models.	٧	V		٧	v								Analyze	No	CO		
	(UC-BTEC- 902C-18: Mobile ADHOC nETWORKS)	PO 1	PO 2	PO 3	PO 4	PO 5	P06	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of		
CO4	Simulate power electronic converters and their control scheme.		٧		٧								V	Apply	No	MSTs, ESE, Class/Quiz Tests		
CO3	Illustrate the operating principle and construct a various types of DC-DC converters	٧	٧			v								Analyze	No	MSTs, ESE, Class/Quiz Tests		
CO2	Demonstrate and build a various single phase AC-DC power converter circuits and understand their applications		V											Apply	No	MSTs, ESE, Class/Quiz Tests		
C01	Attain the abilit and to handle the concept of construction and characteristics of Power semiconductor devices and fundamental of thyristors and family	d	٧		٧	٧								Analyze	No	MSTs, ESE, Class/Quiz Tests		

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University

ت

i	1	٦	٦	٠
,	٨	j		

CO No.	(UC-BTEC-611- 18: Optical Fibres and Communicatio n Laboratory)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO ·	10 PO	11 PO	12 Si		Focus on Employabilit Entrepreneu	y / Too	essment els to asure ainment of		
C04												+		1						
СОЗ	Have a broad knowledge in Fuzzy logic principles and will be able to determine different methods of Defuzzification	٧	V	\ \ \ \	٧	٧									Analyze	No	M	STs, ESE, ass/Quiz		
CO2	understand the mathematical foundations of neural network models		٧	V	v	v									Apply	No	N	MSTs, ESE, Class/Quiz		
CO1	Understand generic machine learning terminology	٧	V	V	V	V									Analyze	No		MSTs, ESE, Class/Quiz Tests		
CO No.	(UC-BTEC- 902E-18: Artificial Neural Networks)	PO1	PO:	2 PO	3 PO 4	1 PO :	5 PC) 6 PC)7 P	0 8 PC) 9	PO 10	PO 11	PO 1:	2 Skill	Focus o Employa Entrepre	bility / eneurs	Assessment Tools to Measure Attainment of		
	networks.	V	V			V			-					V				Tests		
CO3	Analyze the	n d													Analyze	No		MSTs, ESE, Class/Quiz		
CO2	and develop information dissemination protocols for mobile adhoc networks	V		,			v								Apply	No		MSTs, ESE, Class/Quiz Tests		

Head

Denorment of Exchange & Communication Engineering
IK Gujral Puniab Technical University

system & calculation of it BER and Q factor using simulator.						ſ									
types of optical sources and light detectors	٧											1	/ Implementa	etio no	Practical notebooks,Internal viva,End sem external viva
Familiarization with the methods of slicing and connecting techniques of optical fibres	٧	V										V			Practical notebooks,Internal viva,End sem external viva
Study different types of losses in optical fibres.	V	V										٧	Implementat	io yes	Practical notebooks,Internal viva,End sem external viva
Design various applications of optical fiber communication sysytem		v		V								٧			Practical notebooks,Internal viva,End sem external viva
(UC-BTEC-612- 18: Microwave and Antenna Engineering Laboratory)	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	P0 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs	Assessment Tools to Measure Attainment of
Learn about general Microwave components and Microwave bench	٧	V													со
Measure common parameters related to Microwave Oscillator(s).		v		٧	٧								Understanding	no	Practical notebooks,Internal viva,End sem external viva
	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of slicing and connecting techniques of optical fibres Study different types of losses in optical fibres Study different types of losses in optical fibres. Design various applications of optical fiber communication sysytem (UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave bench Measure common parameters related to Microwave	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of slicing and connecting techniques of optical fibres V Study different types of losses in optical fibres. Design various applications of optical fiber communication sysytem (UC-BTEC-612- 18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave bench Weasure common parameters related to Microwave	communication system & calculation of its BER and Q factor using simulator. V V Study various types of optical sources and light detectors V Familiarization with the methods of slicing and connecting techniques of optical fibres V Study different types of losses in optical fibres. V Design various applications of optical fiber communication sysytem V (UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave components and Microwave bench V Measure common parameters related to Microwave Descillator(a)	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of slicing and connecting techniques of optical fibres Study different types of losses in optical fibres. Design various applications of optical fiber communication sysytem (UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave components and Microwave bench Measure common coarameters related to Microwave	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors v Familiarization with the methods of slicing and connecting techniques of optical fibres v Study different types of losses in optical fibres. Design various applications of optical fiber communication sysytem v (UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave components and Microwave bench v v v Measure common parameters related to Microwave Cerilletor(s)	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors v v v v v v v v v v v v v v v v v v v	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors v v v v v v v v v v v v v v v v v v v	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of silicing and connecting techniques of optical fibres V V V Study different types of losses in optical fibres. Design various applications of optical fiber communication sysytem (UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave components and Microwave bench Weasure common parameters elated to Microwave Oscillator(s)	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of silicing and connecting techniques of optical fibres Study different types of losses in optical fibres. Study different types of losses in optical fibres. Design various applications of optical fiber communication sysytem (UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave bench Weasure common parameters elated to Microwave Dscillator(s) Microwave Dscillator(s)	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of silicing and connecting techniques of optical fibres Optical fibres Study different types of losses in optical fibres. Design various applications of optical fibrer communication sysytem (UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory) Learn about general Microwave components and Microwave components and Microwave bench Weasure common parameters related to Microwave Designator(s)	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of slicing and connecting techniques of optical fibres Study different types of losses of optical fibres Optical fibres V V V V V V V V V V V V V V V V V V V	communication system & calculation of its BER and Q factor using simulator. Study various types of optical sources and light detectors Familiarization with the methods of solicing and connecting techniques of optical fibres V V V V V V V V V V V V V V V V V V V	communication system & calculation of its BER and O factor using simulator. V V V V V V V V Implementatio no Minimulator. V V V V V V V V V V V V V V V V V V V

Department of Electronies & Communication Engineeri
IK Guiral Surrials Technical Universit

5

соз	Determine frequency and wavelength of waveguides.	V			V	V										
CO4	Measure and plot radiation patterns of various types of Antennas		٧		٧								V	Implementation Implementation		Practical notebooks, internal viva, End sem external viva
				100000												Practical notebooks,Internal viva,End sem external viva
CO No.	(UC-BTEC-631- 18: Project-I)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs	Assessment Tools to Measure Attainment of
	Understand the Survey and study of published literature on the assigned topic	٧	٧		V	V									hip	Attainment of CO
CO2	Working out a preliminary Approach to the Problem relating to the assigned topic	٧	٧		٧	٧				V				Understanding		Practical notebooks,Internal viva,End sem external viva
CO3	preliminary Analysis/Model ling/Simulation/ Experiment/De sign/Feasibility	٧	٧		V	٧				V				Jnderstanding Y		Practical notebooks,Internal viva,End sem external viva
CO4	Preparing a Written Report on the Study conducted for presentation to the Department	v	v		V	٧								nplementatio Y		ractical notebooks,Internal viva,End sem external viva
1916								-	-	٧			√ Im	plementatio ye	S Dr	actical notebooks, internal viva, End sem external viva

ta

Head
Department of Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kaputhala (Punjab), 144603

H

CO No	Cloud Computing)	PO	PO	2 PO	3 PO	4 PO 6	PO	PO 7	PO 8	PO	PO	10 P	0 11	PO 12	Skill	Employability Entrepreneur	Assessment Tools to Measure Attainment of	
CO1	Understanding concept or cloud computing and analyze trade-off between deploying application on cloud and using local infrastructure	f													Understand		MSTs, ESE, Class/Quiz Tests	
CO2	Identify issues and design challenges in IoT applications.													۷	Understand	No	MSTs, ESE, Class/Quiz Tests	j
CO3	Select appropriate hardware and software components for IoT applications	V	٧		V	٧									nalyze	No	MSTs, ESE, Class/Quiz Tests	
CO4	Conceptual knowledge will help students to build IOT applications	٧	٧		V	٧								V A	pply	yes	MSTs, ESE, Class/Quiz Tests	
CO No.	(BTEC-907C- 18: Robotics and Embedded systems)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7 F	08 F	PO 9 F	PO 10	PO 1	1 PO	12 Sk	áll	Employability /	Assessment Fools to Measure Attainment of	
C01	Ability to understand pasic concept of robotics.	v	٧		v	V				STATE SALES				Und		No C	ASTs, ESE, Class/Quiz ests	

AA

Department of Electronical Communication Engineering
IX Gujran Punjab Technical University
Main Campus, Kaputhala (Punjab) 444000

JO NO.	(BTEC-909C- 18: Embedded Systems Design)	PO 1	PO2	PO	3 PC	D 4 F	05	PO 6	PO 7	PO 8	PO 9	PO 10 PC) 11 PC	0 12	Skill	Employability /	Assessment Fools to Measure ttainment of		
			V			٧	٧						+	٧			MSTs, ESE, Class/Quiz Tests		
CO4	Describe about CMOS Testing techniques														Describe	No			
	VHDL Synthesis and the tools involved	٧	٧			v	٧								Learn	No	MSTs, ESE, Class/Quiz		
C02	Understand the VLSI Circuit Design processes and Gate level design Learn about	٧	V			٧	٧							٧	Understand	No	MSTs, ESE, Class/Quiz Tests		
CO1	Understand the concepts and various processes related to VLSI	v	V			v	٧								Understand	hip No	MSTs, ESE, Class/Quiz	-	
CO No.	Design)	PO:	I PO	2 F	203	PO 4	PO 5	PO	PO	7 PO 1	PO	9 PO 10	PO 11	PO	12 Skill	Focus on Employability Entrepreneurs	Assessment Tools to Measure Attainment of		
CO4	To know about the dynamics and control in robotics industries	v		v		٧	٧								Apply	Yes	MSTs, ESE, Class/Quiz Tests		
CO3	To know about the differential motion, additions in robotics	е		٧		٧	V								Analyze	No	MSTs, ESE, Class/Quiz Tests		
CO2	Instrumentation systems and their applications to various	to v		٧		v									Analyze	No	MSTs, ESE, Class/Quiz Tests		

Department of Electronics & Communication Engineering

	(BTMC-101-18: Indian Constitution)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of		
CO4	Embedded Networking concepts based upon connected MCUs		٧			V								Understand	No	MSTs, ESE, Class/Quiz Tests		
CO3	Reviews and implement the protocols used by microcontroller to communicate with external sensors and actuators in real world Understand	٧			V	٧							٧	Revieweing	No	MSTs, ESE, Class/Quiz Tests		
CO2	Understand hardware interfacing concepts to connect digital as well as analog sensors while ensuring low power considerations.													Understand	d No	MSTs, ESE, Class/Quiz Tests		
CO1	Learn about the basis architecture of 32-bit microcontrollers	f												Learning	No	MSTs, ESE, Class/Quiz Tests		

Department of Electronics & Communication Engineering IK Gujral Punjab Technical University Main Campus, Kapurthala (Punjab)-144603

CO No.	CO Statements (BTMC-102-18; Essence of Indian Traditional Knowledge)	PO-a	РО-ъ	РО-с	PO-d	РО-е	PO-f	PO-g	PO-h	PO-i	PO-j	PO-k	PO-1	Learning Lev	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of CO	
CO4	Prime Minister . The Course will also helpful in prepration of Competitive exams National wide and state level, like IAS, IPS and others.								٧				٧	Understand		MST,s ESE, Class/Quiz Tests	
соз	Examine the Forms of government, Parliamentary form of Govt. & Presidential Form of Govt, powers and position of President and								1				1	Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO2	Understand the Rights and Duties of Citizens, Fundmantal Rights and Human Rights.	s							٧	1			,	Understan	d No	MSTs, ESE, Class/Quiz Tests	
CO1	Understand the Philosophy of Indian constitution, like Sovereignty, Secular, Republic Socialist and Democracy.									٧				√ Understa	nd No	MSTs, ESE Class/Quiz Tests	E, z

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University

CO1	Understand the Philosophy of Indian Knowledge system and and its Basic Structure.								1				1	Understand	No	MSTs, ESE, Class/Quiz Tests	
CO2	Understand the Ancient India Culture, Society and Religion. Examine the								1				1	Understand	No	MSTs, ESE, Class/Quiz Tests	
соз	areas of Indian Linguistic Tradition.								1				1	Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO4	Know the contrubtion of scientists of different eras.								1				1	Understand		MST,s ESE, Class/Quiz Tests	
CO No.	(BTEC-909E- 18: Bio Medical Signal Processing)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		Focus on Employability / Entrepreneurs	Assessment Tools to Measure Attainment of	
COT	Understand the fundamentals of signal processing for various bio- signal analysis	٧	V		٧	٧									No	MSTs, ESE, Class/Quiz Tests	
CO2	Learn the Infinite impulse response (IIR) filter and study its applications	٧			٧	٧							V	Learning	No	MSTs, ESE, Class/Quiz Tests	
CO3 li	Attain in-depth knowledge about the basic concepts of finite mpulse response (FIR) iller and study ts applications	v			V								ı	Inderstand N	lo (MSTs, ESE, Class/Quiz Tests	
					V								٧		Depart	ment of Electronics & Communication Engineering Uiral Puniab Technical University Sampos, Kapurthala (Puniah) 144603	

CO4	Apply different methods of signal processing techniques in analyzing the various biosignals such as Electro cardiogram (ECG), Electro myogram (EMG) and Phonocardiogram (PCG)	٧			٧								v	Apply	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(BTEC-907B- 18: Antenna Radiating Systems)	PO 1	PO 2	PO 3	PO 4	P0 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of	
CO1	To understand the basic concepts of radiation	٧	٧		٧	٧								Understand	No	MSTs, ESE, Class/Quiz Tests	
C02	To analyse the radiation pattern of antenna arrays.	٧	٧										٧	Analyze	No	MSTs, ESE, Class/Quiz Tests	
	To understand the concept of various wave propagation techniques												,	Understand	No	MSTs, ESE, Class/Quiz Tests	
C04	To understand the concept of radiating systems on environment	V	٧		٧	٧							V	Inderstand	No (MSTs, ESE, Class/Quiz ests	

Head

Department of Author Communication Engineering

TK Gujral Punjab Technical University

Main Campus K

CO No.	n Networks)		PO 2	PO 3	PO 4	PO 5	PO	PO	POE	PO 9	PO 10	PO 11	PO 12	2 Skill	Employability Entrepreneurs	Assessment Tools to Measure Attainment of	
CO1	Understand the working principles of the mobile communication													Understand	No	MSTs, ESE, Class/Quiz Tests	
CO2	understand the relation between the user features	٧	V		٧	٧								Understand	No	MSTs, ESE,	
	and underlying technology Analyze mobile communication	٧				٧										Class/Quiz Tests	
соз	systems for improved performance	٧	٧		٧	٧								Analyze	No	MSTs, ESE, Class/Quiz Tests	
	(BTEC-908A- 18: Artificial Intelligence)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10 I	PO 11	PO 12	Skill	Employability / Entrepreneurs	Assessment Tools to Measure Attainment of	
001	Learn about the basic understanding of Artificial Intelligent												L		No	MSTs, ESE, Class/Quiz	
	system Explain about various types	٧	٧	+	٧	٧					-					ests	
CO2	of Artificial Neural Networks & their models	٧	٧		٧	٧							E	xplain N	No C	ISTs, ESE, lass/Quiz ests	
СОЗ	Artificial Neural networks methods, operation and parameters	٧	٧		·	V							Di	escribe N	lo C	STs, ESE, lass/Quiz ests	

Head

Department of Electronics & Communication Engineering

K. Gujan Surfield Vectorical University

Main Campus, Kapurthala (Puniab). 144603

CO4	Explore Neural Network MATLAB Toolbox	V	٧		V	V								Explore	No	MSTs, ESE, Class/Quiz Tests	
CO No.	and Machine Learning) Understand the	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	? Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of CO	
CO1	concept of information and entropy Understand	٧	٧		V	V								Understand	No	MSTs, ESE, Class/Quiz Tests	
CO2	Shannon's theorem for coding				٧	V								Understand	No	MSTs, ESE, Class/Quiz Tests	
CO3	Calculation of channel capacity													Calculate	No	MSTs, ESE, Class/Quiz	
CO4	Apply coding techniques	٧	٧			٧								Apply	No	MSTs, ESE, Class/Quiz Tests	
JU 140.	(BTEC-909B- 18: Information Theory and Coding)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11 I	PO 12	Skill	Employability / Entrepreneurs	Assessment Fools to Measure Attainment of	
CO1	To learn the difference between optimal reasoning Vs human like reasoning	٧	V		٧	V							L		No (ASTs, ESE, Class/Quiz	

The Aura

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kasushala (Punjab)-144603

C02	Develop Python programs with conditionals and loops.	V	v .		v	V							V	Develop	No	MSTs, ESE, Class/Quiz Tests	
C01	Read and write simple Python programs.	٧	٧		٧	٧									INO	MSTs, ESE, Class/Quiz	
CO No.	(BTEC-907D- 18: Python Programmimg)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		Focus on Employability / Entrepreneurs	Assessment Tools to Measure Attainment of	
CO4	representation techniques To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing				V	V							V	Learning	No	Class/Quiz Tests MSTs, ESE, Class/Quiz Tests	
CO2	heuristic search along with the time and space complexities To learn different knowledge	g g e e e	V		٧	V							v			MSTs, ESE, Class/Quiz Tests	

U

Department of Electronics & Communication Engineering
LK Gujrat Punjab Technical University
Main Carrons Medical (Punjab)-144603

CO3	Define Python functions and to use Python data structures—lists , tuples, dictionaries.													Learning	No	MSTs, ESE, Class/Quiz Tests		
CO4	Perform input/output operations with files in Python.	V	٧		V	V							V	Perform	No	MSTs, ESE, Class/Quiz Tests		
CO5	Execute Searching, sorting and merging in Python.	v	٧	٧	٧	V							V	Excecute	Yes	MSTs, ESE, Class/Quiz Tests		
CO NO.	(BTEC-907E- 18: Adaptive Signal Processing)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	P0 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs	Assessment Tools to Measure Attainment of		
CO1	Understand the non-linear control and the need and significance of changing the control parameters with respect to real-time situation	V	V		٧	V								Understand	hip No	MSTs, ESE, Class/Quiz Tests		
CO2	Mathematically represent the adaptability requirement'.	٧	v	٧	٧	v								Apply	No	MSTs, ESE, Class/Quiz Tests		
CO3 to	Understand the mathematical reatment for the modeling and design of the signal processing systems.	v	٧	٧	٧	V							V	\nalyze	No (- 11		
						-					-					- 111	/I	

Main Communication Engineering

CO No.	(BTEC-908D- 18: Soft Computing)	PO 1	PO 2	PO 3	PO 4	PO	5 PO	PO	7 PO 8	POS	PO 16	PO 11	PO 12	Skill	Focus on Employability Entrepreneurs	Attainment of	
CO1	Understand the concepts of Soft Computing and Algorithms involved therein		V		V	V								Understand		MSTs, ESE, Class/Quiz Tests	
CO2	Understand Genetic Algorithms with its operators and applications Learn about		٧		·	٧							V	Understand	No	MSTs, ESE, Class/Quiz Tests	
CO3	the Neural Network models and its applications	٧	٧		٧	٧							V	Applying	Yes	MSTs, ESE, Class/Quiz Tests	
CO4	Describe the Fuzzy systems and Swarm Intelligence	٧			٧									Describe	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(BTEC-909A- 18: Big Data Fundamentals)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10 F	PO 11 F	O 12 S	kill	Employability / Entrepreneurs	Assessment Tools to Measure	
CO1	Understand the Evolution and basics of Big Data.												U	nderstand		Attainment of CO MSTs, ESE, Class/Quiz	
CO2	Understand the Architecture of Hadoop with its file system and its	٧	٧		V								٧	nderstand N	No C	iests ISTs, ESE, lass/Quiz ests	
CO3	Explain the Advanced analytical heory and nethods.		v		v	V V							V Ex	plain N	A Head	STs, ESE, ass/Quiz ests	

W

C O4	Describe the challenges in handling streaming data from the real world.	٧	٧			٧)						٧	Describe	No	MSTs, ESE, Class/Quiz Tests	
CO No.	(BTEC-908E- 18: Digital Image and Video Processing)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of CO	
CO1	Mathematically represent various types of images and analyze them.	٧	٧		٧	٧							٧	Analyze	No	MSTs, ESE, Class/Quiz Tests	
CO2	2. Process these images for the enhancement of certain properties or for optimized use of the		V		٧	V							٧	Apply	Yes	MSTs, ESE, Class/Quiz Tests	
соз	resources. 3. Develop algorithms for image compression and coding.		v		٧	٧								Design	Yes	MSTs, ESE, Class/Quiz Tests	
CO No.	(BTEC-731-18: Project-II)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurs hip	Assessment Tools to Measure Attainment of	
CO1	Review and finalization of the Approach to the Problem relating to the assigned topic	٧	V		٧	v							v	Review	Yes	Report Submission, Internal Viva, Project Submission, Semester-End Viva	

N

Department of Electronics & Communication Engineering.

IN Gultan urban Technical University
Main Campus. Kacurthala (Puniab)-144603.

							1					
CO2	Detailed Analysis/Model ing/Simulation/ Design/Proble m Solving/Experi ment as needed	٧	>		٧	٧		V	Apply	Yes	Report Submission, Internal Viva, Project Submission, Semester-End Viva	Į.
CO3	Final development of product/proces s, testing, results, conclusions and future directions:	>	<	V	٧	V		V	Design	Yes	Report Submission, Internal Viva, Project Submission, Semester-End Viva	
CO4	Prototyping or Product development/P atent and Video demonstration;	v	v	v	٧	V		v	Design	Yes	Report Submission, Internal Viva, Project Submission, Semester-End Viva Report Submission, Internal Viva,	
CO5	Preparing a paper for Conference presentation/P ublication in Journals;	٧	٧		٧			v	Prepare	No	Report Submission, Internal Viva, Project Submission, Semester-End Viva	
CO6	Preparing a Dissertation in the standard format for being evaluated by the Department		V		٧	~		v	Prepare	Yes	Report Submission, Internal Viva, Project Submission, Semester-End Viva	

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kacurthala (Punjab)-144603

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY, MAIN CAMPUS, KAPURTHALA

Department of Electronics and Communication Engineering

Sub: COs for M-Tech Course

MTWC-101-18- Wireless Communication

Course Outcome

CO1: Implement physical models of wireless channels

CO2: Gain knowledge of key concepts of wireless communication

CO3: Measure capacity of AWGN channel, LTI Gaussian channels and various fading channels

CO4: Study uplink and downlink model of AWGN channel, fading channels and multiuser diversity

MTWC-102-18- Information Theory & Coding

Course Outcome

CO1: Understand the fundamentals of information theory.

CO 2: Encode text, audio, speech, image and video signals through various coding and compression techniques.

CO 3: Detect and correct errors in the received signals through error detecting and correcting codes

MTWC-PE1-18- Wireless Sensor Networks

Course Outcome

CO1: Gain insights of Wireless Sensor Network(WSN) background, its challenges, constraints along with its advantages and applications.

CO 2: Know the architecture of WSN and its sub-systems.

CO 3: Explain node structure along with the technologies used in

CO 4: Study various Wireless Propagation Models and discuss the

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

various MAC protocols, communication protocols and routing protocols

MTWC-PE1B-18- RF MEMS FOR WIRELESS COMMUNICATION SYSTEM

Course Outcome

CO 1: Understand the key concepts in RF based MEMS wireless communication system.

CO 2: Design RF based circuits through modelling.

CO 3: Understand the usage of RF based circuit elements to reconfigure the circuit design.

CO 4: Study various oscillators and filters.

MTWC-PE1C-18- ADVANCED DIGITAL SIGNAL PROCESSING

Course Outcome

CO1: Apply digital transform techniques on signals.

CO 2: Design digital FIR and IIR filters.

CO 3: Predict and estimate errors in digital signal processing systems.

CO 4: Handle multirate DSP and use adaptive filters.

MTWC-PE1D-18- AUDIO AND VIDEO SIGNAL PROCESSING

Course Outcome

CO1: Learn the audio and video signal processing systems.

CO 2: Code and decode the image, audio and video signals.

CO 3: Modulate and demodulate digital signal processing systems.

MTWC-PE2A-18-ADVANCED COMMUNICATION SYSTEM

Course Outcome

Department of Electronics & Communication Engineering
IK Guijral Punjab Technical University
Main Communic Kapurthela (Punjab)-144603

CO1: Differentiate between analog and digital communication

CO 2: Transmit data through various digital modulation techniques

CO 3: Understand optical and satellite communication systems.

CO 4: Recognize mobile communication systems, access techniques and transmission protocols.

MTWC-PE2B-18-DETECTION AND ESTIMATION THEORY

Course Outcome

CO1: Know the background of the signals, variables and processes.

CO 2: Test the data through statistical tools.

CO 3: Learn the ways to detect non-parametric, random and deterministic signals.

CO 4: Familiarize with the estimation of signal parameters

MTWC-PE2C-18- MOBILE ADHOC NETWORKS

Course Outcome

CO1: Know the features, applications, models and characteristics of adhoc networks.

CO 2:Learn the protocols followed in MAC layer, Network layer, Transport layer, Security layer and Cross layer design.

CO 3: Learn how to integrate adhoc networks with mobile-IP

MTWC-PE2D-18- OPTICAL NETWORK AND PHOTONIC SWITCHING

Course Outcome

CO1: Know the optical transmission and reception

CO 2: Apply the compensation techniques to the lost data/signals.

CO 3:Learn the architecture and protocols of passive optical networks.

Head

Department of Electronics & Communication Engineering IK Gujral Punjab Technical University Main Campus, Kapurthala (Punjab)-144603

MTRM-101-18 RESEARCH METHODOLOGY & IPR

Course Outcome

CO1: 1. Understand research, research process, define and redefine research problem through literature survey.

CO 2: Know the primary and secondary sources of data collection and select sample size based on the requirement.

CO 3: Utilize the resources efficiently.

CO 4: Critically analyse the data through various statistical measures, perform experiment, gather data and reach to a conclusion based on some hypothesis.

CO5: Know the intellectual property rights

CO6: Write up the report and research article.

MTAC-AO1-18-English for research paper writing

Course Outcome

CO1: Understand that how to improve your writing skills and level of readability

CO 2: Learn about what to write in each section

CO 3:Understand the skills needed when writing a Title

CO 4: Ensure the good quality of paper at very first-time submission.

MTAC-A02-18-Disaster Management

Course Outcome

CO1: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO 2: Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

Head
Department of Electronics & Communication Engineering

IK Gujral Punjab Technical University Main Campus, Kapurthala (Punjab)-144603 CO 3:Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO 4: Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

MTWC-103-18 Advanced Wireless Communication

Course Outcome

CO1: Review the fundamentals of wireless communication

CO 2: Compare the performance of different digital modulation techniques over wireless channels.

CO 3: Design OFDM system and data transmission through multicarrier modulation.

CO 4: Describe OFDMA system, its operation and applications.

MTWC-104-18- Soft Computing Techniques

Course Outcome

CO1: Study basic concept of soft computing and differentiate between supervised, unsupervised and reinforced learning methods.

CO 2: Learn various artificial neural network techniques, fuzzy sets, fuzzification and defuzzification.

CO 3: Optimize solutions using Genetic Algorithm

CO 4: Use hybrid soft computing techniques.

MTWC-105-18- SIMULATION OF WIRELESS COMM. SYSTEMS

Course Outcome

CO1: Study the role of simulation in communication system and random processes.

Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

- CO 2: Review stochastic processes and parameter estimation
- CO 3: Model wireless communication systems through numerical methods.
- CO 4: Study communication channel models and perform Monte Carlo Simulation.

MTWC-PE3A-18- Smart Antennas

Course Outcome

- CO1: Understand the significance of smart antennas and its historical development.
- CO 2: Know the architecture of Smart antennas, types, applications
- CO 3: Learn antenna array fundamentals criteria and beam forming basics
- CO 4: Explain the Spatial Processing techniques for CDMA Smart Antennas

MTWC-PE3B-18 Wireless Network Planning, Optimization and Management

- CO 1: Understand the Radio Network planning and optimization
- CO 2: Know the technologies of WCDMA and GSM
- CO 3: . Learn the fundamentals of Radio Resource Management

MTWC-PE3C-18 Microwave and RF Design

- CO1: Understand the significance of Microwave and RF designs
- CO 2: Know the fundamentals behind Microwave Amplifiers/Oscillators designs.
- CO 3: Technical know-how of Microwave and RF antennas concepts.

Head

Department of Electronics & Communication Engineering IK Gujral Punjab Technical University Main Commun. Konsushola (Austral)

MTWC-PE3D-18- Multimedia Comunication and Technologies

Course Outcome

CO1: Understand the significance of Microwave and RF designs

CO 2: Know the fundamentals behind Microwave Amplifiers/Oscillators designs.

CO 3: Technical know-how of Microwave and RF antennas concepts.

MTWC-PE3D-18- Multimedia Comunication and Technologies

Course Outcome

CO1: Learn multimedia system design techniques.

CO 2: Implement compression and decompression techniques on

CO 3: Understand the concepts of storage and retrieval technologies.

CO 4: Learn multimedia design application.

MTWC-PE4A-18- Cryptography and Wireless

Course Outcome

CO1: Understand the significance of Cryptography.

CO 2: Know its Integrity, Authentication and Management.

CO 3: Learn the concepts of Security and threats to wireless systems.

MTWC-PE4B-18-Software Defined Radio & Cognitive Radio

Course Outcome

CO1: Understand the fundamental concepts of software defined radio and cognitive radio networks.

CO 2: Develop the cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.

Head

Department of Electronics & Communication Engineering IK Gujral Punjab Technical University Main Campus, Kepurthala (Punjab)-144603 CO 3: Understand fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimisation techniques for better spectrum exploitation.

CO 4: Apply SDR principles to smart antennas.

MTWC-PE4C-18- Wireless and Optical Communication Networks

Course Outcome

CO1: Learn Wireless Communication Network layers/technology.

CO 2: Understand basic network components of Wireless and Optical Networks.

CO 3: Explain their applications

MTWC-PE4D-18- MIMO Systems

Course Outcome

CO1: Understand Basic MIMO communication systems.

CO 2: Explore Space-time block codes & Space-time trellis codes.

CO 3: MIMO systems for frequency-selective (FS) fading channels.

MTWC-PE5A-18- Millimeter Wave Communication Technology

Course Outcome

CO1: Familiarization with the concept of Millimeter wave communication.

CO 2: Calculate the performance parameters in millimeter wave antennas.

CO 3: Model the millimeter wave link budget.

CO 4: Analyze the millimeter wave with multiple antennas.

Head

Department of Electronics & Communication Engineering IK Gujral Punjab Technical University Main Campus, Kapurthala (Punjab)-144603

MTWC-PE5B-18- Space Time Wireless Communication

Course Outcome

CO1:Understand Space Time Channel Characterization.

CO 2: Explain Capacity of Multiple Antenna Channels.

CO 3: Learn ST OFDM, Spread Spectrum.

MTWC-PE5C-18- Advanced Techniques for Wireless Reception

Course Outcome

CO1: Understand Wireless Signaling Environment.

CO 2: Explain the usage of Multiuser detection.

CO 3: Learn CDMA, OFDM, MIMO systems

MTWC-PE5D-18- Emerging Technologies of Wireless Communication

Course Outcome

CO1: Understand the concept of cellular/wireless communication

CO 2: Explain the Mobile Radio Propagation and Multiuser systems.

CO 3: Learn technologies of GPRS, UMTS, WiFi, WiMAX, Ultra Wideband communications, 4G and beyond 4G.

MTWC-PE5E-18- Microstrip Antennas

Course Outcome

CO1: Understand the basic concept of micro-strip antennas, methods of analysis and configurations.

CO 2: Explain micro-strip antennas arrays.

CO 3: Understand the physical significance of discontinuities

Head state of the state of the

CO 4: Learn coupled micro-strip line with multiband and broadband behavior

MTOE-301A-18- Cost Management of Engineering Projects

Course Outcome

CO1: Understand the cost calculation for decision-making about an engineering research project

CO 2: Able to define Role of each member in the project team

CO 3:Manage the project by applying Quantitative techniques for cost management

MTWC-111-18-Wireless Communication Lab

Course Outcome

CO1:To design Path-Loss models

CO2:To investigate Fading environments in wireless channels CO3:To develop MATLAB codes for Block codes, Cyclic codes

MTWC-112-18-Information Theory and Coding Lab

Course Outcome

CO1:To understand the programming of Entropies and Mutual In CO2:To learn and practice programming for generation and evaluation CO3:To develop MATLAB codes for Block codes, Cyclic codes

MTWC-105-18- SIMULATION OF WIRELESS COMM. SYSTEMS Laboratory

To understand the programming of OFDM based Transmitter & To learn and practice MATLAB programming for implementing To find the vacant spaces for secondary users in Cognitive Radio

MTWC-MP1-18-Mini Project

CO1: Acquire practical knowledge of the chosen field.

CO2 Identify, analyze, formulate & handle programming projects with systematic approach.

Department of Easternical University

(Cuiral Purisal Technical University

(Cuiral Purisal Reputhala (Purisal)-144603

CO3: Contribute as a team leader in the development of technical projects.

CO4: Develop communication skills for the presentation of project related activities.

MTWC-DS1-18 DISSERTATION PHASE I

Course Outcome

CO1: Critically analyse and evaluate existing knowledge about the chosen problem

CO 2: Find the gaps and motivation through literature survey.

CO 3:Design the framework to optimize the solution for the problem

CO 4: Construct the research proposal.

MTWC-DS2-18- DISSERTATION PHASE II

Course Outcome

CO1: Implement the proposed framework practically or through simulation

CO 2: Gather the results and publish in the research articles.

CO 3: Write-up the proposed work, results with conclusion and future work in the form of thesis

CO4: Present the research work before a committee.

BoS(Co-ordinator)

HODECE

Head of Electronics & Communication En

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY, MAIN CAMPUS, KAPURTHALA

Department of Electronics and Communication Engineering

Sub: COs for B-Tech Course

CO No.(BTEC-301-18: Electronic Devices)

- CO1 Understand physics of semiconductors and behavior of charge carriers within semiconductors
- CO2 Understand the working of semiconductor diodes supported with mathematical explanation.
- CO3 Understand the working of BJT and MOSFET with their equivalent small signal models.
- CO4 Understand the chemical processes used in fabrication of integrated circuits.

CO No. (BTEC-302-18: Digital System Design)

- Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
- To understand and examine the structure of various number systems and its application in CO2 digital design.
- The ability to understand, analyze and design various combinational and sequential circuits. CO3
- Ability to identify basic requirements for a design application and propose a cost effective CO4 solution.
- The ability to identify and prevent various hazards and timing problems in a digital design. CO5

CO No.(BTEC-303-18: Electromagnetic Waves)

- Understand characteristics & wave propagation through transmission lines COL
- Understand Maxwell's equations for electromagnetic waves CO2
- Characterize uniform plane wave CO3
- Calculate reflection and transmission of waves at media interface CO4

CO No. (UC-BTAM-303-18: Engineering Mathematics-III)

- CO1 The mathematical tools needed in evaluating multiple integrals and their usage
- CO2 The effective mathematical tools for the solutions of differential equations that model physical processes.
- CO3 The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.
- CO4 To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering.
- CO5 To provide an overview of probability and statistics to engineers

CO No. (BTEC-304-18: Network Theory)

- Analyze linear networks using network theorems COL
- Use Laplace transform to analyze transient & steady state response of linear networks CO2
- Comprehend network parameters to analyze two port networks. CO3
- Realize one port networks using Foster's and Cauer's methods. CO₄



CO No.(BTEC-311-18: Electronic Devices Laboratory)

- Realization using resistors and diodes in circuits with proper understanding to their working
- Understand characteristics & working of transistor in different configurations. CO2
- Understand characteristics & working of MOSFET in circuits CO3
- Think and design working circuits based on resistors, diodes, transistors and MOSFETs CO₄

CO No. (BTEC-312-18: Digital System Design Laboratory)

- Realize combinational circuits using logic gates CO1
- Realize sequential circuits using logic gates CO2
- Write & simulate VHDL programs for combinational & sequential circuits. CO3
- Think and design working projects using digital 74XX Ics CO4

CO No. (HSMC101-18: Devlopment of Societies)

- Understand the Origin of Family, Clan and Society. COL
- Understand the Forms of Government, like Democracy, Monocracy, Dictatorship and others CO₂
- Understand the Basic concepts of Economic, Barter system and Jajmani system : Socialism, CO3
- Capitalism, and Marxism.. Know about the Development process before, during and after British Rule in India. CO4

CO No. (BTEC-321-18: 4-Weeks Institutional Training)

- Exposure to Practical Aspects of the Discipline CO1
- Realization of common and simple circuits with proper understanding to their working CO2
- Think and design working circuits based on common Electronic components CO3

CO No.(BTEC-331-18: Mentoring and Professional Development)

- Development of Overall Personality and Aptitutde CO1
- General Awareness both Current affairs & GK CO₂
- Development of Communication Skills CO3
- Development of Presentation Skills CO4

CO No.(BTEC-401-18: Analog Circuits)

- Understand the biasing of transistors and analyze BJT/FET amplifiers COL
- Analyze various rectifier and amplifier circuits CO2
- Analyze sinusoidal and non-sinusoidal oscillators CO3
- Understand various types of Power Amplifiers CO₄

CO No. (BTEC-402-18: Microprocessors and Microcontrollers)

- Understand architecture &functionalities of different building block of 8085 microprocessor. CO1
- Understand working of different building blocks of 8051 microcontroller. CO2
- Comprehend and apply programming aspects of 8051 microcontroller. CO₃
- Interface & interact with different peripherals and devices. CO₄

CO No.(BTEC-403-18: Signals and Systems)

- Mathematically characterize different types of signals and systems. COL
- Analyze the behavior of linear-shift invariant systems, CO2
- Apply concepts of Fourier and Laplace Transforms to analyze continuous-time signals and CO3
- Investigate discrete-time signals and systems using Discrete-Time Fourier and Z-Transforms and systems. CO4 simple Probability concepts.

CO No.(HSMC-122-18; Universal Human Values-2)

- Understand the core of Universal Human Values. CO1
- Understand the Harmony and Self Exploration. CO2
- Understand the Basic Human Aspiration. CO3
- Know about the Professional Ethics. CO4

CO No. (EVS-101-18: Environmental Sciences)

- Students will enable to understand environmental problems at local and national level through COL literature and general awareness
- The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues
- The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

CO No. (BTEC-411-18: Analog Circuits Lab)

- Study and verify the characteristics of BJTs in circuits with proper understanding to their COL working.
- Understand frequency response & working of various types of Oscillators CO2
- Understand characteristics & working of different types of Power amplifiers CO3
- Design working circuits of oscillators, emitter follower circuit and power amplifier CO₄

CO No.(BTEC-412-18: Microprocessors and Microcontrollers Lab)

- Understanding the architecture &functionalities of different building blocks of 8085 COL
- Programming for controlling stepper and DC motors using 8085 Microprocessor(s). microprocessor. CO2
- Programs to generate waveforms and interface ADC and DAC using 8051 Microcontroller. CO3

CO No.(UC-BTEC-501-18: Analog and Digital Communication)

- Analyze and compare different analog modulation schemes for their efficiency and bandwidth COL
- Analyze the behavior of a communication system in presence of noise.
- Investigate pulsed modulation system and analyze their system performance. CO2 CO3
- Analyze different digital modulation schemes and can compute the bit error performance. CO4

CO No. (UC-BTEC-502-18: Digital Signal Processing)

Represent signals mathematically in continuous and discrete time and frequency domain COL Get the response of an LSI system to different signals CO₂ Design of different types of digital filters for various applications CO3 CO No.(UC-BTEC-503-18: Linear Integrated Circuits) Represent signals mathematically in continuous and discrete time and frequency domain COL Get the response of an LSI system to different signals CO2 Design of different types of digital filters for various applications CO3 CO No. (UC-BTEC-504-18: Control Systems) Characterize a system and find its steady state behaviour COL Investigate stability of a system using different tests CO2 Design various controllers CO3 Solve linear, non-linear and optimal control problems CO4 CO No.(UC-BTEC-901A-18: AC & DC Motors) Understand the principle of energy conversion Explain the working principle, construction and applications of DC motors COL Explain the working principle, construction and applications of AC motors CO2 CO3 Gain knowledge about the fundamentals of Special motors CO4 CO No.(UC-BTEC-901C-18: Satellite Communication) Interpret & define basics of Satellite communication, understand the complete link design along with and the interference effects on it Understand various fixed and demand assignment multiple access techniques CO2 Understand the special purpose communication satellites. Have knowledge of laser satellite communication and CATV system. CO3 CO4 CO No.(UC-BTEC-901F-18: JAVA Programming) Apply the concepts and basics of JAVA Demonstrate the knowledge of operators and control statements COL CO2 Ability to learn about Inheritance, Interface, Applets CO3 Learn about JAVA database connectivity CO4 CO No.(UC-BTEC-511-18: Analog and Digital Communication Laboratory) Study the characteristics and output waveforms of AM, FM, PCM CO1

Control of Estatorias & Commission Engineering

Control Purised Technical University

Control Purised (Punised) 144603

- Study and compare noise in AM and FM systems CO2
- Investigate the output responses of PAM, PCM, PSK, FSK, MSK and QAM. CO3
- Digital link simulation & error estimation in a digital link using MATLAB (SIMULINK)/ CO4 communication simulation packages.

CO No.(UC-BTEC-512-18: Digital Signal Processing Laboratory)

- Develop a MATLAB program to generate standard sequences and various signals CO1
- Configuring Audio Codec of C6xxx Boards CO2
- Develop programs to verify convolution and design FIR & IIR filters. CO3
- Implementation of Audio Delay Line, Echo and Audio Reverberation CO4

CO No.(UC-BTEC-513-18: Linear Integrated Circuits Laboratory)

- Study the configurations of Differential amplifiers COL
- Determine the performance parameters of an OP-Amp CO2
- Design various applications using Op-Amps CO3
- Examine the operation of a Phase lock loop CO4

CO No.(UC-BTEC-601-18: Wireless Communication)

- Understand the basic elements of Cellular Radio Systems and its design
- Learn about the concepts Digital communication through fading multipath channels COL CO2
- Understand various Multiple Access techniques for Wireless communication CO3
- Know about the Wireless standards and systems CO4

CO No.(BTCS-504-18: Computer Networks)

- Explain the functions of the different layer of the OSI Protoco
- Describe the function of each block of wide-area networks (WANs), local area networks (LANs) CO1 CO2 and Wireless LANs (WLANs)
- Develop the network programming for a given problem related TCP/IP protocol
- Learn about DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, CO₃ CO4
- SNMP, Bluetooth, Firewalls using open source available software and tools.

CO No.(UC-BTEC-602-18: Opticsl Fibres and Communication)

- Recognize and classify the structures of Optical fiber and types. CO1
- Discuss the channel impairments like losses and dispersion and analyze various coupling losses. CO2
- Classify the Optical sources and detectors and to discuss their principle. CO3
- Familiar with Design considerations of fiber optic systems and sources and detectors CO4

CO No.(UC-BTEC-603-18: Microwave and Antenna Engineering)

Understand the working and operation of various Microwave Tubes and Microwave Solid-state COL

Head a Technical Com

devices.

- Learn about various important Microwave Components and the Microwave measurements that CO2 can be carried out
- Explain the basic concepts and types of Antennas and its regions. CO3
- Describe the important concepts of Antenna Arrays and Antenna Aperture CO4

CO No.(UC-BTEC-902B-18: Power Electronics)

- Attain the ability and to handle the concept of construction and characteristics of Power semiconductor devices and fundamental of thyristors and family
- Demonstrate and build a various single phase AC-DC power converter circuits and understand CO₂ their applications
- Illustrate the operating principle and construct a various types of DC-DC converters CO3
- Simulate power electronic converters and their control scheme. CO4

CO No.(UC-BTEC-902C-18: Mobile ADHOC NETWORKS)

- Understand the principles of mobile ad hoc networks, and their models. CO1
- Understand and develop information dissemination protocols for mobile adhoc networks CO2
- Analyze the challenges in designing, routing and security in mobile adhoc networks. CO3

CO No.(UC-BTEC-902E-18: Artificial Neural Networks)

- Understand generic machine learning terminology COL
- Understand the mathematical foundations of neural network models CO2
- Have a broad knowledge in Fuzzy logic principles and will be able to determine different CO3 methods of Defuzzification

CO No.(UC-BTEC-611-18: Optical Fibres and Communication Laboratory)

- Simulation of an optical communication system & calculation of its BER and Q factor using COL simulator.
- Study various types of optical sources and light detectors CO2
- Familiarization with the methods of slicing and connecting techniques of optical fibres CO3
- Study different types of losses in optical fibres. CO₄
- Design various applications of optical fiber communication sysytem CO5

CO No.(UC-BTEC-612-18: Microwave and Antenna Engineering Laboratory)

- Learn about general Microwave components and Microwave bench COL
- Measure common parameters related to Microwave Oscillator(s). CO2
- Determine frequency and wavelength of waveguides. CO3
- Measure and plot radiation patterns of various types of Antennas CO4

CO No.(UC-BTEC-631-18: Project-I)

- Understand the Survey and study of published literature on the assigned topic Working out a preliminary Approach to the Problem relating to the assigned topic COI Analysis/Modelling/Simulation/Experiment/Design/Feasibility CO2 Preparing a Written Report on the Study conducted for presentation to the Department CO3 CO4
- CO No.(BTEC-907A-18: Internet of Things (IOT) & Cloud Computing)
- Understanding concept of cloud computing and analyze trade-off between deploying application on cloud and using local infrastructure
- Identify issues and design challenges in IoT applications.
- Select appropriate hardware and software components for IoT applications CO₂ CO3
- Conceptual knowledge will help students to build IOT applications CO4

CO No.(BTEC-907C-18: Robotics and Embedded systems)

- Ability to understand basic concept of robotics. CO1
- To analyze Instrumentation systems and their applications to various CO2
- To know about the differential motion, add statics in robotics CO3
- To know about the dynamics and control in robotics industries CO4

CO No.(BTEC-908C-18: VLSI Design)

- Understand the concepts and various processes related to VLSI COL
- Understand the VLSI Circuit Design processes and Gate level design CO2
- Learn about VHDL Synthesis and the tools involved CO3
- Describe about CMOS Testing techniques CO4

CO No.(BTEC-909C-18: Embedded Systems Design)

- Learn about the basic architecture of 32-bit microcontrollers COL
- Understand hardware interfacing concepts to connect digital as well as analog sensors while CO2
- Reviews and implement the protocols used by microcontroller to communicate with external ensuring low power considerations. CO3 sensors and actuators in real world
- Understand Embedded Networking concepts based upon connected MCUs

CO No. (BTMC-101-18: Indian Constitution)

- Understand the Philosophy of Indian constitution, like Sovereignty, Secular, Republic, Socialist CO1
- Understand the Rights and Duties of Citizens, Fundamental Rights and Human Rights. and Democracy.
- Examine the Forms of government, Parliamentary form of Govt. & Presidential Form of Govt, CO2
- The Course will also helpful in preparation of Competitive exams National wide and state level, powers and position of President and Prime Minister. like IAS, IPS and others.

CO No.CO Statements (BTMC-102-18: Essence of Indian Traditional Knowledge)

- Understand the Philosophy of Indian Knowledge system and and its Basic Structure.
- Understand the Ancient India Culture, Society and Religion. COL CO₂
- Examine the areas of Indian Linguistic Tradition. CO3

The Mark to the state of the st

Know the contribution of scientists of different eras. CO4

CO No.(BTEC-909E-18: Bio Medical Signal Processing)

- Understand the fundamentals of signal processing for various bio-signal analysis COL
- Learn the Infinite impulse response (IIR) filter and study its applications CO2
- Attain in-depth knowledge about the basic concepts of finite impulse response (FIR) filter and CO3 study its applications
- Apply different methods of signal processing techniques in analyzing the various bio-signals such CO4 as Electro cardiogram (ECG), Electro myogram (EMG) and Phonocardiogram (PCG

CO No. (BTEC-907B-18: Antenna Radiating Systems)

- To understand the basic concepts of radiation COL
- To analyse the radiation pattern of antenna arrays. CO2
- To understand the concept of various wave propagation techniques CO3
- To understand the concept of radiating systems on environment CO4

CO No. (BTEC-908B-18: Mobile Communication Networks)

- Understand the working principles of the mobile communication systems COL
- Understand the relation between the user features and underlying technology CO2
- Analyze mobile communication systems for improved performance CO3

CO No. (BTEC-908A-18: Artificial Intelligence)

- Learn about the basic understanding of Artificial Intelligent system CO1
- Explain about various types of Artificial Neural Networks & their models CO2
- Describe Artificial Neural networks methods, operation and parameters CO3
- Explore Neural Network MATLAB Toolbox CO4

CO No.(BTEC-909D-18: Artificial Intelligence and Machine Learning)

- Understand the concept of information and entropy COL
- Understand Shannon's theorem for coding CO2
- Calculation of channel capacity CO3
- Apply coding techniques CO₄

CO No. (BTEC-909B-18: Information Theory and Coding)

- To learn the difference between optimal reasoning Vs human like reasoning COL
- To understand the notions of state space representation, exhaustive search, heuristic search along CO2 with the time and space complexities
- To learn different knowledge representation techniques CO3
- To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, CO4 Machine Learning and Natural Language Processing

CO No.(BTEC-907D-18: Python Programmimg)

- CO1 Read and write simple Python programs.
- CO2 Develop Python programs with conditionals and loops.
- CO3 Define Python functions and to use Python data structures-lists, tuples, dictionaries.
- CO4 Perform input/output operations with files in Python.
- CO5 Execute Searching, sorting and merging in Python.

CO No.(BTEC-907E-18: Adaptive Signal Processing)

- CO1 Understand the non-linear control and the need and significance of changing the control parameters with respect to real-time situation
- CO2 Mathematically represent the 'adaptability requirement'.
- CO3 Understand the mathematical treatment for the modeling and design of the signal processing systems.

CO No.(BTEC-908D-18: Soft Computing)

- CO1 Understand the concepts of Soft Computing and Algorithms involved there-in
- CO2 Understand Genetic Algorithms with its operators and applications
- CO3 Learn about the Neural Network models and its applications
- CO4 Describe the Fuzzy systems and Swarm Intelligence

CO No.(BTEC-909A-18: Big Data Fundamentals)

- CO1 Understand the Evolution and basics of Big Data.
- CO2 Understand the Architecture of Hadoop with its file system and its Programming.
- CO3 Explain the Advanced analytical theory and methods.
- CO4 Describe the challenges in handling streaming data from the real world.

CO No.(BTEC-908E-18: Digital Image and Video Processing)

- CO1 Mathematically represent various types of images and analyze them.
- CO2 2. Process these images for the enhancement of certain properties or for optimized use of the resources.
- CO3 3. Develop algorithms for image compression and coding.

CO No.(BTEC-731-18: Project-II)

- CO1 Review and finalization of the Approach to the Problem relating to the assigned topic
- CO2 Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed
- CO3 Final development of product/process, testing, results, conclusions and future directions;
- CO4 Prototyping or Product development/Patent and Video demonstration;
- CO5 Preparing a paper for Conference presentation/Publication in Journals;
- CO6. Preparing a Dissertation in the standard format for being evaluated by the Department

Bos(Co-ordinator)

HOD(ECE)

Heard
Department of Electronics & Communication Engineering
IK Guijral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

I K GUJRAL PUNJAB TECHNICAL UNIVERSITY, MAIN CAMPUS, KAPURTHALA

Department of Electronics and Communication Engineering

Sub: COs for M-Tech Course

MTWC-101-18- Wireless Communication

Course Outcomes

CO1: Implement physical models of wireless channels

CO2: Gain knowledge of key concepts of wireless communication

CO3: Measure capacity of AWGN channel, LTI Gaussian channels and various fading channels

CO4: Study uplink and downlink model of AWGN channel, fading channels and multiuser diversity

MTWC-102-18- Information Theory & Coding

Course Outcomes

CO1: Understand the fundamentals of information theory.

CO 2: Encode text, audio, speech, image and video signals through various coding and compression techniques.

CO 3: Detect and correct errors in the received signals through error detecting and correcting codes

MTWC-PE1-18- Wireless Sensor Networks

Course Outcomes

CO1: Gain insights of Wireless Sensor Network(WSN) background, its challenges, constraints along with its advantages and applications.

CO 2: Know the architecture of WSN and its sub-systems.

CO 3: Explain node structure along with the technologies used in

CO 4: Study various Wireless Propagation Models and discuss the



Head
Department of Electronics & Communication Engineering
IK Guiral Punjab Technical University
Main Campus, Kapusthola (Punjab)-144603

various MAC protocols, communication protocols and routing protocols

MTWC-PE1B-18- RF MEMS FOR WIRELESS COMMUNICATION SYSTEM

Course Outcomes

- CO 1: Understand the key concepts in RF based MEMS wireless communication system.
- CO 2: Design RF based circuits through modelling.
- CO 3: Understand the usage of RF based circuit elements to reconfigure the circuit design.
- CO 4: Study various oscillators and filters.

MTWC-PE1C-18- ADVANCED DIGITAL SIGNAL PROCESSING

Course Outcomes

- CO1: Apply digital transform techniques on signals.
- CO 2: Design digital FIR and IIR filters.
- CO 3: Predict and estimate errors in digital signal processing systems.
- CO 4: Handle multirate DSP and use adaptive filters.

MTWC-PEID-18- AUDIO AND VIDEO SIGNAL PROCESSING

Course Outcomes

- CO1: Learn the audio and video signal processing systems.
- CO 2: Code and decode the image, audio and video signals.
- CO 3: Modulate and demodulate digital signal processing systems.

MTWC-PE2A-18-ADVANCED COMMUNICATION SYSTEM

Course Outcome

1

CO1: Differentiate between analog and digital communication

CO 2: Transmit data through various digital modulation techniques

CO 3: Understand optical and satellite communication systems.

CO 4: Recognize mobile communication systems, access techniques and transmission protocols.

MTWC-PE2B-18-DETECTION AND ESTIMATION THEORY

Course Outcome

CO1: Know the background of the signals, variables and processes.

CO 2: Test the data through statistical tools.

CO 3: Learn the ways to detect non-parametric, random and deterministic signals.

CO 4: Familiarize with the estimation of signal parameters

MTWC-PE2C-18- MOBILE ADHOC NETWORKS

Course Outcome

CO1: Know the features, applications, models and characteristics of adhoc networks.

CO 2:Learn the protocols followed in MAC layer, Network layer, Transport layer, Security layer and Cross layer design.

CO 3: Learn how to integrate adhoc networks with mobile-IP

MTWC-PE2D-18- OPTICAL NETWORK AND PHOTONIC SWITCHING

Course Outcomes

CO1: Know the optical transmission and reception

CO 2: Apply the compensation techniques to the lost data/signals.

CO 3:Learn the architecture and protocols of passive optical networks.

4

Head
Deputment of Endroites & Communication Engineering
K Gujral Purijab Technical University
Main Campus, Kapurtnala (Punjab)-144603

CO 4: Learn the process of wire line techniques.

MTRM-101-18 RESEARCH METHODOLOGY & IPR

Course Outcomes

CO1: 1. Understand research, research process, define and redefine research problem through literature survey.

CO 2: Know the primary and secondary sources of data collection and select sample size based on the requirement.

CO 3: Utilize the resources efficiently.

CO 4: Critically analyse the data through various statistical measures, perform experiment, gather data and reach to a conclusion based on some hypothesis.

CO5: Know the intellectual property rights

CO6: Write up the report and research article.

MTAC-AO1-18-English for research paper writing

Course Outcomes

CO1: Understand that how to improve your writing skills and level of readability

CO 2: Learn about what to write in each section

CO 3:Understand the skills needed when writing a Title

CO 4: Ensure the good quality of paper at very first-time submission.

MTAC-A02-18-Disaster Management

Course Outcomes

CO1: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO 2: Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

An

Head

Deprime of Entrains & Communication Engineerally

Deprime of Entrains & Communication Engineerally

Deprime of Entrains & Communication Engineerally

New Guiral Puryab Technical (Puryab) 144603

Hain Campus, Keputhala (Puryab) 144603

CO 3:Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO 4: Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

MTWC-103-18 Advanced Wireless Communication

Course Outcomes

CO1: Review the fundamentals of wireless communication

CO 2: Compare the performance of different digital modulation techniques over wireless channels.

CO 3: Design OFDM system and data transmission through multicarrier modulation.

CO 4: Describe OFDMA system, its operation and applications.

MTWC-104-18- Soft Computing Techniques

Course Outcomes

CO1: Study basic concept of soft computing and differentiate between supervised, unsupervised and reinforced learning methods.

CO 2: Learn various artificial neural network techniques, fuzzy sets, fuzzification and defuzzification.

CO 3: Optimize solutions using Genetic Algorithm

CO 4: Use hybrid soft computing techniques.

MTWC-105-18- SIMULATION OF WIRELESS COMM. SYSTEMS

Course Outcomes

CO1: Study the role of simulation in communication system and random processes.

A

Head Its brings & Commission Expension

Developed Punjab Technical University

IK Gujral Punjab Technical (Punjab)-144603

Main Compus, Kapurhala (Punjab)-144603

CO 2: Review stochastic processes and parameter estimation

CO 3: Model wireless communication systems through numerical methods.

CO 4: Study communication channel models and perform Monte Carlo Simulation.

MTWC-PE3A-18- Smart Antennas

Course Outcomes

CO1: Understand the significance of smart antennas and its historical development.

CO 2: Know the architecture of Smart antennas, types, applications

CO 3: Learn antenna array fundamentals criteria and beam forming basics

CO 4: Explain the Spatial Processing techniques for CDMA Smart Antennas

MTWC-PE3B-18 Wireless Network Planning, Optimization and Management

Course Outcomes

CO 1: Understand the Radio Network planning and optimization

CO 2: Know the technologies of WCDMA and GSM

CO 3: . Learn the fundamentals of Radio Resource Management

MTWC-PE3C-18 Microwave and RF Design

CO1: Understand the significance of Microwave and RF designs

CO 2: Know the fundamentals behind Microwave Amplifiers/Oscillators designs.

CO 3: Technical know-how of Microwave and RF antennas concepts.

M

Head

Department of Department of Communication Communication

Department of Department of Technical University

Medin Campus, Kapunthala (Punjab)-144603

Main Campus, Kapunthala (Punjab)-14603

MTWC-PE3D-18- Multimedia Comunication and Technologies

Course Outcomes

CO1: Understand the significance of Microwave and RF designs

CO 2: Know the fundamentals behind Microwave Amplifiers/Oscillators designs.

CO 3: Technical know-how of Microwave and RF antennas concepts.

MTWC-PE3D-18- Multimedia Comunication and Technologies

Course Outcomes

CO1: Learn multimedia system design techniques.

CO 2: Implement compression and decompression techniques on

CO 3: Understand the concepts of storage and retrieval technologies.

CO 4: Learn multimedia design application.

MTWC-PE4A-18- Cryptography and Wireless

Course Outcomes

CO1: Understand the significance of Cryptography.

CO 2: Know its Integrity, Authentication and Management.

CO 3: Learn the concepts of Security and threats to wireless systems.

MTWC-PE4B-18-Software Defined Radio & Cognitive Radio

Course Outcomes

CO1: Understand the fundamental concepts of software defined radio and cognitive radio networks.

CO 2: Develop the cognitive radio, as well as techniques for spectrum holes detection that

cognitive radio takes advantage: in order to exploit it.

CO 3: Understand fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimisation techniques for better spectrum exploitation.

CO 4: Apply SDR principles to smart antennas.

MTWC-PE4C-18- Wireless and Optical Communication Networks

Course Outcomes

CO1: Learn Wireless Communication Network layers/technology.

CO 2: Understand basic network components of Wireless and Optical Networks.

CO 3: Explain their applications

MTWC-PE4D-18- MIMO Systems

Course Outcomes

CO1: Understand Basic MIMO communication systems.

CO 2: Explore Space-time block codes & Space-time trellis codes.

CO 3: MIMO systems for frequency-selective (FS) fading channels.

MTWC-PE5A-18- Millimeter Wave Communication Technology

Course Outcomes

CO1: Familiarization with the concept of Millimeter wave communication.

CO 2: Calculate the performance parameters in millimeter wave antennas.

CO 3: Model the millimeter wave link budget.

CO 4: Analyze the millimeter wave with multiple antennas.

A

Head
Desimal of Endmirs & Communication Engineering
Technical University
IK Guiral Puriab Technical University
Main Campus, Kapurbala (Punjab)-144603

MTWC-PE5B-18- Space Time Wireless Communication

Course Outcomes

CO1: Understand Space Time Channel Characterization.

CO 2: Explain Capacity of Multiple Antenna Channels.

CO 3: Learn ST OFDM, Spread Spectrum.

MTWC-PE5C-18- Advanced Techniques for Wireless Reception

Course Outcomes

CO1: Understand Wireless Signaling Environment.

CO 2: Explain the usage of Multiuser detection.

CO 3: Learn CDMA, OFDM, MIMO systems

MTWC-PE5D-18- Emerging Technologies of Wireless Communication

Course Outcomes

CO1: Understand the concept of cellular/wireless communication

CO 2: Explain the Mobile Radio Propagation and Multiuser systems.

CO 3: Learn technologies of GPRS, UMTS, WiFi, WiMAX, Ultra Wideband communications, 4G and beyond 4G.

MTWC-PE5E-18- Microstrip Antennas

Course Outcomes

CO1: Understand the basic concept of micro-strip antennas, methods of analysis and configurations.

CO 2: Explain micro-strip antennas arrays.

8

CO 3: Understand the physical significance of discontinuities

CO 4: Learn coupled micro-strip line with multiband and broadband behavior

MTOE-301A-18- Cost Management of Engineering Projects

Course Outcomes

CO1: Understand the cost calculation for decision-making about an engineering research project

CO 2: Able to define Role of each member in the project team

CO 3:Manage the project by applying Quantitative techniques for cost management

MTWC-111-18-Wireless Communication Lab

Course Outcomes

CO1:To design Path-Loss models

CO2:To investigate Fading environments in wireless channels CO3:To develop MATLAB codes for Block codes, Cyclic codes

MTWC-112-18-Information Theory and Coding Lab

Course Outcomes

CO1:To understand the programming of Entropies and Mutual In CO2:To learn and practice programming for generation and evaluation CO3:To develop MATLAB codes for Block codes, Cyclic codes

MTWC-105-18- SIMULATION OF WIRELESS COMM. SYSTEMS Laboratory

To understand the programming of OFDM based Transmitter & To learn and practice MATLAB programming for implementing To find the vacant spaces for secondary users in Cognitive Radio

MTWC-MP1-18-Mini Project

Course Outcomes

M

CO1: Acquire practical knowledge of the chosen field.

CO2 Identify, analyze, formulate & handle programming projects with systematic approach.

CO3: Contribute as a team leader in the development of technical projects.

CO4: Develop communication skills for the presentation of project related activities.

MTWC-DS1-18 DISSERTATION PHASE I

Course Outcomes

CO1: Critically analyse and evaluate existing knowledge about the chosen problem

CO 2: Find the gaps and motivation through literature survey.

CO 3:Design the framework to optimize the solution for the problem

CO 4: Construct the research proposal.

MTWC-DS2-18- DISSERTATION PHASE II

Course Outcomes

CO1: Implement the proposed framework practically or through simulation

CO 2: Gather the results and publish in the research articles.

CO 3: Write-up the proposed work, results with conclusion and future work in the form of thesis

CO4: Present the research work before a committee.

BOS (Co-ordinator)

Chairman (ECE)

IK Gujral Punjab Technical University Main Campus, Kapurihala (Punjab)-14460