Third Year (Sem - V) B. Tech. in Electronics & Telecommunication Engineering	(06)	C04	Scrambler, iterion for	Baseband Digital Transmission and Line Coding: Line coding, Pulse shaping, Inter-symbol interference (ISI), Eye pattern, Scrambler, unscramble, difference between source coding and line coding, Nyquist criterion for distortion less base band binary transmission.	Baseband Digital Transmission and Line Coding: Line coding, Pulse shaping, Inter-symbol interferounscramble, difference between source coding and distortion less base band binary transmission.	Baseband Dig Line coding, unscramble, d distortion less	Unit 5
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering  EX3501: Analog and Digital Communication  Examination Scheme    D3 Hrs/week   Examination Scheme   D2	(08)	C03	ements of and SNR, Systems tive delta		Modulation: Modulation: Elements of diging, Quantization and coding, antization, companding in Pla Modulation: Delta Modu	Pulse Digital Pulse Digital Pulse Digital PCM: Samplii Types of qua (DPCM). Del modulation.	Unit 4
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering  EX3501: Analog and Digital Communication  heme  03 Hrs/week   20  00 Hrs/week	(06)	C03	VM, PPM, Division	pes of pulse modulation-PAM, PW PWM and PPM. Frequency rigital Multiplexers.	Modulation: o pulse analog modulation, Tylond demodulation of PAM, Time Division multiplexing, D	Pulse Analog Introduction to Generation as Multiplexing,	Unit 3
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering  EX3501: Analog and Digital Communication  heme    O3 Hrs/week	(07)	C02	Spectral emphasis, Limiter. nd Ratio	ion, related numericals and and FM, Pre emphasis and Deer seeiver block diagram including detector, Phase Discriminator an	ation: tion (Mathematical express tion (Mathematical express ), Narrow Band and Wide B lirect FM generation. FM Re Single Slope, Balanced slope e Modulation.	Angle Modulat FM Modulat characteristics Direct & Ind Introduction S detector. Phase	Unit 2
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering  EX3501: Analog and Digital Communication  Examination Scheme  03 Hrs/week  00 Hrs/week  03 WSE  04 USE  05 USE  06 USE  CO): Students will be able to scribe the working of AM, FM, PM systems and radio transmitters/receivers.  ESE  Duration of ESE  02 Hrs 30 Min  Duration of ESE  02 Hrs 30 Min  Duration of ESE  O2 Hrs 30 Min	(08)	COI	SSC, cteristics). lector and ransmitter, nethod and ity. Tuned ram, Need of noise, nperature.	ation: Principles of DSB-FC, DSBS I numericals and Spectral characulation. Generation of AM (Colle ansmitter, high and low level tracethod, SSB generation – filter mess-Selectivity, Sensitivity & Fidelit odyne receiver: Detail block diagra Sources of noise, Classification ise figure, Noise Factor, Noise Tem	itters and Receiver: need of modulation, AM Modul thematical expression, related VSB modulation and demodu lator), Details of DSB-FC tr rration- balanced modulator m ethod. Receiver: Characteristic ncy (TRF) Receiver Superheter AGC. Introduction to noise, No tions (thermal noise), SNR, No	AM Transmit Modulation, no SSB-SC (Mat Principle of V Principle of	Unit 1
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering  EX3501: Analog and Digital Communication  Teaching Scheme  Lectures  O3 Hrs/week  Tutorials  O0 Hrs/week  Total Credits  O3  Total Credits  O3  COurse	Flours	CO		ontents	100		
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering  EX3501: Analog and Digital Communication  Teaching Scheme Lectures		erformance.	stems for p	, FSK, PSK, QAM) and M-ary syst	al modulation techniques (ASK	Analyze digita	CO4
Third Year (Sem – V) B. Tech. in Electronics & Telécommunication Engineering    EX3501: Analog and Digital Communication		,	mission.	luction methods in baseband transm	ding, pulse shaping, and ISI rec	Apply line coc	CO3
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication  EX3501: Analog and Digital Communication  heme  03 Hrs/week  00 Hrs/week  03 Secribe the working of AM, FM, PM systems and radio transmitters/receivers.		Aodulation.	and Delta N	ition techniques like PAM, PCM, a	pulse analog and digital modula	Demonstrate p	C02
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication  EX3501: Analog and Digital Communication  heme  03 Hrs/week  00 Hrs/week  Duration of ESE  Duration of ESE				ns and radio transmitters/receivers.	)): Students will be able to working of AM, FM, PM system	Outcomes (CO Describe the w	Course CO1
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication  EX3501: Analog and Digital Communication  heme  03 Hrs/week  00 Hrs/week  EX3501: Analog and Digital Communication  Examination Scher  MSE  ISE  ESE		8 30 Mm		Duration of ESE			
Sc				ESE		-	Total Cro
g Sc			20	ISE	week		Tutorials
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering  EX3501: Analog and Digital Communication  Examination Scheme			20	MSE	week		Lectures
Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering EX3501: Analog and Digital Communication			cheme	Examination Sc		g Scheme	Teachin
Third Year (Sem - V) B. Tech. in Electronics & Telecommunication Engineering		0	g	and Digital Communication	EX3501: Analog a		
		eering	ion Engin	lectronics & Telecommunication	ar (Sem - V) B. Tech. in E.	Third Ye	



<ol> <li>https://c</li> <li>https://r</li> </ol>			Useful Links	3. K. N. HariBh Edition 2010	2. Ranjai	1. A. Bru	Reference Books	3. B.P. Lathi & Press, 2018.	2. Taub, S	1. D. Ker	Text Books	Unit 6 Dig Dig Ke; Shi ary	
	https://nptel.ac.in/courses/117101051/ Prof. Bikash Kumar Dey IIT Bombay	https://onlinecourses.nptel.ac.in/noc21_ee74/preview/ Prof. Gautam Das IIT Kharagpur		K. N. HariBhat and D. Ganesh Rao, "Digital Communications – Theory and Lab Practice", Pearson, Third Edition 2010	Ranjan Bose, McGraw, "Information Theory coding and Cryptography", Hill Publication, 2nd Edition.	A. Bruce Carlson, "Communication Systems", 4th edition, McGraw-Hill, 2006.	oks	B.P. Lathi & Zhi Ding, "Modern Digital and Analog Communication Systems", 5th Edition, Oxford University Press, 2018.	Taub, Schilling and G.Saha, "Principles of Communication Systems", 3rd edition, McGraw Hill, 1995	D. Kennedy, "Electronic Communication Systems", 4th edition, Tata McGraw-Hill, 1999.		Digital Bandpass Modulation Techniques:  Digital Band pass Modulation techniques -Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Quadrature Phase Shift Keying, Quadrature Amplitude Shift Keying. Coherent and non-coherent detection, M-ary Modulation Techniques: M-ary Phase Shift Keying, M-ary Frequency Shift Keying M-ary Quadrature Amplitude Modulation.	
				irson, Thir	Edition.			xford Univ	1, 1995.			C04	
								ersity				(07)	

CO 4	CO 3	CO2	CO 1	PO→ CO↓
3	3	3	w	PO I
3	3	3	2	PO 2
w	w	S	2	PO 3
3	3	1	1	PO 4
3	2	2	3	PO 5
1	1	1	ı	PO 6
10	ī		1	PO 7
- 1	1	1	ı	PO 8
1	t	t	ı	PO 9
ı	ı	1	ı	PO 10
1	1	ı	1	PO 11
3	3	ß	2	PSO 1
з	3	w	3	PSO 2
3	သ	ယ	ယ	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	ı	,	S	5	5	5 .	MSE
20	1	1	5	5	5	5	ISE
60	1	1	20	10	20	10	ESE

Ining Scheme  Ining In	TMS, 2004			Reference Books
EX3502: Digital Signal Processing    Examination Scheme   Examination Scheme   MSE   20   20   20   20   20   20   20   2	, 4 <sup>th</sup> Edition TMS, 2004			in the contract of the contrac
EX3502: Digital Signal Processing  Examination Scheme  MSE  MSE  Duration of ESE  O2  ESE  O2  Duration of ESE  O2  O2  ESE  COUTS  COUT	, 4th Edition	aions,	gnal Processors: Architecture, Programming and Applicaio	4. B. Venkatramani, M. Basker: Digital S
EX3502: Digital Signal Processing    Examination Scheme   Examination Scheme   Examination Scheme   20   20	, 4th Edition		igital Signal Processing", Prentice Hall/Pearson	3. A.V.Oppenheim and R. W. Schafer, "I
EX3502: Digital Signal Processing    Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   MSE   20		earson,	Signal Processing-Principles, Algorithms and Apps", Pear	2. J. G. Proakis, D.K. Manolakis, "Digita
EX3502: Digital Signal Processing    Examination Scheme   MSE   20			ssing", SciTech publication, 4th Edition	1. P. Ramesh Babu, "Digital Signal Proc
EX3502: Digital Signal Processing    Examination Scheme   MSE   20				Text Books
EX3502: Digital Signal Processing    Examination Scheme   20		C04		Unit 6 TMS320C54XX Overview, Architecture, buses, Memory Peripherals, Address Generation Operation, Code Composer Stud
EX3502: Digital Signal Processing    Examination Scheme   20		COS	H.	Unit 5 DSP Processors: Overview, Se Neumann, Harward, VLIV (MAC), Pipelining.
EX3502: Digital Signal Processing    Examination Scheme   MSE   20		CO2		
EX3502: Digital Signal Processing    Examination Scheme   20     MSE   20     ISE   20     ISE   60     ESE   60     Duration of ESE   02 Hrs 30 Min     CO1     CO2     Duration of ESE   02 Hrs 30 Min     Duration of ESE   02 Hrs 30 Min     Duration of ESE   02 Hrs 30 Min     CO3     Duration of ESE   02 Hrs 30 Min     CO4     Duration of ESE   02 Hrs 30 Min     CO5     CO6     CO7     Duration of ESE   02 Hrs 30 Min     CO7     CO8     CO9     CO9			n analog filters using impulse invariant and bilinear zation of IIR filters, Analog and Digital frequency	Design of IIR digital filters fro transformation techniques, Rea transformations
EX3502: Digital Signal Processing  Examination Scheme  MSE  20  ISE  SES  CO  ESE  Duration of ESE  O2 Hrs 30 Min  Will be able to  Duration of ESE  Transform: Discrete Fourier transform (DFT), Properties of the DFT to other transforms, Filtering of long data in and decimation in frequency FFT algorithms, Differences of the DFT to other transforms, Filtering of long data in and decimation in frequency FFT algorithms, Differences of the DFT algorithms  EST Structures for realization of DT systems, Structures for IIR  CO2  II, Cascade form and Parallel form structures, Lattice Ladder of FIR systems-Direct form, Cascade form, Frequency sampling re		C02		Unit 3 Design of IIR Filters: Freque Analog filters, Analog Low Pas Bandston filters
EX3502: Digital Signal Processing    Examination Scheme   20     MSE   20     ISE   60     Duration of ESE   02 Hrs 30 Min     Serties, relationships and FFT algorithms   20     Serties, relationships and FFT a		CO2	4 1/0	Unit 2 Digital Filter Structures: Structures: Structures Filt Systems - Direct form I,II, Casc structures, Structures for FIR systructure, Lattice structure
EX3502: Digital Signal Processing  Examination Scheme  MSE  MSE  20  ISE  BESE  Will be able to  Duration of ESE  O2 Hrs 30 Min  Course Contents  COURSE CONTENT Transform (DFT), Properties  COURSE CONTENT Transform (DFT), Properties				sequences: Overlap-Save and of Radix-2 decimation in time and and Similarities between DIT an
EX3502: Digital Signal Processing    Examination Scheme   20     MSE   20     ISE   60     ESE   02 Hrs 30 Min     will be able to   Duration of ESE   02 Hrs 30 Min     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures     or as per specification with understanding of their structures		C01		Unit 1 Discrete and Fast Fourier Tra
EX3502: Digital Signal Processing  Examination Scheme  MSE  ISE  ESE  Will be able to  Duration of ESE  will be able to  perties, relationships and FFT algorithms rs as per specification with understanding of their structures processors and illustrate various architectures processor Symptomic Structures processor TMS320C54X processor		CO	Course Contents	
EX3502: Digital Signal Processing  Examination Scheme  MSE  ISE  ESE  Will be able to  Duration of ESE  will be able to  Percessors and illustrate various architectures  Tracessors and illustrate various architectures			ing TMS320C54X processor	
EX3502: Digital Signal Processing  Examination Scheme  MSE  ISE  ESE  Will be able to  Duration of ESE  will be able to  Duration of ESE			specification with understanding of their suddimes	CO2 Design FIK and IIK filters as per
EX3502: Digital Signal Processing  Examination Scheme  MSE  ISE  ESE  Duration of ESE  will be able to	7		lationships and FFT algorithms	
EX3502: Digital Signal Processing  Examination Scheme  MSE  ISE  ESE  Duration of ESE			ole to	Course Outcomes (CO): Students will be able to
heme EX3502: Digital Signal Processing    Digital Signal Processing				Prerequisite: Signals and Systems
	lin	rs 30 M	tion of ESE	
icheme EX3502: Digital Signal Processing  Examination Scheme  03 Hrs/week MSE 20  00 Hrs/week ISE 20				dits
EX3502: Digital Signal Processing Scheme Examination Scheme  O3 Hrs/week MSE 20				
EX3502: Digital Signal Processing  Examination Scheme				
EX3502: Digital Signal Processing			Examination Scheme	Teaching Scheme
0			3502: Digital Signal Processing	
Third Year (Sem - V) B. Tech. Electronics and Telecommunication Engineering		eering	ech. Electronics and Telecommunication Engineer	Third Year (Sem - V) B.



				,			
1. Climbt (I our)	CO 4	CO 3	CO 2	CO 1	<b>←</b>	→ CO	PO
t (T our	w	2	3	3		1	PO
	3	3	3	2		2	PO
٦.١	2	2	2	2		(J)	PO
Todoro.	1	1	1	1		4	PO
7. Madarata (Madium)	1	2	2	2		S	PO
1:	ı	1	L	-		6	PO
	1	ľ	1	1		7	PO
3. 6.	1	ı	ı	1		8	PO
hatant:	ı	ı	ı	ī		9	PO
2. Cubatantial (III ab)	1	1	ı	1		0	PO
,	1	ı	1	1			PO
	1	1	1	ı		jamenti'	PSO
	1	1	£	į.		2	PSO
	1	1	1	1		S	PSO
				_	_	_	_

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern

TOTAL 20	Create -	Evaluate -	Analyse 5	Apply 5	Understand 5	Remember 5	INTOMICASE PEACE INTOR
0 20	ı		5	5	5	5 5	TICH TIC
60		1	20	10	20	10	LOL

Third Year (Sun—Y) B. Tech. Electronise & Telecommunication  Teaching Scheme  Lectures  O3 Hrs/week  J00 Hrs/week  J01 Hrs/week  J02 Hrs/week  J03 Hrs/week  J03 Hrs/week  J03 Hrs/week  J04 Hrs/week  J05 Hrs/week  J05 Hrs/week  J06 Hrs/week  J07 Hrs/week  J08 Hrs/week  J08 Hrs/week  J08 Hrs/week  J08 Hrs/week  J00 Hrs/week  J01 Hrs/week  J02 Hrs/week  J03 Hrs/week  J03 Hrs/week  J03 Hrs/week  J04 Hrs/week  J04 Hrs/week  J05 Hrs/week  J05 Hrs/week  J07 Hrs/week  J08 Hrs/week  J02 J03 Hrs/week  J03 Hrs/week  J03 Hrs/week  J03 Hrs/week  J04 Hrs/week  J05 Hrs/week  J05 Hrs/week  J05 Hrs/week  J05 Hrs/week  J07 Hrs/week  J08 Hrs/week  J09 Hrs/w			ks	Text Books
Third Year (Sem — V) B. Tech Electronies & Telecommunication  EX3503: Embedded system & RIOS  Examination Scheme etures 03 Hrs/week   MSE 20  Iterrals 00 H	(06)	CO <sub>4</sub>	's: Introduction, features, ment, semaphore management	Unit 6
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  EX3503: Embedded system & RTOS  Examination Scheme  EX3503: Embedded system & RTOS  Examination Scheme  MSE  20  20  20  20  20  20  20  20  20  2			Clear-cut distinction between Functions, ISRS cteristics, Concept of Semaphores, Shared nunication, Signal Function, Semaphore Functions, Means of Semaphore Functions, Means of Functions, Pipe Functions, Socket Functions, RPC Functions, RPC Functions, Pipe Functions, Socket Functions, RPC Functions, Pipe Func	
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3613; Embedded system & RTOS  Examination Scheme  EX3613; Embedded system & RTOS  Examination Scheme  EX3613; Embedded system & RTOS  Examination Scheme  EX3613; Embedded system & RTOS  MSE  20  MSE  20  MSE  20  MISE  ANALYZER (Sortex M4 Microcontroller in Embedded System applications.  Design & Develop Embedded System principles such as multitasking techniques.  Losign & Develop Embedded System principles such as multitasking techniques.  Losign & Develop Embedded Systems; Introduction to Embedded Systems; Introduction to Embedded Systems; Introduction to Embedded Systems; Procent trends in embedded Systems; Introduction to Embedded Systems; Contrecture, Soperalities of embedded systems; Procent trends in embedded systems; Architecture of embedded systems; Procent trends in embedded systems; Architecture of embedded systems; Procent trends in embedded systems; Architecture, Software and Hardware tools like Cross Assembler, Compiler, Debugger, Simulator, In-Circuit Emulator (ICE), Keypad Simulator, Interfacing, Static and Dynamic Proticus, Procon, Software architecture, Procentive and Architecture, Procent	(07)	CO3	Inter-process Communication and Synchronization of Processes, Threads and Tasks:	Unit 5
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Exactures  On Hrs/week  cutures  On Hrs/week  Dual Credits  On Hrs/week  MSE  On Hrs/week  Ng Heal Writing Hadded System Applications of Enbedded Systems, Architecture, Application Software, Control, Clock & Power Control, Pin Connect Block. CMSIS Standard, Bus Protocols Ethernet, CAN  USB, Bluetooth, Development and Debugging Tools: Software and Hardware tools like Cross Assembler, Compiler, Debugger, Simulator, In-Circuit Emulator (ICE), Logic Analyzer etc.  Real world interfacing, stepper motor interfacing, digital -input output interfacing, Forgamaming on 12c & SPI bus Protocol, Study of any two real life embedded pynducts in detail.  Ritch Resources Taske Mking Incorate Switching Keenel Structure Pre-emptrice  CO			and non-pre-emptive Schedulers, Static and Dynamic Priorities, Priority Inversion, Mutual exclusion, Synchronization, Inter task communication mechanisms, Interrupts: Latency, Response and recovery, Clock Tick, Memory Requirements.	
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Exaching Scheme  Extractives  00 Hrs/week  01 Hllustrale & Apply concepts of Cortex M4 Microcontroller in Embedded System applications.  Dosign & Develop Embedded System applications for Real life, Engineering and Industrial Purpose Implement the real-time operating system principles such as multitasking techniques.  Analyze the structure and working of real-time operating systems.  Introduction to Embedded Systems: Introduction to Embedded Systems; Overview of embedded systems; Introduction to Embedded Systems, Coverview of embedded systems; Introduction to Embedded Systems, Hardware architecture, Specialities of embedded systems, Freather, Communication Software architecture, Specialities of embedded systems, Architecture of embedded systems, Application Software, Communication Software architecture, Application Software, Communication Software architecture, Application Software, Communication Software architecture, Application, System Control, Clock & Power Countol, Pin Connect Block, CMSIS Standard, Bus Protocols Ethemet, CAN USB, Bluetooth, Development and Debugging Tools: Software and Hardware tools like Cross Assembler, Compiler, Debugger, Simulator, In-Circuit Emulator (ICE), Logic Analyzer etc.  10 Logic Analyzer etc.  10 Real world interfacing, stepper motor interfacing, digital -input output interfacing, switch interfacing, stepper motor interfacing, digital -input output interfacing, Stepperny-Pi /Cortex M4: LED, LCD, Keypad CO2 interfacing, Stepperny-Pi /Cort	(08)	C02	RTOS Concepts: Foreground and background systems, Critical section, Shared Resources Tasks Multirasking Context Switching Kernel Structure Presembline	I nit 4
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  Extures  O3 Hrs/week  O4 Hrs/week  O5 Hrs/week  O6 Hrs/week  D6 Hrs/week  D7 Hrs/week  D8 Hrs/week  D8 Hrs/week  D8 Hrs/week  D9 Hrs/week	(06)	C02	Real world interfacing using Raspberry-Pi /Cortex M4: LED, LCD, Keypad interfacing, switch interfacing, stepper motor interfacing, digital -input output interfacing, Programming on I2c & SPI bus Protocol, Study of any two real life embedded products in detail.	Unit 3
Third Year (Sem - V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS    Examination Scheme   Examination   Examination Scheme   Examination   Examination Scheme   Examinatio			Power Control, Pin Connect Block. CMSIS Standard, Bus Protocols Ethernet, CAN USB, Bluetooth. Development and Debugging Tools: Software and Hardware tools like Cross Assembler, Compiler, Debugger, Simulator, In-Circuit Emulator (ICE), Logic Analyzer etc.	
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  MSE  Scheme  MSE  Scheme  Scheme Sc	(08)	C02	ARM CORTEX Fundamentals: Background of ARM Architecture, ARM CORTEX series features, Improvement over classical series, CORTEX ARM processors series, Features and applications, ARM- M series Based Microcontroller:	Unit 2
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  eaching Scheme  Extures  O0 Hrs/week  O0 Hrs/week  Duration of ESE  Duration of ESE  Implement the real-time operating system applications for Real life, Engineering and Industrial Purpose Introduction to Embedded Systems: Introduction to Embedded Systems, CO1  Introduction to Embedded Systems: Introduction to Embedded Systems, CO1		-	Application Areas, Design Methodology, Design Metrics, Categories of embedded systems, Overview of embedded system architecture, Specialties of embedded systems, recent trends in embedded systems, Architecture of embedded systems, Hardware architecture, Software architecture, Application Software, Communication Software. Embedded system design and development: Embedded system design, Life- Cycle Models, Development tools.	Unit 1
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  aching Scheme  ctures  03 Hrs/week  1SE  20  20  20  20  20  20  20  20  20  2	Hours (07)	CO1	Introduction to Embedded Systems: Introduction to Embedded Systems,	
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  cetures  03 Hrs/week  torials  00 Hrs/week  torials  03 Green  Third Year (Sem – V) B. Tech. Electronics & Telecommunication  MSE  20  MSE  20  ESE  60  Duration of ESE  02 Hrs  Terequisite: Microcontroller  Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Tech. Electronics & Telecommunication Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Tech. Electronics & Telecommunication Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Tech. Electronics & Telecommunication Scheme  EX3503: Embedded System & RTOS  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded System & RTOS  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Tech. Electronics & Telecommunication Scheme  EX3503: Embedded System & RTOS  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  Examination Scheme  20  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B. Telecommunication  ESE  02 Hrs  Third Year (Sem – V) B.			nalyze the structure and working of real-time operating systems.	
Third Year (Sem - V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  Examination Scheme  aching Scheme  aching Scheme  bital Credits  03 Hrs/week  torials  00 Hrs/week  torials  00 Hrs/week  torials  00 Hrs/week  torials  10 Hrs/week  tor		ļ	nplement the real-time operating system principles such as multitasking techniques.	
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  g Scheme  03 Hrs/week  00 Hrs/week		as.  Purpose	lustrate & Apply concepts of Cortex M4 Microcontroller in Embedded System application esion & Develon Embedded System applications for Real life. Engineering and Industrial	
Third Year (Sem - V) B. Tech. Electronics & Telecommunication			will be able to	Student v
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  g Scheme  03 Hrs/week 00 Hrs/week edits 03  Duration of ESE 01  Diration of ESE 01  Diration of ESE 01  Diration of ESE 01  Diration of ESE 02  Diration of ESE 03  Diration of ESE 04  Diration of ESE 05  Diratio			Outcomes (CO)	Course (
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  g Scheme  03 Hrs/week  00 Hrs/week  00 Hrs/week  Duration of ESE  Min			isite: Microcontroller	Prerequi
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  g Scheme  03 Hrs/week  00 Hrs/week  00 Hrs/week  EX3503: Embedded system & RTOS  Examination Scheme  MSE  1SE  ESE	rs 30	02 H		
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  g Scheme  03 Hrs/week  00 Hrs/week  Examination Scheme  ISE		60	03	Total Cre
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3503: Embedded system & RTOS  g Scheme  O3 Hrs/week  MSE		20	00 Hrs/week	Tutorials
Government College of Engineering, Kara d Year (Sem – V) B. Tech. Electronics & Telecomr EX3503: Embedded system & RTOS		20	Hrs/week	Lectures
Third Year (Sem – V) B. Tech. Electronics & Telecommunication		me	EA3503: Embedded System & K1OS	Toochin
Government College of Engineering, Karad			Third Year (Sem – V) B. Tech. Electronics & Telecommunication	
~			Government College of Engineering, Karad	



 Joseph Yiu, "The Definitive Guide to ARM Cortex M3/M4 Processors", Elsevier; First edition, 2014
 Dr. K. V. K. K. Prasad; Embedded / real-time systems: concepts, design & programming, Black Book; Dreamtech press, Reprint edition2013
 Reference Books
 Mark Lutz, "Learning Python", O'Reilly Media, 5th Edition, 2016.
 Jean Labrosse: MicroC/OS-II: The Real-Time Kernel; Meets Requirements for Safety-Critical Systems , 2nd Edition, Elsevier/Shroff Publishers, 2011. Useful Links 1. Raj Kamal, "Embedded Systems, 4th Edition", Published by McGraw Hill India, 2020

### Mapping of COs and POs

www.arm.com
 www.nxp.com

CO 4	CO 3	CO2	CO 1	*	00	PO→
1	3	2	1		)d	РО
2	3	2	2	2	0	Ъ
1	w	2	1			PO3
2	3	2	1			PO3 PO4 PO5 PO6
1	ယ	2	1			PO 5
1	3	1	1			9 O d
t	3	2	1			PO7
ı	•	,	1			P08
ı	ယ	2	_	9	0	P
L		ı	1			PO10
_	3	2	1			PO11
2	3	2	1		01	PS
1	3	1	1	1		PSO2
1	2	3	1			PSO3

## Guideline for Assessment Pattern

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	1	-	S	5	5	5	MSE
20	,	,	5	5	5	5	ISE
60	1	1	20	10	20	10	ESE

Trachling Scheme   EX3514; Control System (Program Elective 401)		Learning New Delhi, 2" edition, 1997.	199/.	FHI Learning New Delhi, 2 edition, 19	. Denjamin C.Nuo, Automane Control System
EX3514: Control System (Program Elective OI)  B Hrs/week			2	The state of the s	Reniamin C Vuo "Automatia Control Control
arching Scheme  EX3514: Control System (Program Engliteering CO)  arching Scheme  Examination  Exam				ce Hall.	3. Ogata K, "Modern Control Engineering", Prent
cheme EX3514: Control System (Program Elective-01)  EX3514: Control System (Program Elective-01)  EX3514: Control System (Program Elective-01)  BYSE 20  CO1  BYSE 20  CO2  BYSE 20  CO3  BYSE 20  CO3  BYSE 20  CO2  BYSE 20  BYSE		on, 2018.	ed Editic	rol System Engineering", Scitech, 5th Revise	+
cheme  Cheme  EX3514: Control System (Program Elective-OI)  EX3514: Control System (Program Elective-OI)  Examination Scheme  03 Hrs/week  03 Hrs/week  03 Hrs/week  04 MSE  20  05 Bold Hrs/week  Examination of ESE  06 Duration of ESE  07 Hrs 30 Min  Examine the time domain behavior of first and second order system.  Course Control System using frequency response methods.  Course Control System suring state space analysis.  Course Control System suring state space analysis.  Course Control System, Concept of Open & Closed of control Systems, Basic elements in Control System, Concept of Open & Closed of control Systems, Mathematical Modeling of electrical and mechanical systems canalational and Rotational), Block diagram representation of systems, Block diagram duction techniques, Signal Flow Graph and Mason's gain formula reduction.  Imp Domain Analysis:  Touted of stability, Absolute and relative stability, necessary conditions of stability analysis using bode plot, transfer function from Bode plot, stability analysis using Bode plot, transfer function from Bode plot, Polar plot, Nyquist stability iterion  Troduction to controller design:  and Compensation, Lag Compensation, Lag-lead Compensation, P. Pl. P.D. P.D. controllers of State variables and state equations, Concept of State variables and State variables and state feedback.  CO2  ate Variable analysis and Controller:  Domain Analysis and Controller:  CO3  Touted of the control state equations, Concept of Controllability and Observability, Pole accement by state feedback.		18.	onal, 20	ngineering", 6th Edition, New Age Internation	
EX3514: Control System (Program Elective -01)  Examination Engineering  Examination Scheme  O3 Hrs/week  O6 Hrs/week  O7 Hrs/week  O8 Hrs/week  O8 Hrs/week  O9 Hrs/week  O8 Hrs/week  O9 Hrs/week  O8 Hrs/week  O9 Hrs/week  O0 Determine the time domain behavior of first and second order systems. Basic elements in Control System, Concept of Open & Closed loop control Systems, Basic elements in Control Systems, Concept of Open & Closed loop control systems, Mathematical Modeling of electrical and mechanical systems (Translational and Rotational), Block diagram representation of systems, Block diagram reduction techniques, Signal Flow Graph and Mason's gain formula reduction.  Time Domain Analysis:  Time Domain Analysis:  Time Domain Analysis:  C01  Type and order of the Control Systems, Types of Standard Inputs, Transient response of first and second order systems, Signal Flow Graph and Mason's gain formula reduction.  C01  Type and order of the Control Systems, Types of Standard Inputs, Transient response of first and second order systems, Signal Flow Graph and Mason's gain formula reduction.  C01  C02  C03  Translations Analysis:  C03  Translations Analysis using Bode plot, Tansfer function from Bode plot, Polar plot, Nyquist stability analysis using bode plot, transfer function from Bode plot, Polar plot, Nyquist stability analysis using shalling reduction.  C02  C03  C03  Tarnslations (Plase, Plased Compensation, P. Pl, PD, PID controllers variable placement of state equations, Concept of Controllability and Obser					Text Books
EX3514: Control System (Program Elective -01)  Examination Engineering  EX3514: Control System (Program Elective -01)  Examination Scheme  03 Hrs/week  00 Hrs/weem  00 Hrs/week  00 Hrs/week  00 Hrs/week  00 Hrs/week  00 Hrs/we	(06)	CO4	riable nd its , Pole	tate Model, Different forms of state varionical form), State Transition Matrix annept of Controllability and Observability,	
Scheme   EX3514: Control System (Program Elective -01)	(06)	CO2	rollers dustrial obotics	ag-lead Compensation, P, PI, PD, PID control control in Temperature Regulation (Indexented (Electric Vehicles), PD Control in Ro	
EX3514: Control System (Program Elective -01)	(08)	CO3	tability lity	n from Bode plot, Polar plot, Nyquist stabili	
Scheme   EX3514: Control System (Program Elective -01)	(08)	CO2	Routh	ue: stability, necessary conditions of stability, R ules for plotting root loci, stability analysis u	Unit 3 Stability Analysis & Root Locus Technic Concept of stability, Absolute and relative stability criterion, Concept of root locus, Froot locus
EX3514: Control System (Program Elective -01)  EX3514: Control System (Program Elective -01)  Examination Scheme  O3 Hrs/week  O4 Hrs/week  O5 Hrs/week  O6 Hrs/week  D0 Hrs/week  D1 SE  D20  Determine the time domain behavior of first and second order system.  Identify the stability of the system using frequency response methods.  Examine the control Systems using state space analysis.  Course Contents  Introduction to Control Systems.  Basic elements in Control System, Concept of Open & Closed loop control system, Mathematical Modeling of electrical and mechanical systems (Translational and Rotational), Block diagram representation of systems, Block diagram reduction.  Examine the control Systems, Signal Flow Graph and Mason's gain formula reduction.	(08)	C01	nse of error	Types of Standard Inputs, Transient responain specifications, Steady state errors and n.	Unit 2 Time Domain Analysis:  Type and order of the Control Systems, first and second order systems, Time dor constants, Effect of adding a zero to system
EX3514: Control System (Program Elective -01)  g Scheme  03 Hrs/week  00 Hrs/week  00 Hrs/week  00 Unstrol System (Program Elective -01)  Examination Scheme  20  MSE  20  ISE  20  Duration of ESE  02 Hrs 30 Min  Determine the time domain behavior of first and second order system.  Identify the stability of the system using frequency response methods.  Examine the control systems using state space analysis.  Course Contents  Course Contents  Course Contents	(06)	C01	losed stems um	in Control System, Concept of Open & Cledeling of electrical and mechanical systems ram representation of systems, Block diagrand Mason's gain formula reduction.	
EX3514: Control System (Program Elective -01)    System   Figure   Examination Scheme   Examination Scheme   20	Hours	CO		se Contents	
EX3514: Control System (Program Elective -01)  EX3514: Control System (Program Elective -01)  Examination Schem  O3 Hrs/week  O0 Hrs/week  O3 Hrs/week  ISE  ISE  Site: Mathematics, Computer Fundamentals  Determine the time domain behavior of first and second order system.  Identify the stability of the system using frequency response methods.	,			ace analysis.	CO4 Examine the control systems using state sp
EX3514: Control System (Program Elective -01)  EX3514: Control System (Program Elective -01)  Examination Schem  O3 Hrs/week  O0 Hrs/week  O3 WSE  ISE  Site: Mathematics, Computer Fundamentals  Dutcomes (CO): Students will be able to  Determine the time domain behavior of first and second order system.				frequency response methods.	CO3 Recognize the behavior of the system using
EX3514: Control System (Program Elective -01)  EX3514: Control System (Program Elective -01)  Examination Schem  O3 Hrs/week  O0 Hrs/week  O3 Hrs/week  ISE  Site: Mathematics, Computer Fundamentals  Determine the time domain behavior of first and second order system.					CO2 Identify the stability of the systems.
EX3514: Control System (Program Elective -01)  EX3514: Control System (Program Elective -01)  O3 Hrs/week  O0 Hrs/week  O0 Hrs/week  ISE  Site: Mathematics, Computer Fundamentals  Duration of ESE  Utcomes (CO): Students will be able to				t and second order system.	CO1 Determine the time domain behavior of fir
Scheme  EX3514: Control System (Program Elective -01)  EX3514: Control System (Program Elective -01)  Examination Schem  O0 Hrs/week  O0 Hrs/week  ISE  dits  O3  ESE  Duration of ESE					Course Outcomes (CO): Students will be able to
g Scheme EX3514: Control System (Program Elective -01)  O3 Hrs/week O9 Hrs/week ISE  cdits O3 Duration of ESE  Duration of ESE				S	rerequisite: Mathematics, Computer Fundamenta
g Sch dits		30 Min	02 Hrs	ntion of ESE	
Sch			60		dits
g Sch			20		
EX3514: Control System (Program Elective -01)			30		S OCHE
Inita year (Sem - v) B. Iech. Ejectronics & Lejecommunication Engineering				System (Program Elective -UI)	
		20	incerin	lectronics & Telecommunication Engi	Inird Year (Sem - V) B. Iech. I



4 CO	3 3	CO 2	100	<b>←</b>	CO	1	PO
-	_	1	3			<b></b>	PO
1	1	1	2			2	PO
. I	1	1	1			ယ	PO
1	1	2	-1			4	PO
1	ı		1			Uı	PO
1	1	1	1			6	PO
	1	1	1			6	PO
ı	ı	1	. 1		96	00	PO
1	T.	1	1			9	PO
ı	t	1	1			10	PO
1	I	1	1			1	PO
1	1	-	1			<b></b>	PSO
	1		1			2	PSO
1	1	1				Ç.	PSO

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	1	,	5	5	5	5	MSE
20	-	1	5	5	5	5	ISE
60	1	-	20	10	20	10	ESE

ing scheme    Distance   Distance	+
MSE   20    MSE   20   SEE   20   ESE   20   Est   20   ESE   20   Est   20   ESE   20   Est   20	1. Andi Sudiana Putra "Drives and Control to
MSE   20	macnines
MSE   20  ESE   60  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  III be able to   20  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  ESE   60  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  ESE   20  Duration of ESE   02 Hrs 30 Min    Machines, Control Systems,   20  Control Hours   20  Control Hours   20  Control Control, Single-phase and three-phase and field current control, Single-phase and three-phase and systems, Applications of DC (07)  Control:	in servo drives, Industrial application
MSE  MSE  MSE  MSE  MSE  MSE  MSE  MSE	stepper motor control, Servo motors:
MSE    MSE   MSS	
MSE  MSE  MSE  MSE  MSE  MSE  MSE  MSE	Init 6 Stonnor and Source Duits
Machines, Control Systems,  III be able to  III be able to  Duration of ESE  Duration of ESE  Duration of ESE  O2 Hrs 30 Min  Machines, Control Systems,  III be able to  Duration of ESE  Duration of ESE  O2 Hrs 30 Min  Machines, Control Systems,  Duration of ESE  O2 Hrs 30 Min  COI  COI  COI  COI  COI  (07)  COI  COI  COI  (07)  COI  COI  COI  (07)  COI  COI  COI  COI  COI  COI  COI  CO	Modulation) in AC drives. Inverter-fe
Machines, Control Systems,  Machines, Control Systems,  III be able to  Duration of ESE  Duration of ESE  Duration of ESE  O2 Hrs 30 Min  Machines, Control Systems,  III be able to  Duration of ESE  Duration of ESE  O2 Hrs 30 Min  Machines, Control Systems,  Duration of ESE  O2 Hrs 30 Min  COI  COI  COI  COI  COI  COI  COI  CO	motors: Voltage control V/f control
MSE    MSE   20   SESE   60   Duration of ESE   02 Hrs 30 Min   Machines, Control Systems,   III be able to   Duration and explain closed-loop control systems.   Course Contents   Course	Unit 5 AC Drives and Their Control:
Machines, Control Systems, III be able to  Machines, Control Systems, III be able to  Duration of ESE  Duration of ESE  Duration of ESE  Duration of ESE  O2 Hrs 30 Min  CO2 Hours  CO3 (07)  CO3 (07)  Dives:  CO4 (07)  To dives in automation, Types of electrical drives: AC Drives, DC control lrypes in automation, Pages of closed-loop control lrypes, or drives in industrial automation, Basics of closed-loop control lrypes, or drives in industrial automation, Basics of closed-loop control lrypes, DC control lrypes in dearacteristics, Speed control methods of DC motors: Types and characteristics, Speed control methods woltage and field current control, Single-phase and three-phase trol of DC motors using feedback systems, Applications of DC  D2 (07)	-
MSE    BSE   20	DC drives, Closed-loop control of DC
MSE    SESE   20	of DC motors: Armature voltage and
MSE  ISE  ISE  MSE  ISE  MSE  ISE  MSE  ISE  MASE  ISE  ISE  MASE  ISE  ISE  ISE  ISE  ISE  ISE  ISE	Construction and working of DC mot
MSE  MSE  MSE  MSE  MSE  MSE  MSE  MSE	Unit 4 DC Drives and Their Control:
MSE  MSE  MSE  MSE  MSE  MSE  MSE  MSE	Control Structure, Digital control Imp
MSE  MSE  MSE  MSE  MSE  MSE  MSE  MSE	Open-loop Versus Closed-loop Control, Servo
MSE  MSE  MSE  20  ISE  20  ISE  20  ESE  MORACHINES, Control Systems, Ill be able to  pes of power converters and their applications of power semiconductor  pes of electrical drives used in automation and explain closed-loop control systems.  TOC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  cs  characteristics and Applications)  c operations and types (Rectifier, Inverter, Chopper, CO2  characteristics and Applications, Power converters, controllers, or drives in industrial automation, Basics of closed-loop control systems.  CO1  (07)  (07)  (07)	Unit 3 Control System in Servo Drives:
MSE  MSE  IISE  Duration of ESE  O2 Hrs 30 Min  Machines, Control Systems,  Ill be able to  Duration and explain closed-loop control systems.  Pes of power converters and their applications.  Pes of electrical drives used in automation and explain closed-loop control systems.  TOC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  Col  Course Contents  Col  Col  (07)  ices like SCR, TRIAC, DIAC, IGBT, UJT, DIODE (Symbol. CO2)  characteristics and Applications)  c operations and types (Rectifier, Inverter, Chopper, Control systems, DC)  jives in automation, Types of electrical drives: AC Drives, DC  3, Drive components: Motors, power converters, controllers, Controllers, DC  3, Drive in industrial automation, Basics of closed-loop control  CO3  (07)	in automation systems
MSE  ISE  SESE  MAChines, Control Systems, Ill be able to  res, operation, V-I characteristics, and applications of power semiconductor pes of electrical drives used in automation and explain closed-loop control systems.  TOC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  CO  CO  CO  CO  CO  CO  CO  CO  CO  C	sensors, Selection criteria for drives ii
MSE  MSE  MSE  20  ISE  ESE  60  Duration of ESE  02 Hrs 30 Min  Machines, Control Systems,  Ill be able to  res, operation, V-I characteristics, and applications of power semiconductor pes of electrical drives used in automation and explain closed-loop control systems.  r DC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  cs  characteristics and Applications)  c operations and types (Rectifier, Inverter, Chopper, CO2  characteristics and Applications)  c operations  Types of electrical drives: AC Drives, DC  O7)  CO3  (07)	Drives, and Servo Drives, Drive c
MSE  MSE  MSE  20  ISE  ESE  60  Duration of ESE  02 Hrs 30 Min  Machines, Control Systems,  ill be able to  res, operation, V-I characteristics, and applications of power semiconductor  pes of power converters and their applications.  pes of electrical drives used in automation and explain closed-loop control systems.  or DC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  cs  characteristics and Applications)  c operations and types (Rectifier, Inverter, Chopper,  CO2  CO3  (07)	Definition and need for drives in au
MSE  MSE  MSE  20  ISE  BESE  MAChines, Control Systems, Ill be able to  res, operation, V-I characteristics, and applications of power semiconductor  pes of power converters and their applications.  pes of electrical drives used in automation and explain closed-loop control systems.  TDC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  Course Contents  cs  characteristics and Applications)  c operations and types (Rectifier, Inverter, Chopper,	Unit 2 Introduction to Drives and Automation:
MSE  MSE  MSE  20  ISE  20  ESE  60  Duration of ESE  02 Hrs 30 Min  Machines, Control Systems,  ill be able to  res, operation, V-I characteristics, and applications of power semiconductor  pes of power converters and their applications.  pes of electrical drives used in automation and explain closed-loop control systems.  or DC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  Course Contents  cs  characteristics and Applications)  c operations and types (Rectifier, Inverter, Chopper, Chop	onverter)
MSE  MSE  MSE  20  ISE  20  ESE  Machines, Control Systems, Ill be able to  Ises of power converters and their applications.  Pes of electrical drives used in automation and explain closed-loop control systems.  In DC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  Course Contents  Course Contents  Columbol.	Power Converters Basic operati
MSE  ISE  ISE  OUT  MACHINES, Control Systems,  III be able to  III be able to	Key feature, operation, V-I characteri
MSE  MSE  MSE  20  ISE  20  ISE  20  ESE  Machines, Control Systems,  Ill be able to  Ill be able to  In pes of power converters and their applications.  In pes of electrical drives used in automation and explain closed-loop control systems.  In DC, AC, stepper, and servo drives in industrial automation and robotics.  Course Contents  CO  Hours  CO  (07)	_
MSE  MSE  MSE  20  ISE  ESE  Machines, Control Systems,  III be able to  III be able to  III be applications of power semiconductor  The pes of power converters and their applications.  The pes of electrical drives used in automation and explain closed-loop control systems.  The per contents  Course Contents  MSE  20  LIVE  AC, Stepper, and servo drives in industrial automation and robotics.  Course Contents  MSE  20  LIVE  AC  BURS 30 Min  CO  Hours	Unit 1 Basics of Power Electronics
MSE  MSE  20  ISE  ESE  MAChines, Control Systems, ill be able to rres, operation, V-I characteristics, and applications of power semiconductor pes of power converters and their applications. pes of electrical drives used in automation and explain closed-loop control systems. r DC, AC, stepper, and servo drives in industrial automation and robotics.	
MSE  ISE  ISE  ESE  O2 Hrs 30 Min  Machines, Control Systems,  ill be able to  res, operation, V-I characteristics, and applications of power semiconductor  pes of power converters and their applications.  pes of electrical drives used in automation and explain closed-loop control systems.	CO4 Apply control techniques for DC, AC,
MSE  ISE  ISE  ESE  MOSE  OUT A THE PROPERTY OF THE PROPERTY O	CO3 Identify components and types of elec
MSE  MSE  20  ISE  ESE  Machines, Control Systems, ill be able to  res, operation, V-I characteristics, and applications of power semiconductor	CO2 Explain the working and types of pow
MSE 20  ISE 20  ISE 60  Machines, Control Systems,  III be able to Examination Science  MSE 20  ESE 60  Duration of ESE 02 Hrs 30 Min	devices
MSE ISE ESE Duration of ESE	80
MSE ISE ESE Duration of ESE	Prerequisite: Basics of Electrical Machines, Control Systems,
nination Schem	
nination Schem	Total Credits 03
nination Schem	Tutorials 00 Hrs/week
Examination Scheme	Lectures 03 Hrs/week
	Teaching Scheme
EX3524: Drives and Control for Automation (Program Elective -01)	EX3524: Drives and Co
Third Year (Sem - V) B. Tech. Electronics and Telecommunication Engineering	I hird Year (Sem - V) is, Leci
AN TOTAL TRANSPORT OF THE STATE	The state of the s



Reference Books
ŗ.
2. R. Krishnan, "Electric Motor Drives: Modelling, Analysis, and Control", Prentice Hall, 2009.
3. Bimal K. Bose, "Modern Power Electronics and AC Drives" Published by Pearson India, 2015
Useful Links
<u> </u>
2

CO 4	СО 3	CO 2	CO 1	PO CO↓
1	_	-	1	PO I
1	_	w	_	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 6 PO 8 PO 9
2	ယ	-		PO 3
2	-	_	_	PO 4
ယ	1	1	2	PO 5
1	1	1	- 1	PO 6
1	1	1		PO 6
1	- 1	1	,	PO 8
ı	1	ī	1	PO 9
1	1	1		5 5
1	1	1	1	PO
2	1	_	_	PSO
2	2	2	1	PSO 2
3	-	1	1	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
		te .	e		ınd	er	Level
20	ı	1 .	5	5	5	5	MSE
20	r	ı	5	5	5	5	ISE
60	1	1	20	10	20	10	ESE

	TOOR	Thomas r Qualiert, Discrete-time speech Signal Processing – Principles and Practice", Pearson Education	1.   Inollias r Qualieri, Discre
	1		-
r, second	ierabac	Edition, 2001.	Edition, 2001.
Canan	arokod	a Audio 11000531118, Wiley Illuia, New Delli, 2012.	-
		Rabiner and Schafer, "Digital Processing of Speech Signals", Pearson Education, Delhi, 2004.  Dr. Shaila D. Ante. "Speech and Audio Processing" Wiley India New Delhi, 2012.	<ol> <li>Rabiner and Schafer, "Digita</li> <li>Dr. Shaila D. Ante. "Sneech a</li> </ol>
			100
)		system—speaker recognition and speaker verification, different parameters used for speaker recognition, speech recognition and Understanding, Introduction to text —to- speech synthesis system.	system –speaker recogn recognition, speech re synthesis system.
(05)	CO4	<b>Speech Applications:</b> Speech processing applications such speech recognition, state of art for speech recognition, Architecture of a large vocabulary continuous speech recognition	Unit 6 Speech Applications: S for speech recognition,
		A-law & Mu Law compander, sub band coding, speech	Nonlinear quantization, A-law & Mu Law enhancement introduction,
(07)	C03	Speech coding techniques: PCM, differential encoding, Prediction in DPCM, DPCM, ADPCM, Delta modulation, G.726 recommendation for ADPCM, scalar quantizers,	Unit 5 Speech coding technic ADPCM, Delta modu
(0.)	COS	coefficients, Forward and backward linear prediction, Derivation of normal equations, Levinson Durbin algorithm, Selection criteria for order of the predictor	coefficients, Forward a Levinson Durbin algorit
-			
(08)	C02	<b>Speech Analysis:</b> Short time analysis and filter bank approach, Cepstral coefficients, Mel Frequency Cepstral coefficients, Homomorphic processing, Transform domain analysis of speech. Short time spectrum analysis of speech 2-D. 3-D spectrogram analysis, use of	Unit 3   Speech Analysis: Shor Frequency Cepstral coe speech. Short time spe
		Methods to find pitch period such as autocorrelation method, AMDF, parallel processing approach etc. Linear prediction parameters, Formants, Relation between LPC and formants, Methods to find formants, Dynamic time warping for pattern comparison, (7L)	Methods to find pitch I approach etc. Linear pre Methods to find forman
(07)	C02	ure extraction, fundamental frequency,	Unit 2 Basic Speech Paramet
(08)	C01	<b>Speech and Audio Fundamentals:</b> Basics of speech production, LTI model for speech signal, Time varying nature of speech, LTV model for speech, Voiced and unvoiced speech, Acoustic phonetics: vowels, diphthongs, semivowels, nasals, fricatives, stops and affricates. consonants and fricatives etc. Methods of V/UV decision making, Nature of speech signal, random process. Format of a wav file	Unit 1 Speech and Audio Fu signal, Time varying 1 speech, Acoustic phone affricates. consonants 2 speech signal, random p
) bespect	CO		
		g Applications	CO4 Explore Speech Processing Applications
		sing Algorithms	CO3 Implement Speech Processing Algorithms
		Analyze Speech Signals Using Various Techniques	CO2 Analyze Speech Signals
		Understand the Fundamentals of Speech Processing	CO1 Understand the Fundam
		will be able to	Course Outcomes (CO): Students will be able
	0	P. HIMING OF PART	Prerequisite: Signals and Systems
3	30 M	Duration of ESE 00 Hrs 30 Min	Total Credits 03
		MSE 20	Lectures 03 Hrs/week
		Examination Scheme	Teaching Scheme
		EX3534: Digital Speech Processing (Program Elective -01)	EX353
	2d	Third Year (Sem - V) B. Tech. Electronics and Telecommunication Engineering	Third Year (Sem



6.	.s	4	çu	2.	1.	Use		w
6. https://www.youtube.com/watch?v=cnkVeKtaTjk&t=1660s	https://www.youtube.com/watch?v=Xjzm7S kBU	https://web.ece.ucsb.edu/Faculty/Rabiner/ece259/speech%20course.html	3. https://www.youtube.com/watch?v=GxkzxTFvhDU	2. https://www.youtube.com/watch?v=X_JvfZiGEek&list=PL90C59267A925137D	1. https://nptel.ac.in/courses/117/105/117105145/	Useful Links	music, Wiley-India Edition, Student Edition, 2006.	3. Ben gold and Nelson Morgan, "Speech and audio signal processing", processing and perception of speech and

CO 4	CO3	CO 2	CO I	PO → CO
2	2	ယ	w	PO 1
2	2	2	2	PO 2
1	2	2	1	PO 3
1	1	Н	Ы	PO 4
1	Н	ሥ	ı	PO 5
ı	1			PO 6
	1	1	1	PO .7
1	1	. 1		PO 8
ı	,		1	PO 9
1	1	1	ı.	PO 10
ı	1	,	Ē.	PO 11
1	,		1	PSO 1
2		2	,	PSO 2
	,	,	1	PSO 3
	2 2 - 1 1 2	2     2     2     1     1     - <td>3       2       2       1       1       -       -       -       -       -       2       2         2       2       2       1       1       -</td> <td>3       2       1       1       -</td>	3       2       2       1       1       -       -       -       -       -       2       2         2       2       2       1       1       -	3       2       1       1       -

## Assessment Pattern (with revised Bloom's Taxonomy)

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	F	ı	5	5	5	5	MSE
20	1	L	5	5	5	5	ISE
60	ı	Ē	20	10	20	10	ESE

	Third Vear (Som - V) R Tech Flactronics & Telecommunication Engineering	Felocommination Whitippris	no	
E)	EX3544: Machine Learning with Mathematical Foundations (Program Elective -01)	oundations (Program Elective	-01)	
Teaching Scheme	eme	<b>Examination Scheme</b>		
Lectures	03 Hrs/week	MSE 20		=
Lutorials	00 Hrs/week	ISE 20		
Total Credits	03	ESE 60		
		Duration of ESE 02 Hr	02 Hrs 30 Min	
Prerequisite:				
Course Outco	Course Outcomes (CO): Students will be able to			
CO1 Appl:	Apply concepts of Linear Algebra and Calculus to solve data science and machine learning problems	a science and machine learning pro	blems	
CO2 Anal	Analyze probability distributions and statistical methods for data interpretation and decision-making	r data interpretation and decision-m	naking.	
CO3 Evah	Evaluate EDA and Feature Engineering techniques to enhance data preprocessing for machine learning	ice data preprocessing for machine	learning.	
CO4 Desig	Design and implement Machine Learning models, optimizing performance using evaluation metrics Regularization.	nizing performance using evaluat	ion metr	ics and
	Course Contents		CO	Hours
Unit 1			C01	(07)
	Vectors-Magnitude and direction, Vector example in machine learning, Row and Column Vector, Vector addition & subtraction, scalar multiplication, dot product, cross product Feature vectors distance metrics (Finelidean distance cosine)	Vector example in machine learning, Row and & subtraction, scalar multiplication, dot product, distance metrics (Fuelidean distance cosine		
	similarity). Matrices Rows, columns, Types of Matrices, Matrix Operations, Transpose of a Matrix, Determinant, Minor, Cofactor, Adjoint, Inverse of Matrix, Solving a system of Linear Equations, Introduction to tensors and hyperplane. Calculus: Differentiation and Integration, Partial Derivatives and Chain Rule, Taylor Series Expansion, Applications in Neural Network.	Types of Matrices, Matrix Operations, inor, Cofactor, Adjoint, Inverse of Matrix, s, Introduction to tensors and hyperplane, Partial Derivatives and Chain Rule, Taylor Network.		
Unit 2	Probability & Statistics 1:  Descriptive Statistics: Population vs Sample, Measures of central tendency, Measure of Dispersion, Coefficient of variation, Quantiles and Percentiles, Five Number	ures of central tendency, Measure and Percentiles, Five Number	C01	(07)
	Summary, Boxplots, Covariance, Correlation. <b>Probability Distribution Functions:</b> Random Variables, Probability Distributions, Probability Distribution Functions and its types, Probability Mass Function (PMF), Cumulative Distribution Function (CDF) of Improbability Density Function (PDF), Density Estimation, Parametric and Non-parametric Density Estimation, Kernel Density Estimate (KDE), Cumulative Distribution Function (CDF) of PDF	n.  s, Probability Distribution Functions and Cumulative Distribution Function (CDF)  Density Estimation, Parametric and Non- Density Estimate (KDE), Cumulative		
Unit 3	Probability & Statistics 2:  Normal Distribution: Standard Normal Variate (importance, z-table, empirical rule),	portance, z-table, empirical rule),	CO2	(05)
	Properties of Normal Distribution, Skewness, CDF of Normal Distribution, Use of Normal Distribution in Data Science.  Non-Gaussian Probability Distributions: Kurtosis, Excess Kurtosis and Types of Rutoses On lot Uniform Distribution.	of Normal Distribution, Use of s, Excess Kurtosis and Types of		
	Transformations Inferential Statistics: Central Limit Theorem, Distribution, Confidence Intervals. Hypothesis Te square test, ANOVA, correlation	Bernoulli Distribution, Binomial Testing: p-value and t-tests, Chi-		

CO 4	CO 3	CO 2	COI	COŢ	1	PO
ယ	ω	2	2			PO I
1	3	ω	w			PO 2
2	ω	2	ω			PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9
ယ	_	2	2			PO 4
	1	ı	ı			PO 5
	L	L	1			PO 6
1	r	1	1	-		PO 7
1	1	1	1			PO 8
1	1	1	1			PO 9
1	1	1	1	ě	10	PO
1	1	1				PO
2	ω	2	2	,	_	PSO
,	ı	1	_	1	)	PSO
1	1	1				PSO3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	1	5	5	5	5	,	MSE
20	1	5	5	S	5	1	ISE
60	1	20	20	10	10	ı	ESE

Teaching Scheme  EX3554: Manual Testing (Program Elective 401)  Teaching Scheme  EX3554: Manual Testing (Program Elective 401)  Teaching Scheme  EX3554: Manual Testing (Program Elective 401)  Examination Scheme  Course Coll (02)  Examination Scheme  Examination Scheme  Course Contents  Cours	CO <sub>2</sub> CO <sub>2</sub>	fall Model, Spiral Model, V Different Levels of Testing tance Testing (UAT).  Mutation testing, Execution Testing, State Transition Testinging, State Transition Testingting.  Itages of Agile, Agile Vs. V sting, Ad-hoc testing, Sanity egression testing.	odologies and Techniques  Sting- Execution testing, Operation testing, sting- Execution testing, Operation testing, ent Coverage, Decision Coverage. Black Bosoundary Value Analysis, Decision Table Test. Functionality testing and non-Functionality testing and resting Terminology  Terminologies- Monkey testing, Exploratory testing Testing, Incremental testing, Retesting and Rent, Defect Lifecycle, and Documentation-  nd Test Strategies, -Software Testing Life Cycle prity, Bug Tracking Tools. Test Documentation bility Matrix, Agile test plan.	Agile Methodo Agile Architect model, Testing, Big-bar testing, Big-bar Test Managem Test Planning a Severity & Pric Reports, Tracea	Unit 4 Unit 5
Intro Year (Seem – V )B. Lech. Electronics and Telecommunication Engineering  EX354: Manual Testing (Program Elective -01)  Base	CO <sub>2</sub>	fall Model, Spiral Model, V Different Levels of Testing tance Testing (UAT).  Mutation testing, Execution Testing, State Transition Testing, sting.  Itages of Agile, Agile Vs. V Sting, Ad-hoc testing, Sanity egression testing.	ntegration Testing, System Testing, User Accep  odologies and Techniques  sting- Execution testing, Operation testing, tent Coverage, Decision Coverage. Black Boston oundary Value Analysis, Decision Table Test. Functionality testing and non-Functionality testing and Testing Terminology  ture, Scrum meeting, Advantages and Disadvan Terminologies- Monkey testing, Exploratory teng Testing, Incremental testing, Retesting and Rent, Defect Lifecycle, and Documentation-	Agile Methodo Agile Architect model, Testing, Big-bar Test Managem	Unit 4
Intru Year (Sem. – V) B. Lech. Electronics and Telecommunication Engineering  EX3554: Manual Testing (Program Elective -01)  EX3554: Manual Testing (Program Elective -01)  Examination Scheme  BYE 20  Introduction of His/week 20  Introduction of Hanual testing methodologies for effective functionality and non-Functionality testing and data validation.  Course Contents  Introduction of Manual testing with esting testing various Software Development Life Cycle (SDLC) models and testing techniques. Apply White Box and Black Box testing methodologies for effective functionality and non-Functionality testing and data validation.  Course Contents  Introduction of Manual testing  What is software testing with the use of test management techniques, defect lifecycle and SQL queries for backend testing and data validation.  Course Contents  Introduction of Manual testing  What is software testing various Task Involved in Testing. Difference between Verification & Validation, Difference between QA &QC.  Software Development Life Cycle (SDLC) and Testing  Introduction of Software Process, SDLC, what is SBS? Waterfall Model, Spiral Model, Vanie Box Testing. Statement Coverage, Decision Coverage. Black Box Testing (UAT).  Testing Methodologies and Techniques  White Box Testing - Execution testing, Operation testing, Mutation testing, Executions testing, Statement Coverage, Decision Coverage. Black Box Testing-Equivalence Class Partitioning, Boundary Value Analysis, Decision Table Testing, State Transition Testing, Error Guessing, Functionality testing and non-Functionality testing, Sanity testing, Agile Agile, Agile Agile Agile Agile, Agile Agile Agile, Agile Agile, Agile Agile Agile, Agile Agile, Agile, Agile Agile Agile, Agile Agile, Agile, Agile Agile, Agile, Agile, Agile Agile,	CO2	fall Model, Spiral Model, V Different Levels of Testing tance Testing (UAT).  Mutation testing, Execution Testing, State Transition Testing, State Transition Testing, sting.  Itages of Agile, Agile Vs. V sting, Ad-hoc testing, Sanity egression testing.	Integration Testing, System Testing, User Acceptodologies and Techniques  Sting- Execution testing, Operation testing, sting- Execution testing, Operation Testing, tent Coverage, Decision Coverage. Black Booundary Value Analysis, Decision Table Test. Functionality testing and non-Functionality testing and non-Functionality testing. Functionality testing and Testing Terminology  Terminologies- Monkey testing, Exploratory teng Testing, Incremental testing, Retesting and R	testing, Statem Partitioning, B Error Guessing  Agile Methodo Agile Architect model, Testing testing, Big-bar	Unit 4
Ing Scheme  EX3554: Manual Testing (Program Elective-01)  EXanination Engineering  Examination Scheme  Examination Scheme  Examination Scheme  Software Development Life Cycle (SDLC) and Testing and data validation of Esting. Difference between Verification & Value Analysis, Decision Table Testing, Statement Coverage, Decision Software Process, SDLC, what is SR27 Water Fating, Statement Coverage, Decision Coverage. Black Box Testing, Executions Functionality testing. Partitioning, Software Process, System Testing, Statement Coverage, Decision Testing, State Transition Testing, Error Guessing, Functionality testing and non-Functionality testing.  Examination Scheme  Examination of ESE  20  Duration of ESE  20  Duration of ESE  20  Duration of ESE  20  Understand testing techniques, defect lifecycle and testing techniques.  Apply White Box and Black Box testing methodologies for effective functionality and non-  Examination of Schware Process, SDLC, and Testing necessary? Software tester vs.  CO1  Introduction of Software Process, SDLC, and Testing necessary? Software tester vs.  Software Development Life Cycle (SDLC) and Testing necessary? Software tester vs.  CO2  Introduction of Software Process, SDLC, and Testing necessary? Software tester vs.  CO3  Introduction of Software Process, SDLC, what is SR2? Waterfall Model, Spiral Model, V-  Model, Hybrid Model, Static Testing vs. Dynamic Testing, Different Levels of Testing.  CO2  Introduction of Software Process, SDLC, proce		fall Model, Spiral Model, V Different Levels of Testing tance Testing (UAT).  Mutation testing, Execution testing- Equivalence Claing, State Transition Testing	ntegration Testing, System Testing, User Acceptodologies and Techniques sting- Execution testing, Operation testing, tent Coverage, Decision Coverage, Black Booundary Value Analysis, Decision Table Test. Functionality testing and non-Functionality testing.	testing, Statem Partitioning, B Error Guessing	
Electronics and Telecommunication Engineering tal Testing (Program Elective -01)  Examination Scheme  MSE  20  ISE  20  ESE  400  ESE  4	C03	fall Model, Spiral Model, V Different Levels of Testing tance Testing (UAT).	ntegration Testing, System Testing, User Accep	Testing Metho	Unit 3
Electronics and Telecommunication Engineering  [All Testing (Program Elective -01)]    Examination Scheme   20   20     ISE   20   20     ESE   60   02 Hrs 30 Min     ITesting.   Duration of ESE   02 Hrs 30 Min     Italis   Ital	C02		Flopment Life Cycle (SDLC) and Testing Software Process, SDLC, what is SRS? Water Model, Static Testing vs. Dynamic Testing,	Software Deve Introduction of Model, Hybrid Unit Testing, I	Unit 2
Electronics and Telecommunication Engineering  [All Testing (Program Elective -01)]  Examination Scheme  MSE  MSE  ISE  Duration of ESE  1 Testing.  I Testing.  I Testing.  I Testing.  I Testing.  I Testing.  I techniques, defect lifecycle and SQL queries for backend  urse Contents  CO  Examination Scheme  20  20  ESE  02 Hrs 30 Min  1 techniques.  CO  CO  CO  CO  CO  CO  CO  CO  CO  C	C01	ecessary? Software tester vs. s Task Involved in Testing veen QA &QC.	of Manual testing are, what is Software testing? Why is testing nare, what is Software testing?	What is software deve Software deve Difference bety	Unit 1
Electronics and Telecommunication Englal Testing (Program Elective -01)  Examination Schen  MSE  ISE  ESE  Duration of ESE  I Testing.  I Testing.  I Testing.  I Testing.  I truite Cycle (SDLC) models and testing technic methodologies for effective functionality and techniques, defect lifecycle and SQL queries					
Electronics and Telecommunication Engram Elective -01)  Examination Schen  MSE  ISE  ESE  Duration of ESE  Itals  I Testing.	backend	ecycle and SQL queries for b	ne use of test management techniques, defect life a validation.	Demonstrate the testing and data	C04
Electronics and Telecommunication Englal Testing (Program Elective -01)  Examination Schen  MSE  ISE  ESE  Latals  I Testing.  I Testing.  I Testing.  I Testing.  I Testing (Program Elective functionality and testing technic program and testing technical program and testing technical program is and testing technical program and testing technical program is a second program and testing technical program is a second program in the control of the control		Course Introductionally which thou	esting.	Functionality to	
Electronics and Telecommunication Englal Testing (Program Elective -01)  Examination Schen  MSE  ISE  ESE  Duration of ESE  Itals  I Testing.	]-  -	ective functionality and non-	ox and Black Box testing methodologies for ef	Apply White B	CO3
Electronics and Telecommunication Engral Testing (Program Elective -01)  Examination Schen  MSE  ISE  ESE  Duration of ESE  Itals		nodels and testing techniques	us Software Development Life Cycle (SDLC) n	Describe vario	CO2
Electronics and Telecommunication Englal Testing (Program Elective -01)  Examination Schen  MSE  ISE  ESE  Duration of ESE			Fundamentals of Manual Testing.	Understand the	CO1
Testing (Program Elective -01)  Examination Schen  MSE  ISE  ESE  Duration of ESE			: Students will be able to	Outcomes (CO)	Course
Inird Year (Sem – V) B. Tech. Electronics and Telecommunication English Examination Schen  EX3554: Manual Testing (Program Elective -01)  Examination Schen  MSE  00 Hrs/week  03 ESE  Duration of ESE			tics, Computer Fundamentals	uisite: Mathema	Prerequ
Bengod	Hrs 30 Min				
g Scl					Total C
Scl			week		Tutorial
Teaching Scheme  EX3554: Manual Testing (Program Elective -01)  Examination Scheme			week		Lecture
EX3554: Manual Testing (Program Elective -01)		<b>Examination Scheme</b>		ng Scheme	Teachi
Inird Year (Sem – V) B. Tech. Electronics and Telecommunication Engineering		n Elective -01)	EX3554: Manual Testing (Program		
	ering	lecommunication Engine	ar (Sem - V) B. Tech. Electronics and Te	Third Ye	



I Init 6	Unit 6 Region of SOI for Software Testing	207	(80)
Citation	The desired to Detail the property of the policy of the po	(	(00)
	Definition Language) – CREATE, ALTER, DROP, DML (Data Manipulation Language) –		
	SELECT, INSERT, UPDATE, DELETE, DCL (Data Control Language) - GRANT,		
	REVOKE. Different Function-Number function, Aggregate Function, Character Function,		
	Conversion Function, Date Function. different types of operators- Arithmetic Operators,		
	Logical Operators, Comparison Operator, Special Operator, Set Operation.		
Text Books	looks		
1. So	1. Software Engineering by Rajib Mall, PHI 2014		
2. So	2. Software Testing: A Craftsman's Approach, by Paul C. Jorgensen, Third Edition		
Referen	Reference Books		
1. Ag Ed	Agile Testing: A Practical Guide for Testers and Agile Teams by by Lisa Crispin, Janet Gregory, 1st Edition.	st	
2. Le Per	Lessons Learned in Software Testing: A Context-Driven Approach, by Cem Kaner, James Bach, Bret Pettichord ,1st Edition	ret	

CO	CO3	CO	CO		CO	<b>1</b>	РО
4	CJ.	12	-				
ယ	ယ	ယ	w				PO I
ယ	3	3	2				PO 2
1	w	2	1				PO3
w	S	2					PO 4
w	2	3	2				PO 5
1	1	1	1				PO 6
1	1	1	1				PO7
,	1	1	ı				PO 8
1	1	.1	1				PO 9
1	ı	1	1				PO 10
3	3	3	2				PO 10 PO 11
3	3	3	3	2	hame	0	P
3	3	3	2			2	PSO
3	3	2	2			w	PSO

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

### Guideline for Assessment

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	1	1	()	5	5	5	MSE
20	1	-	5	5	5	5	ISE
60	1	5	20	10	20	5	ESE

(07)	C02		) y pairs y instances linstances Connect, CloudShell, CLI ninate	Unit 3 Elastic Compute Cloud (EC2)  - EC2 instance types, AMIs, key pairs - Launching and accessing EC2 instances - Security Groups and SSH key-based access - Connecting via EC2 Instance Connect, CloudShell, CLI - EC2 lifecycle: start, stop, terminate
(07)	CO2		nent (IAM) ups, Roles, Policies syntax, permissions (MFA) prvices for IAM figuration	
		30)	Definition and characteristics of cloud computing (scalability, elasticity, pay-as-you-go) Traditional IT vs. cloud computing Cloud deployment models: Public, Private, Hybrid Overview of AWS global infrastructure: Regions, AZs, Edge Locations Shared responsibility model basics AWS Free Tier account setup, MFA, billing alerts	11111
Hours	38		Course Contents and AWS Fundamentals	Unit 1 Cloud Computing Overview and AWS Fundamentals
ning and ud-native	, and clou	ryption	object storage configurations.  Explore data management strategies in the cloud, including replication, backup, encryption, and cloud-native database services such as RDS and Aurora.	cos Describe and evaluate compute and storage object storage configurations.  CO4 Explore data management strategies in the database services such as RDS and Aurora.
tion, and	authoriza	cation,	Analyze and apply identity and access management concepts to ensure secure authentication, authorization, and resource control in a cloud environment.	
with the	ng along	omputi	Understand the fundamental principles, service models, and architecture of cloud computing along benefits and challenges of cloud adoption.	CO1 Understand the fundamental principles, benefits and challenges of cloud adoption
			be able to	Course Outcomes (CO): Students will be able to
	02 Hrs 30 Min	02 Hr	tion of ESE	A COMA CAPULATO
A •		20	ISE 2	Tutorials 00 Hrs/week Total Credits 03
		20	MSE 2	
		ne	Examination Scheme	Teaching Scheme
			EX3564: Cloud Computing Foundation (Program Elective -01)	EX3564: Clo
-		non	Third Year (Sem - V) B. Tech. Electronics and Telecommunication	Third Year (Se
*			Government College of Engineering, Karad	Go



		AWS Cloud Practitioner Essentials (Free Course) https://explore.skillbuilder.aws/learn/courses/134/aws-cloud-practitioner-essentials	2.
		Cloud Computing by Prof. Soumya Kanti Ghesh   IIT Kharagpur https://onlinecourses.nptel.ac.in/noc25_cs11/preview	
		Useful Links	Usefi
		Dan Marinescu, "Cloud Computing: Theory and Practice", Elsevier, 2013.	w.
		Kief Morris, "Infrastructure as Code", O'Reilly Media, Incorporated, 2021.	2.
olution	r: It Revo	Gene Kim, Patrick Debois, John Willis, and Jez Humble, "The DevOps Handbook", Portland, Or: It Revolution Press, Llc, 2017.	)-mi
		Reference Books	Refe
ecture"	& Archite	Thomas Erl, Ricardo Puttini, Zaigham Mahmood, "Cloud Computing: Concepts, Technology & Architecture" Pearson, 2023 (Unit 1)	į.
chuster,	n and Sc	Andreas Wittig and Michael Wittig, "Amazon Web Services in Action" Third Edition. Simon and Schuster, 2023.(Units 1,2,3)	2.
n,(Units	C02 Exan	Ben Piper, David Clinton "AWS Certified Solutions Architect Study Guide", 3E-Associate SAA-C02 Exam, (Units 1, 2, 3, 4)	-
		Text Books	Text
		- Backup, recovery, and termination to avoid charges	
		- Database provisioning and connectivity - RDS monitoring and scaling	
		- Supported engines (MySQL, PostgreSQL, etc.)	
		- Overview of RDS and Amazon Aurora	
(07)	C04		Unit 6
		Overview of AWS Storage Gateway types	
		- Snowball job creation and data lifecycle	
		- AWS Snow Family: Snowcone. Snowhall Edge. Snowmobile	
		- Cross-region replication	
(07)	C04	Unit 5 Advanced S3 Features and Data Transfer Services	Uni
		Upload files and change their storage class (e.g., Standard → Glacier).  Configure Lifecycle Rules to move files after a set period.	
		Storage Classes & Lifewoole	
		- Bucket policies, access control, IAM for S3	
		- Versioning, storage classes, lifecycle policies	
		- S3 static website hosting	
		- Bucket creation, file management, folder hierarchy	
(07)	CO3	1 6	Unit 4

	60	3	20	-8	<u>+</u> CO → PO
	2	2	2	သ	PO 1
	2	2	3	2	PO 2
1: Sli	2	3	2	2	PO 3
1: Slight(Low)	ω	2	2	1	PO 4
W)	3	w	2	2	PO 5
2	2	2	1	1	PO 6
: Mode		1 %	1	I	PO 7
erate(N	г	_	1	i	PO 8
2: Moderate(Medium)	ı			ı	PO 9
	ı	1	1	-1	PO 10
3: Su	w	2	2	1	PO
3: Substantial(High)	2	2	2	ω,	PSO 1
High)	2	1	1	1	PSO 2
	-	-	1	. 1	PSO 3

## Assessment Pattern (with revised Bloom's Taxonomy)

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level	
20	ı	ı	5	5	5	5	MSE	
20	ı		5	5	5	5	ISE	
60	1	5	15	15	15	10	ESE	

Third Year (Sem – V) B. Tech. Electronics & Telecommunication  Eaching Scheme  Lectures    D3 Hrs/week   Examination Scheme   Examination   Ex	(08)	C03, C04	e debugging. s in code. frameworks.	s for real-time nication issues or unit test f timization.	<b>Debugging, Testing, and Performance Analysis:</b> Use of JTAG, SWD, GDB, logic analyzers, and oscilloscopes for real-time debugging. Handling ISRs, stack overflows, and peripheral communication issues in code. Testing embedded C programs using Ceedling and other unit test frameworks. Profiling execution time, memory, and power for performance optimization.	b, and Performa D, GDB, logic lack overflows C programs ime, memory, an	Debugging, Testing, and Performance Analysis: Use of JTAG, SWD, GDB, logic analyzers, and Handling ISRs, stack overflows, and peripl Testing embedded C programs using Ceedle Profiling execution time, memory, and power for p		Unit 5
Tech. Electronics & Telecommunication    ded C Programming (Program Elective -01)     Examination Scheme     MSE	(07)	C02	ponsiveness. g strategies. umunication. thniques.	y, and resp and scheduling l inter-task com	ng: ering deadlines, latendation, priority assignment, hores, mutexes, queues, anng sleep modes, interrupts,	and Multitaski design consideration with task creating using semap edded design us	-Time Systems -time task )S fundamentals ds-on multitaskii er-efficient embe		Unit
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01)    Examination Scheme   20   1SE   20     ISE   20   20   20     ESE   60   02 Hrs 30 Min     Understanding of microcontrollers and digital electronics.  Ing. and scheduling.  Ind. and system-oncepts in embedded environments. Understanding ons. Bitwise operations for register manipulation. extern. Memory-mapped I/O and direct register manipulation. extern. Memory-mapped I/O and direct register optimization flags and techniques. Memory optimization flags and techniques. Memory optimization and successed in the fragmentation and second in the schedule of the sched	(08)	C02	ties, latency lelay, PWM nd interrupt- motors, and	interrupt prioriting software dusing polling ar acing LEDs, neasurement.	Interfacing: writing ISRs, configuring unter modules: implemen DC and DAC programming ming examples for inter modes in timers for event 1	and Periphera ning concepts: Timer and concepts: y measurement. GPÍO prograr capture/compare	rrupts, Timers, rrupts programn ction strategies. ration, frequency d mechanisms. buttons. Use of		Unit
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01)    Examination Scheme   20     MSE   20     ISE   20     ESE   60     Duration of ESE   02 Hrs 30 Min     Understanding of microcontrollers and digital electronics.  efficient Embedded C programs.  ing, and scheduling.  ing advanced tools and techniques. bedded applications with optimized C code.  rse Contents   CO1     CO1	(07)	C01	assembly for s. Memory entation and	nments. Inline a and technique sues like fragmo	Optimization: t code for embedded environt code for embedding memory in the code for embedded environt co	nming & Code nd size- efficier routines. Cor /s. heap manage	'-Level Progran ing optimized au ormance-critical mization: stack v k overflow.		Unit
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01)  Examination Scheme  MSE  20  ISE  Duration of ESE  Understanding of microcontrollers and digital electronics.  efficient Embedded C programs.  ing, and scheduling.  g advanced tools and techniques.  bedded applications with optimized C code.  rse Contents  CO  Examination  Examination Scheme  20  20  ESE  02 Hrs 30 Min  CO  CO  CO  CO  CO  CO  CO  CO  CO  C	(06)	C01	and system- nderstanding nanipulation. rect register	nemory access, nvironments. Un s for register m sed I/O and di	ials: erstanding target hardware, C concepts in embedded e unions. Bitwise operation atic, extern. Memory-map	nbedded C: und Review of basic, structures, and platile, const, s	bedded C Progr rview of C vs Er I programming. types, pointers, nory classes: vc ss.		Unit
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01  Examination Schen  MSE  ISE  ESE  Understanding of microcontrollers and digit  efficient Embedded C programs.  ing, and scheduling.  g advanced tools and techniques.  bedded annifications with outinized C code	Sanonis	CO	Ode.	n opumzea e v	Course Contents	rotting of the	G., and Carre ber		
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01  Examination Schem  MSE  ISE  ESE  Understanding of microcontrollers and digit  efficient Embedded C programs.			ode	chniques.	s using advanced tools and t	nbedded system	ug and profile en	-	
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01  Examination Schen  MSE  ISE  ESE  Duration of ESE  Understanding of microcontrollers and digit  efficient Embedded C programs.					itasking, and scheduling.	operations, mul	lement real-time	-	CO
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01  Examination Schen  MSE  ISE  ESE  Duration of ESE  Understanding of microcontrollers and digit				rograms.	ory-efficient Embedded C I	mized, and men	te advanced, opti	l Writ	CO
Tech. Electronics & Telecommunication  ded C Programming (Program Elective -01  Examination Schen  MSE  ISE  ESE  Duration of ESE  Duration of ESE		ronics.	d digital elec	ocontrollers and		e of C programme of C programme	mes (CO): Stud	se Outco	Cour
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3574: Advanced Embedded C Programming (Program Elective -01  heme  03 Hrs/week  00 Hrs/week  ESE  ESE		30 Min	E   02 Hr	Duration of ES		260	Posis basedada	200	Dron
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3574: Advanced Embedded C Programming (Program Elective -01  Scheme  03 Hrs/week  00 Hrs/week  ISE				ESE			03	Credits	Total
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3574: Advanced Embedded C Programming (Program Elective -01  Examination Schem  Hrs/week  MSE			20	ISE			00 Hrs/week	ials	Tutor
Third Year (Sem – V) B. Tech. Electronics & T EX3574: Advanced Embedded C Programming (F			20	MSE			03 Hrs/week	ıres	Lectu
Third Year (Sem – V) B. Tech. Electronics & Telecommunication  EX3574: Advanced Embedded C Programming (Program Elective -01)			Scheme	Examination S				hing Sch	Teac
Third Year (Sem - V) B. Tech. Electronics & Telecommunication			ve -01)	Program Electiv	bedded C Programming	1: Advanced En	EX3574		
			Tion:	Telecommunica	V) B. Tech. Electronics &	d Year (Sem -	posses, posses		

		https://www.emertxe.com/embedded-systems/c-programming/	2. 1	
		https://www.udemy.com/topic/embedded- c/?srsltid=AfmBOooti4ttQ54aiFWmD5NF5wLCrgV3ox9obWLydBeQ8RNzr5Ba2xuZ	1.	1
		Links	Useful Links	T
		"ARM Assembly Language: Fundamentals and Techniques" - William Hohl & Christopher Hinds	2. "+	
		"C Programming Absolute Beginner's Guide" Greg Perry and Dean Miller	1. "(	
		Reference Books	Refere	
		"The C Programming Language" - Brian W. Kernighan & Dennis Ritchie	2. "T	
	ng Zhu	"Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C" by Yifeng Zhu	1. "E	
		Books	Text Books	
		CAN protocol and UDS (ISO 14229) for in-vehicle networking and diagnostics.		
	50 =	Project-based IoT system integrating sensors, wireless protocols, and cloud interface.		
		Wireless data transmission using ESP32, Zigbee, NRF24L01 with real-time debugging.		
	C04	Hands-on implementation of UART, SPI, I2C using embedded C with peripheral drivers.		
(06)	CO2,	Unit 6 Advanced Communication and Application Development:	Unit 6	_

1: S	CO 4	CO 3	CO 2	001	СО↓	PO→ PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO PSO PSO
1: Slight (Low)	1	1	2	2		PO I
(wo	_	1.	w	1		PO 2
2:	3	2	-	-		PO3
2: Moderate (Medium)	1	1	1	1		PO 4
ate (Me	t		1	2		PO 5
dium)	1	1	1	1		PO 6
	1	1	. a			PO 7
3: Sul		1	1	1		PO 8
ostantia	1	1	ı	1		PO 9
3: Substantial (High)	1	1	ı	1		PO 10
	1	1	1		Ξ	PO
	2	2	1	r	<u></u>	PSO
	2	-	1	2	1	PSO
	3	w	2	1	Ú.	PSO

# Assessment Pattern (with revised Bloom's Taxonomy)

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	1	ī	S	S	S	S	MSE
20			5	5	5	5	ISE
60	ı	1	20	10	20	10	ESE

Exashing Stehense  Exasting Stehense  Exasting Stehense  Exasting Stehense  Examination and Telecommunication  Exasting Stehense  Examination Scheme  MSE  20  Triboralis  03  Examination Scheme  MSE  20  Triboralis  03  Examination Scheme  MSE  20  Examination Scheme  Examination Scheme  Examination Scheme  MSE  20  Examination Scheme  CO1  EXEMPLA PLANCING Increase  CO3  EXEMPLA PLANCING Increase  CO3  EXEMPLA PLANCING Increase  CO3  EXEMPLA PLANCING Increase  CO3  EXAMINATION Increase  CO3  EXAMINATION Increase  CO4  EXAMINATION Increase  CO3  EXAMINATION Increase  CO4  EXAMINATION Increase  Examination of Exe   CO5  EXAMINATION Increase  CO5  EXAMINATION Increase  CO6  EXEMPLA PLANCING Increase  CO7  EXAMINATION Increase  Examination Department Increase  CO7  EXAMINATION Increase  CO8  EXAMINATION Increase  CO9  EXAMINATION Increase  CO9  EXAMINATION Increase  CO9  EXAMINATION Increase  Examination Department Increase  CO9  EXAMINATION Increase  C	CO1 (08) CO4 (07) CO2, (07) CO3 tion), (2003). tive", Pearson	Till Pu	JS Logic St. Logic St. CMOS Logic St. CMOS ST. C	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design gic families and their performance.  mory:  mory:  mory:  mory:  nory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  n to low power design, Input and Output Interface circuits. BiCMOS Litroduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A. Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G. Dynamic CMOS where applicable, Schematic design and transistor-lettion, Layout design using standard EDA tools, Power, delay, and an techniques, DRC and Post-layout simulation, Comparison with indust J. Udesigns.  Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", McGraw-Hitmantha P.Chandrakasan, BorivojeNikolić, "Digital Integrated Circuits: A Design dition), (2003).)  Eshraghian, "Principles of CMOS VLSI Design", PHI., (3rd Edition), (2013).	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circu Case Studi Design and functional operations: Logic and implementa optimizatio optimizatio standard A) standard A) ooks S.M. Kang & Y an M. Rabaey, an M. Ra	Unit 5 Unit 5 Unit 6 Unit 6 Unit 6 Unit 6 Unit 6 Unit 6
Third Vear (Sem V) B. Trech. Electronics and Telecommunication	CO1 (08) CO4 (07) CO2, (07) CO3 City, (2003). Give", Pearson	G C C C C C C C C C C C C C C C C C C C	JS Logic St. Logic St. Logic St. Logic St. CMOS St. CMOS St. CMOS St. Logic	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design gic families and their performance.  mory:  mory:  mory:  mory:  no y design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  n to low power design, Input and Output Interface circuits. BiCMOS Litroduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN equirements of a 4-bit or 8-bit ALU, CMOS logic design for key A. Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification and techniques, DRC and Post-layout simulation, Comparison with indust J. U designs.  Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", McGraw-Hitmantha P.Chandrakasan, BorivojeNikolić, "Digital Integrated Circuits: A System	Dynamic lo CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circu Case Stud: Design and functional operations: Logic and implementa optimizatio standard Ai ooks S.M. Kang & Y an M. Rabaey, an M. Rabaey, an M. Rabaey, Sducation, (2nd ooks Standard Ai ooks S.M. Kang & Y an M. Rabaey, Sull Weste& K. Douglas Puckne	Unit 5 Unit 5 Unit 6 Unit 6 Unit 6 Unit 6
Third Year (Sem – V) B. Tech. Electronics and Telecommuniteation  EX3584: Digital CMOS Circuit Design (Program Elective -0.1)  Examination Scheme  Office Heavweek  Office Semiconductor Theory  st (CO): Students will be able to set (CO): Students will be able to lessing and Electronics. Semiconductor Theory  and Dynamic Electronics Semiconductor Theory  ESE  EAWOUT Design Rules in CMOS Logic  Duration of ESE  Layout Design Rules in CMOS Logic Couries  Layout Dynamic behavior, transition time, Propagation Delay, Power Consumption.  ELS Layout Fundamentals:  SLayout Fundamentals:  Ocology scaling, MOS Circuit Layout, Stick diagrams, Layout design rules, MOS layout, Inverter layout, CMOS-circuits layout, Circuit Compaction, Euler's Rule.  and Dynamic Logic.  SAmonery:  SMemory  Memory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  CO2  SMemory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Logic circuits.  CO3  and Dynamic CMOS where applicable, Schematic design and transistor-level circuits.  CO4  co5  and Dynamic CMOS bightal Integrated Circuits-Analysis & Design*, MeGraw-Hill, (3"dedition), (20)  20* Edition), (2003)).  ESE	CO1 (08) CO4 (07) CO2, (07) CO3 CO3 Citon), (2003). Give", Pearson	c c C C C C C C C C C C C C C C C C C C	DS Logical States of the control of	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Litic and dynamic latches, flip flops & registers.  Logic:  1 to low power design, Input and Output Interface circuits. BiCMOS Litroduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  2 Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and a techniques, DRC and Post-layout simulation, Comparison with indust JU designs.  Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", McGraw-Hi Manantha P.Chandrakasan, BorivojeNikolić, "Digital Integrated Circuits: A Design Eshraghian, "Principles of CMOS VLSI Design: A Systems Perspective", McGraw-Hi Michael Comparison of CMOS VLSI Design: A Systems Perspective", McGraw-Hi Michael Circuits (Mos VLSI Design: A Systems Perspective).	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, It Logic circu Case Stud: Design and functional operations: Logic and implementa optimizatio standard A: ooks ooks S.M. Kang & Y an M. Rabaey, and Rebaeks lee Books lee Books	Unit 5 Unit 5 Unit 6 Unit 6
Third Year (Sem – V) B. Tech. Electronics and Telecommuniteation  EX3584: Digital CMOS Circuit Design (Program Elective -01):  6	CO1 (08) CO4 (07) CO2, (07) CO3 Cition), (2003).	c c C C C C C C C C C C C C C C C C C C	JS Logic St. Logic St. Logic St. Logic St. Logic St. CMOS St. CMOS St. Logic	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design gic families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and a techniques, DRC and Post-layout simulation, Comparison with indust U designs.  Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", McGraw-Hi Mantha P.Chandrakasan, BorivojeNikolić, "Digital Integrated Circuits: A Design dition), (2003).)	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, I Logic circu Case Study Design and functional operations: Logic and implementa optimizatio standard A: ooks  M. Kang & Y an M. Rabaey, an M. Rabaey, an M. Rabaey, CCMOS Men CMOS MOS Substandard A: ooks  M. Kang & Y an M. Rabaey,	Unit 5 Unit 5 Unit 6 Unit 6
Third Year (Sem - V) B. Tech. Electronics and Telecommunication  EX3584: Digital CMOS Circuit Design (Program Elective -01)  6	CO1 (08) CO4 (07) CO2, (07) CO3 tion), (2003).	c c C C C C C C C C C C C C C C C C C C	JS Logic ii-CMOS and ion and y ALU on Gate or-level nd area idustry-w-Hill, (Constitution Pe	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design gic families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A. Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G. Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and an techniques, DRC and Post-layout simulation, Comparison with indust U. U. designs.  Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", McGraw-Hichitation), (2003).)	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, It Logic circu Case Study Design and functional operations: Logic and implementa optimizatio optimizatio standard A) ooks S.M. Kang & Y an M. Rabaey, an M. Rabaey, an M. Rabaey,	Unit 5 Unit 5 Unit 6 Unit 6
Third Year (Sem V) B. Tech. Electronics and Telecommunication  EX3584: Digital CMOS Circuit Design (Program Elective-41)  EXamination Scheme  03 Hrs/week  04 Hrs/week  05 Hrs/week  06 Hrs/week  08 Digital Electronics. Semiconductor Theory  Examination of ESE  09 Doll Hrs/week  09 Hrs/week  00 Hrs/wee	CO1 (08) CO4 (07) CO2, (07) CO3 CO3.	c c c	DS Logical States of the control of	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BicMOS L troduction, Basic BicMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and an techniques, DRC and Post-layout simulation, Comparison with indust U designs.  Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", McGraw-Hills Mantha P Chandrakasan Borivoien Micolic "Dicital Integrated Circuits A Design".	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circu Case Stud: Design and functional operations: Logic and implementa optimizatio standard A: ooks ooks  OMOS Men M. Rabaev. an M. Rabaev.	Unit 5 Unit 5 Unit 6 Unit 6
CO3  Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3564: Digital CMOS Circuit Design (Program Elective-01)  EXAMINATION Services  OO Hrs/week  OB Hrs/week  OB Hrs/week  OB Hrs/week  OB Hrs/week  OO Hrs/wee	CO1 (08) CO4 (07) CO2, (07) CO3	00 0 0	JS Logic St. Logic St. Logic St. Logic St. Logic St. CMOS St. CMOS St. Logic	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design gic families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key Aladdition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and an techniques, DRC and Post-layout simulation, Comparison with indust JU designs.	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, It Logic circu Case Study Design and functional operations: Logic and implementa optimizatio standard A	Unit 4 Unit 5 Unit 6
ENASSA: Digital CMOS Circuit Design (Program Elective -01)  ENASSA: Digital CMOS Circuit Design (Program Elective -01)  EXASTANCE   Examination Scheme   20  On Hrs/week   03   ESE   20  On Hrs/week   08   ESE   20  On Hrs/week   09   ESE   20  INSE   20  On Hrs/week   09   ESE   20  On Hrs/week   09   ESE   20  INSE   20  INSE   20  On Hrs/week   09   ESE   20  On Hrs/week   09   ESE   20  INSE   20  INSE   20  On Hrs/week   09   ESE   20  INSE   20  INSE   20  INSE   20  INSE   20  On Hrs/week   09   ESE   20  INSE   20  INSE   20  INSE   20  INSE   20  On Hrs/week   09   ESE   20  INSE   20  INSE   20  INSE   20  INSE   20  On Hrs/week   09   ESE   20  INSE   2			OS Logical Structure of the Company	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A. Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G. Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and an techniques, DRC and Post-layout simulation, Comparison with indust U designs.	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circu Case Stud: Design and functional operations: Logic and implementa optimizatio optimizatio	Unit 4 Unit 5 Unit 6
reistics    Examination Scheme   20   20   ISE   20   INVERTIONAL CHARACTERISTICS, and MOS inverters, the basic CMOS inverter, shold, Noise margins. Second order effects in imperence in imper			DS Logic ii-CMOS  ii-CMOS  ion and y ALU on Gate or-level and area adustry-	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification are requirements of a 4-bit or 8-bit ALU, CMOS logic design for key Anaddition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and an techniques, DRC and Post-layout simulation, Comparison with indust	Dynamic le CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, I Logic circu Case Studi Design and functional operations: Logic and implementa optimizatio	Unit 4 Unit 5 Unit 6
Circuit Design (Program Elective -01)  Examination Scheme   20  ESE   20  EOJ, ES			DS Logic Si-CMOS Si-CMOS Si-CMOS Si-CMOS Si-CMOS Si-CMOS Si-CMOS Si-CMOS Si-CMOS	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design gic families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G Dynamic CMOS where applicable, Schematic design and transistor-letion, Layout design using standard EDA tools, Power, delay, and a	Dynamic lo CMOS Men MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circu Case Studi Design and functional operations: Logic and implementa	Unit 4 Unit 5 Unit 6
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  20  ESE  00  ESE  00  Duration of ESE  20  CMOS Logic  CMOS Logic  See Contents  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in ime, Propagation Delay, Power Consumption.  ECO  Title diagrams, Layout design rules, MOS dayout, Circuit Compaction, Euler's Rule.  MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS design, nee.  CO3  RAM and DRAM cells, Sequential MOS Logic ps & registers.  MOS design Complementary MOS design, and Output Interface circuits. BiCMOS Logic frithmetic Logic Unit (ALU), Specification and brand propertical for key ALU  R, XOR, and Shift, Use of Transmission Gate leash, Schematic design and transistor-level			DS Logical	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  **Table 1. The control of the contr	Dynamic le CMOS Me MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circu Case Study Design and functional operations: Logic and	Unit 4 Unit 5 Unit 6
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  20  ESE  102  ESE  20  Duration of ESE  20  CMOS Logic  CMOS Logic  Contents  Conte			JS Logic  JS Logic  JS Logic  ii-CMO  ion and y ALU  on Gate	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory: ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic: to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification arequirements of a 4-bit or 8-bit ALU, CMOS logic design for key A Addition, Subtraction, AND, OR, XOR, and Shift, Use of Transmission G	Dynamic le CMOS Me MOS Men Design, Sta Bi-CMOS Introductio Circuits, Ir Logic circu Case Studi Design and functional operations:	Unit 4 Unit 5 Unit 6
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  20  20  ESE  Duration of ESE  02 Hrs 30 Min  Duration of ESE  02 Hrs 30 Min  Duration of ESE  02 Hrs 30 Min  ESE  CMOS Logic  Circuits  CMOS Logic  See Contents  CO1,  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in imae, Propagation Delay, Power Consumption.  Shold, Noise margins. Layout design rules, MOS instance, Propagation Delay, Power Consumption.  CO2  The Stick diagrams, Layout design rules, MOS instance, CO3  MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS design, nee.  CO3  MOS design, Complementary MOS design, and Output Interface circuits. BicMOS Logic ricuit behavior, Switching Delay in Bi-CMOS  CO4  Tithmetic Logic Unit (ALU), Specification and third and CO2, CO3, CO3, CO3, CO3, CO3, CO3, CO3, CO3			JS Logical Structure of the Control	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification are requirements of a 4-bit or 8-bit ALU, CMOS logic design for key A.	Dynamic le CMOS Me MOS Men Design, Sta Bi-CMOS Introductio Circuits, It Logic circu Case Studi Design and functional	Unit 4 Unit 5 Unit 6
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  20  ISE  20  ESE  60  Duration of ESE  CMOS Logic  Sec Contents  CON  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in impered in shold, Noise margins. Second order effects in shold, Noise margins and Second order			OS Logi Si-CMOS	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.  Analysis of a CMOS-Based Arithmetic Logic Unit (ALU), Specification a	Dynamic lo CMOS Mo MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circu Case Studi Design and	Unit 4 Unit 5 Unit 6
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  20  ISE  20  ESE  60  OUT HTS 30 Min  Duration of ESE  CMOS Logic  Circuits  CMOS Logic Circuits  See Contents  CO1, Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in imperence, shold, Noise margins. Second order effects in imperence, propagation Delay, Power Consumption.  CO2  It, Stick diagrams, Layout design rules, MOS agate logic and circuit Compaction, Euler's Rule.  CO3  MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS design, censulated and Output Interface circuits. BiCMOS Logic ircuit behavior, Switching Delay in Bi-CMOS  CO2  CO3  CO4  CO4  CO6  CO7  CO7  CO7  CO7  CO8  CO9  CO9  CO9  CO9  CO9  CO9  CO9			OS Logi	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.	Dynamic lo CMOS Mo MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circuits	Unit 4 Unit 5 Unit 6
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  20  ISE  20  ESE  CMOS Logic  CMOS Logic  Contents  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in me, Propagation Delay, Power Consumption.  CMOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS design, nee.  MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS Logic ps & registers.  CO1  RAM and DRAM cells, Sequential MOS Logic ircuit behavior, Switching Delay in Bi-CMOS  CO4  and Output Interface circuits. BiCMOS Logic ircuit behavior, Switching Delay in Bi-CMOS			OS Logi	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN ts.	Dynamic lo CMOS Mo MOS Men Design, Sta Bi-CMOS Introductio Circuits, In Logic circuits	Unit 4 Unit 5
Circuit Design (Program Elective -01)   Examination Scheme   20   20   ISE   20   20     ESE   60   20     ESE   CMOS Logic Circuits   Duration of ESE   02 Hrs 30 Min   CMOS Logic Circuits   CO1, Stock diagrams, Layout design rules, MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS Logic ricuit behavior, Switching Delay in Bi-CMOS Logic ricuit behavior, Switching Delay in Bi-CMOS   CO4   C			OS Logi	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory: mory: ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic: to low power design, Input and Output Interface circuits. BiCMOS L troduction, Basic BiCMOS Circuit behavior, Switching Delay in Bi-CN	Dynamic lo CMOS Mo MOS Men Design, Sta Bi-CMOS Introductio Circuits, In	Unit 4 Unit 5
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  20  ISE  20  ESE  02 Hrs 30 Min  CMOS Logic  CMOS Logic  Contents  CO1,  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in ime, Propagation Delay, Power Consumption.  CO2  t, Stick diagrams, Layout design rules, MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS design, cee.  CO3  RAM and DRAM cells, Sequential MOS Logic ps & registers.  CO4  and Output Interface circuits BiCMOS Logic CO4  CO4			OS Logi	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:  to low power design. Input and Output Interface circuits. BiCMOS I.	Dynamic lo CMOS Mo MOS Men Design, Sta Bi-CMOS Introductio	Unit 4 Unit 5
Circuit Design (Program Elective -01)   Examination Scheme   MSE   20   20			OS Logi	Transistor logic, Transmission gate logic and circuits. Dynamic MOS desigic families and their performance.  mory: ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.  Logic:	Dynamic lo CMOS Mo MOS Men Design, Sta Bi-CMOS	Unit 4 Unit 5
Circuit Design (Program Elective -01)   Examination Scheme   20   ISE   20			OS Logi	Transistor logic, Transmission gate logic and circuits. Dynamic MOS desigic families and their performance.  mory:  ory design, Design of ROM, SRAM and DRAM cells, Sequential MOS Lic and dynamic latches, flip flops & registers.	CMOS Men MOS Men Design, Sta	Unit 4
Circuit Design (Program Elective -01)  Examination Scheme  MSE  MSE  ISE  ESSE  O2 Hrs 30 Min  Duration of ESE  CMOS Logic  Contents  ECO1, Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in ime, Propagation Delay, Power Consumption.  The Amand DRAM cells Segmential MOS Logic and circuits. Dynamic MOS design, and DRAM cells Segmential MOS Logic CO1  RAM and DRAM cells Segmential MOS Logic CO1  CO1  ESSE  O2 Hrs 30 Min  CO2  CO1, CO3  CO3  CO3  CO3  CO3  CO3  CO3  CO3			design,	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design families and their performance.  mory:  ory design. Design of ROM. SRAM and DRAM cells. Segmential MOS I	Dynamic Io CMOS Mo MOS Men	Unit 4
Circuit Design (Program Elective -01)  Examination Scheme  MSE  120  ISE  Duration of ESE  02 Hrs 30 Min  Duration of ESE  CMOS Logic  See Contents  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects intene, Propagation Delay, Power Consumption.  It, Stick diagrams, Layout design rules, MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS design, nce.  CO3  CO4  CO5  CO5  CO6  CO7  CO7  CO7  CO8  CO8  CO8  CO9  CO9  CO9  CO9  CO9			design,	Transistor logic, Transmission gate logic and circuits. Dynamic MOS desigic families and their performance.	Dynamic lo	Unit 4
Circuit Design (Program Elective -01)  Examination Scheme  MSE  120  ISE  1SE  20  ESSE  Ouration of ESE  Others 30 Min  Duration of ESE  CMOS Logic  Circuits  See Contents  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects interpropagation Delay, Power Consumption.  Inverters, Stock diagrams, Layout design rules, MOS design, Complementary MOS, Ratioed gate logic and circuits. Dynamic MOS design, and circuits.			design,	Transistor logic, Transmission gate logic and circuits. Dynamic MOS design gic families and their performance.	Dynamic lo	
Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ISE  ESSE  O2 Hrs 30 Min  Duration of ESE  CMOS Logic  CMOS Logic  See Contents  See Contents  Inverters, Static and Dynamic characteristics, and NMOS inverters, the basic CMOS inverter, shold, Noise margins. Second order effects in time, Propagation Delay, Power Consumption.  CMOS design, Complementary MOS, Ratioed  MOS design, Complementary MOS, Ratioed  CO3  MOS design, Complementary MOS, Ratioed  CO3				Transistor logic Design, static MOS design, complementary MOS Jose	10810, 1 400	
Circuit Design (Program Elective -01)  Examination Scheme  MSE  MSE  ISE  ESE  MSE  O2  ISE  O2  Duration of ESE  O2  Hrs 30 Min  Duration of ESE  CMOS Logic  See Contents  For Contents  Inverters, Static and Dynamic characteristics, and NMOS inverters, the basic CMOS inverter, shold, Noise margins. Second order effects in time, Propagation Delay, Power Consumption.  CO3  t, Stick diagrams, Layout design rules, MOS ints layout, Circuit Compaction, Euler's Rule.  CO3  CO3  CO4  CO5  CO5  CO6  CO7  CO7  CO7  CO7  CO8  CO8  CO9  CO9  CO9  CO9  CO9  CO9	_		Katioed	The same of the sa	logic Pass	
Circuit Design (Program Elective -01)  Examination Scheme  MSE  MSE  ISE  OUT  ISE  OUT  OUT  OUT  OUT  OUT  OUT  OUT  OU		_		Dynamic Logic:	Static and	Unit 3
Circuit Design (Program Elective -01)  Examination Scheme  MSE  SESE  Duration of ESE  CMOS Logic  See Contents  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in ime, Propagation Delay, Power Consumption.  Total Telective -01)  Examination Scheme  20  20  ESE  02 Hrs 30 Min  CO1,  CO1,  CO1,  Sinverters, Static and Dynamic characteristics, and NMOS inverters, the basic CMOS inverter, shold, Noise margins. Second order effects in ime, Propagation Delay, Power Consumption.  CO2  t, Stick diagrams, Layout design rules, MOS			Rule.	ut, Inverter layout, CMOS-circuits layout, Circuit Compaction, Euler's Rule	device layo	
Circuit Design (Program Elective -01)  Examination Scheme    MSE   20     ISE   20     ESE   60     Duration of ESE   02 Hrs 30 Min     CMOS Logic   Circuits   Se Contents   CO1, se Contents   Co1, shold, Noise margins. Second order effects in ime, Propagation Delay, Power Consumption.   CO2			s, MOS	scaling, MOS Circuit Layout, Stick diagrams, Layout design rules, M	Technolog	
Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ESE  EISE  ENSE  Duration of ESE  CMOS Logic  Circuits  CMOS Logic  Se Contents  Inverters, Static and Dynamic characteristics, shold, Noise margins. Second order effects in ime, Propagation Delay, Power Consumption.		0		out Fundamentals:	CMOS La	Unit 2
Circuit Design (Program Elective -01)  Examination Scheme    Examination Scheme   20   20			ption.	Dynamic behavior, transition time, Propagation Delay, Power Consumption	MOSFETs	
Circuit Design (Program Elective -01)  Examination Scheme    Examination Scheme   20   20   20   20   20   20   20   2			ffects in	nsfer characteristics, logic threshold, Noise margins. Second order effects	voltage tra	
Circuit Design (Program Elective -01)  Examination Scheme  Examination Scheme  MSE  ISE  ISE  O2 Hrs 30 Min  Duration of ESE  CMOS Logic  CCMOS Logic  See Contents  Inverters, Static and Dynamic characteristics.  CO1,		1	inverter,	Depletion and Enhancement load NMOS inverters, the basic CMOS inver-	Resistive,	
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ISE  ESE  Duration of ESE  02 Hrs 30 Min  CMOS Logic  CMOS Logic  Contents  CO1  CO1		0	teristics,	principles of MOSFETs. MOS Inverters, Static and Dynamic characterist	Types and	
Circuit Design (Program Elective -01)  Examination Scheme    MSE   20     ISE   20     ESE   60     Duration of ESE   02 Hrs 30 Min     CMOS Logic Circuits   Se Contents   CO	+				Fundamer	Unit 1
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ESE  ESE  Duration of ESE  circuits  CMOS Logic  CMOS Logic				Course Contents		
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ESE  Duration of ESE  uits  CMOS Logic				AOS Memory and Bi-CMOS Logic Circuits	Develop C	C04
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ESE  Duration of ESE  eristics				Implement Static and Dynamic CMOS Logic	Design and	CO3
Circuit Design (Program Elective -01)  Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ESE  Duration of ESE  eristics				ut Design Rules in CMOS Circuits	Apply Lay	CO2
Circuit Design (Program Elective -01)  Examination Scheme  MSE  ISE  ESE  Duration of ESE		-		AOS Logic Design and Characteristics	Analyze C	C01
Circuit Design (Program Elective -01)  Examination Scheme  MSE  ESE  Duration of ESE				): Students will be able to	Outcomes (Co	Course
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3584: Digital CMOS Circuit Design (Program Elective -01)  Examination Scheme  03 Hrs/week  00 Hrs/week  Duration of ESE  Duration of ESE					uisite: Digital	Prerequ
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3584: Digital CMOS Circuit Design (Program Elective -01)  Heme  03 Hrs/week  MSE  MSE  00 Hrs/week  ESE	Min	Irs 30	02 H	tion of ESE		
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3584: Digital CMOS Circuit Design (Program Elective -01)  Examination Scheme  03 Hrs/week  MSE  00 Hrs/week  ISE			60	ESE		Total C
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3584: Digital CMOS Circuit Design (Program Elective -01)  g Scheme  03 Hrs/week  MSE			20	ISE		Tutorial
Third Year (Sem – V) B. Tech. Electronics and Te EX3584: Digital CMOS Circuit Design (Program				MSE		Lecture
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3584: Digital CMOS Circuit Design (Program Elective -01)			eme	Examination Scheme	ng Scheme	Teachi
Third Year (Sem - V) B. Tech. Electronics and Telecommunication				EX3584: Digital CMOS Circuit Design (Program Elective -01)		
				Third Year (Sem - V) B. Tech. Electronics and Telecommunication		

CO 4	CO 3	CO 2	CO 1	CO↓	PO →
1	1	1	ယ		PO I
_	1	1	1		POI PO2
	1	1	1		PO 3
1	1	1	1		PO 3 PO 4
1	1	1	1		PO 5
1	1	I I	1		PO
1	1	1	1		6 PO 6 1
1	2	1	1		8 Od
1	1	!	1		PO 8 PO 9
1	1	1	ł	0.1	РО
1	2 .	1	1	<u></u>	PO
1	1	1	1		PSO I
1	ı	3	1		PSO 2
1	1	1	1	دن	PSC

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Assessment Pattern (with revised Bloom's Taxonomy)

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20				10	5	S	MSE
20			5	10	5		ISE
60			20	20	10	10	ESE

Chairman Board of Studies- E&TC

- What had been been

EX3505: ing Scheme  es	(04)	C04	ROC, Inverse	Overview of Laplace Transform: Laplace Transform and properties (No proofs), ROC, relation between continuous time Fourier Transform and Laplace Transform, Invelaplace Transform	-	Cuito
ird Year (Sem-V) B. Tech. Electronics and Telecommunication  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Scheme   RSE			gnals, ies of and ans on	verse Fourier Transform on periodic and non-periodic sign ansform and need for Laplace and z Transform Properties rity, time shifting, time reversal, frequency shifting, time attion in time domain, differentiation and integration, problems	-	
ird Year (Sem-V) B. Tech. Electronics and Telecommunication  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Scheme  k    Examination Scheme   Examination Scheme   20	(08)	C03-	sform	r Transform (CTFT) and Discrete Time Fourier Transfo		Unit
ird Year (Sem-V) B. Tech. Electronics and Telecommunication  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Scheme    Examination Scheme   20	(07)	CO3	FS eries.	esentation of periodic Continuous Time (CT) signals, ignals using trigonometric and exponential Fourier servies, properties of Fourier series and their physical significan	Fourier Series Fourier series representation Applications of Gibbs phenome	Unii
irid Year (Sem–V) B. Tech. Electronics and Telecommunication  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Scheme  k  MSE  20  ISE  20  ESE  60  Duration of ESE  02 Hrs 30 Min  Duration of ESE  102 Hrs 30 Min  Duration of ESE  102 Hrs 30 Min  Duration of ESE  103 Hrs 30 Min  Duration of ESE  104 Hrs 30 Min  Duration of ESE  105 Hrs 30 Min  ESE  106 Duration of ESE  107 Hrs 30 Min  ESE  108 Hrs 30 Min  Duration of ESE  109 Hrs 30 Min  ESE  100 ESE  100 ESE  101 Hrs 30 Min  ESE  102 Hrs 30 Min  Duration of ESE  102 Hrs 30 Min  ESE  103 Hrs 30 Min  ESE  104 Hrs 30 Min  ESE  105 Hrs 30 Min  ESE  106 ESE  107 Hrs 30 Min  ESE  108 Hrs 30 Min  ESE  109 Hrs 30 Min  ESE  109 Hrs 30 Min  ESE  100 Hrs 30 Min  ESE  100 Hrs 30 Min  ESE  100 Hrs 30 Min  ESE  101 Hrs 30 Min  ESE  102 Hrs 30 Min  ESE  102 Hrs 30 Min  ESE  103 Hrs 30 Min  ESE  105 Hrs 30 Min  ESE  106 Hrs 30 Min  ESE  107 Hrs 30 Min  ESE  108 Hrs 30 Min  ESE  109 Hrs 30 Min  ESE  100 Hrs 30 Min  ESE  107 Hrs 30 Min  ESE  108 Hrs 30 Min  ESE  109 Hrs 30 Min  ESE  100 H	(08)	C02	tation onse, cross	tion of LTI System  nd convolution integral for LTI system analysis, Representatial/difference equation, impulse, step and exponential response response of interconnected systems, auto-correlation, en correlation and convolution.		Uni
EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Scheme    MSE	(09)	COI	on of ramp, signal, Non-ll and variant	nd systems raphical, Functional, Tabular and Sequence representation rime signals. Basics of Elementary signals: Unit step, Unit ranential, rectangular pulse, Triangular, Signum. me shifting, time reversal, time scaling, amplitude scaling, siplication. Deterministic, Random, periodic, Non periodic, Causal, al. assification of Systems: static and dynamic systems, causal ar and Non- linear systems, time variant and time invale systems, invertible and non- invertible systems.		Cni
Third Year (Sem–V) B. Tech. Electronics and Telecommunication  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Teaching Scheme  Lectures  O3 Hrs/week  Tutorials  O6 Hrs/week  Total Credits  O3  Total Credits  O4  Total Credits  O5  Total Credits  O5  Total Credits  O6  Total Credits  O6  Total Credits  O7  Total Credits  O8  Total Credits  O8  Total Credits  O9  Total Credits  O9	Hours	CO		Course Contents		
EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Schem  MSE  K  ISE  Udents will be able to  ret different types of signals and systems  us Time and Discrete Time LTI systems in time and Transform doma  we the properties of Fourier Series and Transform doma  we the properties of Fourier Series and Transforms for signals	m	Z transfo	rm and	nous and Discrete Time Fourier Transform, Laplace Transform		CO
EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Schem  K  K  ISE  ESE  Duration of ESE  Indents will be able to  Indents will be able to  Indents will be able to			ains	and Discrete Time LTI systems in time and Transform domain		36
EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  EX3605: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Schen MSE  k				rent types of signals and systems	O1 Classify and interpret diffi	00
EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Scherr  MSE  K  ESE  Duration of ESE				vill be able to	erequisite: Mathematics, urse Outcomes (CO): Students	Cou
Third Year (Sem–V) B. Tech. Electronics and Telecommunication  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  heme		30 Min	02 Hrs	ition of ESE		
Third Year (Sem-V) B. Tech. Electronics and Telecommunication  EX3505: Signals and Systems (Multi-Disciplinary Minor-03)  Examination Scheme  03 Hrs/week  MSE			20			Tota
Third Year (Sem-V) B. Tech. Electronics and T EX3505: Signals and Systems (Multi-Discipli			20			Lect
Third Year (Sem-V) B. Tech. Electronics and Telecommunication EX3505: Signals and Systems (Multi-Disciplinary Minor-03)			ne	Examination Scheme		Teac
Third Year (Sem-V) B. Tech. Electronics and Telecommunication				: Signals and Systems (Multi-Disciplinary Minor-03)	EX350	
				r (Sem-V) B. Tech. Electronics and Telecommunication	Third Yea	

çu	2.	<u></u>	Use	çu)	2.	)t	Ref	4.	છ	2.	1.	Tex	Uni
IITBombayX course on Signals and systems by Dr. V M Gadre	Lecture Series on, "Signals & Systems" http://www.nptelvideos.in/2012/12/signals-and-system.html	NPTEL Course "Principles of Signals & System" https://nptel.ac.in/courses/108/104/108104100/	Useful Links	Alan V. Oppenheim, Alan S. Willsky with S. Hamid "Signals and Systems" (2nd Edition-1996), reprint 2024	B. P. Lathi, "Signals Systems and Communication", BS Publications, 2024	Michael J. Roberts, "Fundamentals of signals & systems", Tata McGraw Hill, 2010.	Reference Books	Simon Haykins and Barry Van Veen, "Signals and Systems", Wiley India, 2 nd Edition, 2004.	Dr.Sanjay Shrma, "Signals & System", S.K.Kataria & Sons, 1st edition, 2013.	A Nagoor Kani "Signals & system", TMH Publication, 2011.	Ramesh Babu "Signals & system", SciTech Publication 2018, 5th edition.	Text Books	Unit 6 Z transform CO4 Introduction of Z-transform, Relation between DTFT and Z-transform, ROC, properties of ROC, Unilateral and bilateral Z-transform, Inverse Z- transform: Long division method, PFE method.

1	,	ı	1	1		,	1.		3 2	w	CO 4
		1	1	1	1	1	1	1	w	2	CO 3
55		ı	1	1	1	1	1	1	3	2	CO 2
		ı	ı	1	ı	2	ť	1	3	3	CO 1
											CO↓
								7			1
9	13	70	PU &	70/	POI POZ POS PO4 POS PO6 PO7 PO8 PO9 PO10 PO11 PSO PSO	700	FO4	PUS	PU Z	POI	PO

## Guideline for Assessment Pattern

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	1	1	5	5	5	5	MSE
20	1		5	5	5	5	ISE
60	1	5	20	20	10	5	ESE

		BOOKS	Lext Books
(06)	C04	MicroC/OS-II case studies: ntroduction, features, Task management, time management, semaphore nanagement, Message Mailbox Management, Message Queue Management.	Unit 6
		Multiple Processes in an application, Multiple Threads in an application, Task and Data, Clear-cut distinction between Functions, ISRS and tasks by their Characteristics, Concept of Semaphores, Shared Data, Inter-process Communication, Signal Function,	
(07)	C04		Unit 5
(00)	8	Foreground and background systems, Critical section, Shared Resources, Tasks, Multitasking, Context Switching, Kernel Structure, Pre-emptive and non-pre-emptive Schedulers, Static and Dynamic Priorities, Priority Inversion,	Unit 4
(06)	C 03	acing using Raspberry-Pi/Cortex M4:  pad interfacing, switch interfacing, stepper motor interfacing, ut interfacing, Programming on I2c & SPI bus Protocol, Study e embedded products in detail.	Unit 3
(08)	C03	features, Improvement atures and applications, cture block diagram & Pin Connect Block.	Unit 2
(07)	COI	Introduction to Embedded Systems: Introduction to Embedded Systems, Application Areas, Design Methodology, Design Metrics, Categories of embedded systems, Overview of embedded system architecture, Specialties of embedded systems, recent trends in embedded systems, Architecture of embedded systems, Hardware architecture, Software architecture, Application Software, Communication Software. Embedded system design and development: Embedded system design, Life- Cycle Models, Development tools.	Unit 1
Hours	СО	Course Contents	
		Implement the real-time operating system principles such as multitasking techniques.  Analyze the structure and working of real-time operating systems.	4. 5. A. In
ose.	rial Purpo	Design & Develop Embedded System applications for Real life, Engineering and Industrial Purpose	
	ions.	<ol> <li>Illustrate &amp; Apply concepts of Cortex M4 Microcontroller in Embedded System applications.</li> </ol>	1. III
		Course Outcomes (CO)	Course (
o. To Change	Car a all o	Prerequisite: Microcontroller	Prerequ
00 Um 30 Min	60	redits 02 ESE	Total Credits
	20	00 Hrs/week	Tutorials
	20	s 02 Hrs/week MSE	Lectures
	eme	Teaching Scheme Examination Scheme	Teachin
		EX3516: Embedded system & RTOS (OEC-03)	
		Third Variation of the state of	Control of the second



2.	2. Joseph Yiu, "The Definitive Guide to ARM Cortex M3/M4 Processors", Elsevier; First edition, 2014
è	3. Dr. K. V. K. K. Prasad; Embedded / real-time systems: concepts, design & programming, Black Book;
	Dreamtech press, Reprint edition2013
Ref	Reference Books
	1. Mark Lutz, "Learning Python", O'Reilly Media, 5th Edition, 2016.
2.	2. Jean Labrosse: MicroC/OS-II: The Real-Time Kernel; Meets Requirements for Safety-Critical Systems
	, 2nd Edition, Elsevier/Shroff Publishers, 2011.
Use	Useful Links
1.	www.arm.com
2	2. www.nxp.com

CO 4	CO 3	CO2	CO 1	CO↓	PO→
1	ω	2	Ъ	-	PO
2	ω	2	2	2	PO
1	ω	2	1		PO 3
2	З	2	,		PO4
Ľ	3	2	ı		0 5
1	ω	2	1		PO 6
1	1	1	ţ		P07
1	ω	2	1		PO8
L	• 1	1	1	9	PO
1	ω	2	1		PO10
2	ω	2	1		PO11
2	ω	2	1	Н	PSO
Н	ω	1	1		PSO2
₽	2	ω	ı		PSO3

## Guideline for Assessment Pattern

TOTAL 20	Create -	Evaluate -	Analyse 5	Apply 5	Understand 5	Remember 5	Knowledge Level MSE
20	1	1	S	5	5	5	ISE
60	ı	5	20	20	10	5	ESE

Govern	Government College of Engineering, Karad	200	
Second Year (Sem - V) B	Second Year (Sem - V) B. Tech. Electronics and Telecommunication Engineering	nunication ]	Engineering
EX3526-0	EX3526-OEC -03 - (MOOC) Embedded systems	stems	
Teaching Scheme		Examinati	<b>Examination Scheme</b>
Lectures -		ISE	1
Tutorials -		ESE	100
Total Credits 02			
Course Outcomes (CO): Students will be able to	able to		

Students in the domain Digital Electronics and submit a copy of the certificate to Head of Department prior to ESE.

#### Guidelines:

- Selection of the MOOC course should be with the prior permission of Head of Department
- Duration for completion of MOOC course certification isminimum8Weeks.
- Platform: NPTEL or SWYAM only
- by the student in NPTEL or SWAYAM course certification and it will be converted to ESE score. Assessment Guideline: -The evaluation of the MOOC Course will be based on at actual score secured
- internal evaluation (40 % weightage). evaluation will be based on assignment score (60% weightage) of registered NPTEL/SWAYAM and If the student unable to submit the NPTEL or SWAYAM completion Certificate, in such cases
- The rubrics for internal evaluation are given below.

#### Department of Electronics & Telecommunication Government College of Engineering, Karad

2	Ь	No.	Cou	Com	
		Reg.	Course Title:-	Course Code:	
		Name of Student	:		
		Course Title		Assessment Sheet Class:	
		Knowledge of Course (08 Marks)		Sheet (	
				Class:	
		Communication Skill (08 Marks)			A. Y. 2024-25
		Presentation Skill (08 Marks)			
		Content (08 Marks)			
		Q & A (08 Marks)			
		Total Marks (out of 40)			

Faculty Name and Sign.

Head of the Department

Board of Studies- E&TC Chairman

Third Year (Sem – V) B. Tech. in Electronics & Telecommunication Engineering.    Examination Females   Digital Communication Laboratory		xperiments: 10	Minimum number of Experiments: 10	
Covernment College of Engineering, Karad				List of Su
Covernment College of Engineering, Karad	C04	e QPSK modulation and demodulation.		Experime
Course Outcomes (CO): Students will be able to	C04	BPSK modulation and demodulation.		Experime
Course Outcomes (CO): Students will be able to	C04	e PSK modulation and demodulation.		Experime
Course College of Engineering, Karad	CO4	dated waveforms.		емрения
redit fory	C03	e PCM- Time division multiplexing and demultiplexing.		Experime
l cedit cedi	CO3	e PAM, PWM and PPM generation and detection		Experime
tory   Out	CO3	e sampling and reconstruction using sample and hold		Experime
tory   Out	CO2	e PLL as FM Detector		Experime
tory	C02	e Pre emphasis and De-emphasis		Experime
ent:	CO2	e frequency modulation and demodulation.		Experime
ents ents	C01	e SSB-SC Modulator & Detector (Phase Shift Method)		Experime
entt	C01	e amplitude modulation and demodulation		Experime
Out edit			entation of following concepts	Implemen
Our editi	CO	ourse Contents	C	
Out edit	g experimental	odulation techniques (ASK, FSK, PSK, BPSK, QPSK) usi	Analyze and compare digital m setups.	C04
Out	r waveforms.	ation schemes (PAM, PWM, PPM, PCM) and interpret the	Implement various pulse modul	CO3
	communication	uction, and time-division multiplexing techniques in pulse	Demonstrate sampling, reconstrate systems.	CO2
Government College of Engineering, I Third Year (Sem – V) B. Tech. in Electronics & Telecommu  EX3507: Analog & Digital Communication tory Scheme:    02 Hrs/week   01		M, PM, and SSB modulation and demodulation techniques	Explain the principles of AM, I	COI
Third Year (Sem – V) B. Tech. in Electronics & Telecommu  EX3507: Analog & Digital Communication  tory Scheme:  02 Hrs/week  edits  O1		ble to	Outcomes (CO): Students will be	Course O
Government College of Engineering, I Third Year (Sem – V) B. Tech. in Electronics & Telecommu EX3507: Analog & Digital Communication tory Scheme:    02 Hrs/week				
Third Year (Sem – V) B. Tech. in Electronics & Telecommu  EX3507: Analog & Digital Communication  tory Scheme:  02 Hrs/week				Total Crev
Government College of Engineering, I ar (Sem – V) B. Tech. in Electronics & Telecommu  EX3507: Analog & Digital Communication		JSC HSI	-	Practical
		Examination Scheme:		Laborato
		log & Digital Communication Laboratory	EX3507: Ana	
Government College of Engineering, Karad		. in Electronics & Telecommunication Engineering		
		ment College of Engineering, Karad	Govern	

				(High)	tantial (	3: Subs		Medium)		2: Moderate (1	N	Low)	1: Slight (Low)	
-	3	1	1	ı	1	ı	,	ω	3	w	w	w	w	
_	3	1	ı		,	1	,	1	2	2	S	2	2	CO 3
-	S	1	1	1	ı	1	1	2	2	2	2	S	2	CO 2
1	3	1	1	,	1	1	1	2	1	2	2	2	2	COL
w	12	_												CO
PSO	PSO	PSO	PO 10 PO 11	PO 10	PO 9	PO 8	PO 7	PO 6	PO 5	PO 4	PO 3	PO 2	POI	PO →

## Guideline for Assessment Pattern

Skill Level (as per	Exp	Avg									
CAS Sheet)	-	2	3	4	S	6	7	~	9	10	
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
ISE	25	25	25	25	25	25	25	25	25	25	25

Laboratory Scheme:   EX3508: Digital Signal Processing Laboratory		Governn	Government College of Engineering, Karad	g, Karad		
	Tird	l Year (Sem - V) B. To	ech. Electronics and Teleco	mminication	Engineering	30
		EX3508: I	Digital Signal Processing L	aboratory		
	Laboratory Schen			Examination S	cheme:	
	Practical	02 Hrs/week		ISE	25	
	Total Credits	01		ESE	1	
	Prerequisite: Sign	nals and Systems Lab, N	ATLAB/Scilab			
	Course Outcomes	s (CO): Students will be a	ble to			
		ement linear and circular	convolution using MATLAB a	ind DSP Board.		
		pute DFT/IDFT and demo	onstrate segmented convolution	n using MATLA	B and DSP B	oard.
		gn and implement digital	FIR and IIR filter			
		lop digital filters for real-	world signals and demonstrate	hardware-based	implementat	ion.
		C	ourse Contents			00
	Implementation o	-				
	Experiment 1	Implement Linear and and DSP Board)	Circular convolution. (Perform	n practical on M	ATLAB	C01
	Experiment 2	Compute DFT and IDF DSP Board)	T of a DT signal. (Perform pr	actical on MATI	AB and	C01
	Experiment 3	Evaluate Segmented C (Perform practical on N	onvolution using Overlap Add AATLAB and DSP Board)	or Overlap Save	Method.	CO1
	Experiment 4	Design of Butterworth	IIR filter using Impulse Invari	ance Technique.		C02
	Experiment 5	Design of Butterworth	IIR filter using Bilinear Transf	ormation Technic	que.	C02
	Experiment 6	Design of LPF, HPF FI	R filter using Frequency Samp	ling method.		CO3
	Experiment 7	Design of LPF, HPF FI	R filter using windowing meth	ıod.		CO3
	Experiment 8	Design of IIR/FIR digi	al filters and use the designed	filter to filter an	input	CO3
		signals like ECG/EEG,	speech signal etc.	nents of real-wor	Id	
	Experiment 9	Design of Low Pass file	ter (Hardware based- TMS 320	C/FXXXX serie	s)	C04
The second second	Experiment 10	Design of High Pass fil	ter (Hardware based- TMS 32)	OC/FXXXX serie	8)	CO4
	Experiment 11	Virtual Laboratory http concepts like DFT and	://vlabs.iitkgp.ernet.in/dsp/# fi its inverse, FIR filter using wi	or demonstration	of etc.	C04
Minimum number of Experiments: 10 (Minimum Two Experiments should be perforn DSP Board)	List of Submission		C	c		
1000000		Minimum number of E	xperiments: 10 (Minimum Tw	o Experiments sh	ould be perfo	rmed on

CO 4	CO <sub>3</sub>	CO2	COI	PO → CO ↓
_	2	2	ယ	PO I
2	w	w	ယ	PO 2
S	w	2	2	PO3
1	w	w	_	PO 4
-	2	2	2	PO 5
1	1	1	1	PO 6
ı	1	1	1	PO 7
ı	ı	1	1	PO 8
1	,	1	1	PO 9
1	1	1	1	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PSO 1 PSO 2
1	1	1	1,	PO 11
_	1	_	2	PSO 1
2	3	ယ	_	PSO 2
3	2	-	-	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern

ISE	Task III	Task II	Task I	CAS Sheet)	Skill Level (as per
25	05	05	15	,	Exp
25	05	05	15	2	Exp
25	05	05	15	ယ	Exp
25	05	05	15	4	Exp
25	05	0.5	15	5	Exp
25	05	05	15	6	Exp
25	05	05	15	7	Exp
25	05	05	15	∞	Exp
25	05	05	15	9	Exp
25	05	05	15	10	Exp
25	05	05	15		Avg

			Experiments: 10	Minimum number of Experiments:	
				1	List of Submission:
C04		r and SPI ADC IC.	Measure Ambient temperature using a sensor and SPI ADC IC		Experiment 12
C04	isplay	Interface 12-bit internal ADC to convert the analog to digital and display the same on LCD.	al ADC to convert the	Interface 12-bit intern the same on LCD.	Experiment 11
C04		y code on an LCD	ard and display the ke	Interface a 4×4 keyboard and display the key code on an LCD	Experiment 10
C04			a DC Motor.	Interface and Control a DC Motor	Experiment 9
	alla	ounouter Benerator I MINI	OF THE PROPERTY OF	vary its duty cycle.	
CO3	and	Using the Internal PWM module of ARM controller generate PWM and	M module of ARM co	Using the Internal PW	Experiment 8
603	00	LUAKI.	Demonstrate the use of an external internal OAKI	Demonstrate the use	Experiment 7
COS		d Square waveroun	Scholate High Interna	Display Hello World	Experiment 6
003		d Square waveform	Interface a DAC and generate Triangular and Square waveform	Interface a DAC and	Experiment 5
C02	3	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.	s 0 to F on a 7-segmen etween.	Display the Hex digits 0 to F appropriate delay in between	Experiment 4
C03	ise	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.	otor and rotate it in clo	Interface a Stepper modirection.	Experiment 3
C03	zer	Interface a simple Switch and display its status through Relay, Buzzer and LED.	itch and display its sta	Interface a simple Sw and LED.	Experiment 2
CO1		RTEX Series)	Introduction to embedded system (ARM CORTEX Series	Introduction to embed	Experiment 1
				Implementation of following concepts	Implementation o
CO.			Course Contents		
			with IOT.	Integrate Embedded Systems with IOT	CO4 Integr
			unication Protocols	Implement Embedded Communication Protocols	CO3 Imple
		n.	with Embedded syster	Interface keypad and sensors with Embedded system	CO2 Interfa
			tecture & Components	Understand Embedded Architecture & Components	CO1 Under
			able to	Course Outcomes (CO): Students will be able to	Course Outcomes
			etwork	Prerequisite: Microcontroller, computer network	Prerequisite: Micr
	25	ESE		01	Total Credits
,	25	ISE		02 Hrs./week	Practical
	n Scheme:	Examination Scheme:		ne:	Laboratory Scheme:
		RTOS Laboratory	EX3509: Embedded System & RTOS Laboratory	EX3509:	
	ation	Third Year (Sem - V) B. Tech. Electronics & Telecommunication	- V) B. Tech. Electro	Third Year (Sem	74.5
		Sincering, Narau	Government Conege of Engineering, Narao	COACT	

CO 4	CO3	CO2	COL	COT	PO →
1	ı	1	3		PO 1
1	-	2	1	2	PO
2	3	1			PO 3
w	2	_	_		PO 4 PO 5
ī		ı	1		PO 5
_	_	_	-		9 O q
pool	1	_			PO 7
ı	1	,			PO 8
1	1	1	1	(	PO 9
1	ı	1	1		PO 10
1	ı		1		PO 11
2	2	1	1		DSO 1
1	1	,	2	50	PSO 3
2	1	_	2		PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern

ISE	Task III	Task II	Task I	Skill Level (as per CAS Sheet)
25	05	05	15	Exp 1
25	05	05	15	Exp 2
25	05	05	15	Exp 3
25	05	05	15	Exp 4
25	05	05	15	Exp 5
25	05	05	15	Exp 6
25	05	05	15	Exp 7
25	05	05	15	Exp 8
25	05	05	15	Exp 9
25	05	05	15	Exp 10
25	05	05	15	Avg

	Govern	Government College of Engineering, Karad	arad		
	Third Year (Sem -	Third Year (Sem -V) B. Tech. Electronics and Telecommunication	ecommunication		
	EX3510: Signals a	EX3510: Signals and Systems Lab (Multi-Disciplinary Minor-03)	nary Minor-03)		
Laboratory Scheme:	Scheme:		Examination Scheme:	ieme:	
Practical	02 Hrs/week		ISE 5	50	
Total Credits	s 01		ESE -		
Course Out	Course Outcomes (CO): Students will be able to	ble to			
CO1	Utilize MATLAB as powerful	Utilize MATLAB as powerful tool for analyzing and developing system application	system applicat	ion	
C02	Plot the signals and implement basic signal operations	basic signal operations.			
C03	Obtain impulse and step respor	Obtain impulse and step response of the system, Convolution, Correlation	orrelation		
C04	Compute CTFT, DTFT, Laplace,	e, Inverse Laplace, Z and Inverse	Z transform of a signal	signal	
Course Contents	ents			СО	)
Implementa	Implementation of following concepts				
Experiment 1		Introduction to MATLAB Software and to define and use of varianctions, matrices and vectors, arithmetical operators and mathematical functions using MATLAB.	and use of va	of variables, CO1	)1
Experiment 2	To Plot the addition, subtraction, discrete time signal using MATLAB	subtraction, Multiplication of ng MATLAB.	continuous and	d CO2	)2
Experiment 3	To Plot Basic El Sinusoidal, Real Triangular, Signum	: Unit	step, Unit ramp, Impulse exponential, rectangular	pulse, CO2	)2
Experiment 4		Implement Basic signal operations such as Time Shifting, Time Scaling Amplitude Scaling, Time compression and expansion using MATLAB.	ng, Time Scaling	, CO2	)2
Experiment 5		For given signal $x_1(t)$ and $x_2(t)$ find its even and odd component and show CO3 that the original signal is addition of even and odd signals using MATLAB.	dd component a	nd show CC	)3
Experiment 6		To obtain linear convolution of the given sequences using MATLAB	g MATLAB.	C03	)3
Experiment 7	To compute MATLAB.	autocorrelation and cross Co-relation o	of sequence using	g CO3	)3
Experiment 8		Find the impulse response and step response of a system findifference equation. Compute and plot the response of a given system to a given input using MATLAB.	f a system fr given system to	from its CO4 to	)4
Experiment 9		Find Laplace and inverse Laplace Transform for given signal / function using MATLAB.	signal / function	CO4	)4
Experiment 10	Find Z and inverse MATLAB.	Z transform for given signal	/-function using	CO4	)4
List of Submission:	ission:				
	Minimum Number of experiments-8	operiments-8			
	Design and simulate a p Multisim, Scilab, or MA	Design and simulate a project relevant to the syllabus using any tools such as PSpice. Multisim, Scilab, or MATLAB. Form a group of three or four students.	ng any tools sucl four students.	n as PSpice,	



_	CO 4	CO 3	CO 2	CO 1	PO →
1: Slight (Low)	3	3	သ	သ	PO1
(Low)	1	2	1	w	
	1	1	1	3	PO3
2: M	1	1	1	1	P04
2: Moderate (Medium)	2	3	3	3	PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9
(Medin	-	1	-	1	PO6
ım)	'	1	-	1	PO7
(.)	-	1	1	1	PO8
3: Substantial (High	1	1	-	1	PO9
ntial (Hig	1	1	1	1	PO10
ф	1	1	-	1	PO11
	1	1	1	2	PO10 PO11 PSO11 PSO2
	1	1	-	2	PSO2
	1	1	1	1	PSO3

## Guideline for Assessment Pattern

70	50	50	50	50	50	50	50	50	50	ISE
10	10	10	10	10	10	10	10	10	10	Task III
10	10	10	10	10	10	10	10	10	10	Task II
30	30	30	30	30	30	30	30	30	30	Task I
Exp 10	Exp 9	Exp 8	Exp 7	Exp 6		Exp 4 Exp 5	Exp 3	Exp 2 Exp 3	Exp 1	Skill Level (as per CAS Sheet)

	7 1 1 17		A LE LE LES CONTRACTOR OF WATER PROPERTY OF THE PROPERTY OF TH			
	Inira Yes	ar (Sem - V) B. Lech	Inita year (Sem - v) B. Jech. Electronics and Jelecommunication Engineering	mication Eng	meering	
		EX3511: Contro	EX3511: Control System Laboratory (Program Elective -01)	m Elective -0	jonek	
Laboratory Scheme:	Scheme:			<b>Examination Scheme</b>	n Scheme:	
Practical		02 Hrs/week		ISE	25	
Total Credits	S	01		ESE	1	
Course Ou	tcomes (C	Course Outcomes (CO): Students will be able to	ble to			
C01	Demonst	rate the ability to anal	Demonstrate the ability to analyze the control system.			
C02	Identify t	Identify the stability of the system	em.			
C03	Identify t	he behavior of contro	Identify the behavior of control system using frequency analysis	sis.		
C04	Examine	Examine the system using state space analysis	space analysis.			
		C	Course Contents			00
Implement	ation of fo	Implementation of following concepts				
Experiment 1		velop step and impuls	Develop step and impulse responses of first-order system using MATLAB	m using MA	TLAB	C01
<b>Experiment 2</b>		velop step and impuls	Develop step and impulse responses of second-order system using MATLAB	stem using M	ATLAB	CO2
<b>Experiment 3</b>		nstruct Root locus an	Construct Root locus and identify stability of a system using MATLAB	using MATL	AВ	C02
<b>Experiment 4</b>		plot Bode plot and id	To plot Bode plot and identify stability of a system using MATLAB	ng MATLAB.		CO3
<b>Experiment 5</b>		plot Nyquist plot and	To plot Nyquist plot and identify stability of a system using MATLAB	ising MATLA	В.	CO3
Experiment 6		plement frequency res	Implement frequency response of Lag Compensator using MATLAB	ing MATLAE		C02
<b>Experiment 7</b>		plement frequency res	Implement frequency response of Lead Compensator using MATLAB	sing MATLA	В.	C02
<b>Experiment 8</b>		plement PI and PD co	Implement PI and PD controllers using MATLAB.			C02
<b>Experiment 9</b>		alyze the output response	Analyze the output response of PID controller using MATLAB	ATLAB.		CO2
<b>Experiment 10</b>		tain the time response	Obtain the time response from state model of a system using MATLAB	using MATL	AB.	C02
List of Submission:	mission:					
		Vinimum ampha of Francisco	0			

1: S	CO 4	CO 3	CO 2	COI	CO↓	PO →
1: Slight (Low)		-	_	u	_	PO
(wo	1	<b>-</b>	_		2	PO
	1	-	1	-1	Ç	PO
2: Moo	, –	1	1	r		PO PO 4 PO 5 PO
2: Moderate (Medium)		,	1	,		PO 5
Mediur	17	1	1	ı	9/	PO
n)	ı	1	1	1	7	РО
3:	1	- 1	1	ı		PO 8
Substa	1	-1	ī	1		PO 9
3: Substantial (High)	1	1		1		PO 10
gh)	ı	ı	. 1	1	=	PO
	1	1	r	1		PO 8 PO 9 PO 10 PO PSO 1 PSO
	1	-	1	1	2	PSO
	2	,	1	-		PSO 3

## Guideline for Assessment Pattern

ISE 25 25	05	05	15 15	Skill Level (as per Exp Exp I CAS Sheet) 1 2
25	05	05	15	Exp 3
25	05	05	15	Exp 4
25	05	05	15	Exp 5
25	05	05	15	Exp 6
25	05	05	15	Exp 7
25	05	05	15	Exp 8
25	05	05	15	Exp 9
25	05	05	15	Exp 10
25	05	05	15	Avg

	Governi Governi	Government College of Engineering, Karad  Third Vear (Sem - V) R Tech in Electronics & Telegommunication Engineering	z, Karad	n Engineerin	G .
	EVACAL DELLE	THE RESERVE OF THE PARTY OF THE	N N N N N N N N N N N N N N N N N N N	A TAMBATTON	ď
	EASSAL DIEVES AND CON	EASSZI: Drives and Control Laboratory (Frogram Elective -01 Laboratory)	Elective -UI	Laboratory)	
Laboratory Scheme:	cheme:		<b>Examination Scheme</b>	n Scheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	1	
Prerequisite:					
Course Outco	Course Outcomes (CO): Students will be able to	able to			
CO1 U	Inderstanding of Electrical Di	Understanding of Electrical Drive Systems and Components.			
CO2 In	Implementation of Motor Control Techniques	trol Techniques.			
CO3 In	Integration of controllers in Drive Automation	ive Automation.			
CO4 D	Diagnosis and Performance Analysis of Electrical Drives	nalysis of Electrical Drives.			
	0	Course Contents			CO
Experiment 1	Study of Electrical Drives and Their Components	s and Their Components			C01
Experiment 2	Speed Control of DC Mo	Speed Control of DC Motor Using Armature Voltage Control	ontrol		C02
Experiment 3	Speed Control of DC Mo	Speed Control of DC Motor Using PWM Technique			C02
Experiment 4	Open loop and closed loop control of DC Motor	op control of DC Motor			CO3
Experiment 5	Servo Motor Control Using PID Controller	ng PID Controller			C02
Experiment 6	Open loop and closed loo	Open loop and closed loop control of stepper Motor			C02
Experiment 7	Regenerative Braking in Electrical Drives	Electrical Drives			C03
Experiment 8	Fault Detection and Diagnosis in Motor Drives	nosis in Motor Drives			C03
Experiment 9	Case Study: Automation	Case Study: Automation in Industrial Applications			C04
Experiment 10	Case Study: Industrial ap	Case Study: Industrial applications of stepper and servo drives	drives.		CO4
Experiment 11	Case Study: Modern trends in drive technology.	ds in drive technology.			C04
List of Submission:	Sion:				
	Minimum number of Experiments: 8	periments: 8			
Monnie	Manning of CO J BO				

CO 4	CO3	CO 2	COI	PO → CO↓
1	1		(J	PO 1
1	-	2	1	PO2
2	3	,	1	PO 3
w	2	1	_	PO 4
1	1	1	1	PO 5
_	1		-	PO 6
_	1	1	_	PO 7
Ŀ	1	1	ı	PO 8
1	1	1	ı	PO 9
	1	1		PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10
1	1	1	1	PO 11
1	1	1	1	PO 11 PSO 1
1	1	1	2	PSO 2
-	1	1	2	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Guideline for Assessment Pattern:

ISE 25 25	k III	Task II 05 05		Skill Level (as per Exp Exp CAS Sheet) 1 2
25	05	05	15	Exp 3
25	95	05	15	Exp 4
25	05	05	15	Exp 5
25	05	05	15	Exp 6
25	05	05	15	Exp 7
25	05	05	15	Exp 8
25	05	05	15	Exp 9
25	05	05	15	Exp 10
25	05	05	15	Avg

	Company	mont College of Francis	Trans.		
Thir	d Year (Sem – V) B. T	Third Year (Sem – V) B. Tech, Electronics and Telecommunication Engineering	communication	Engineerin	9
4	X3531: Digital Speed	EX3531: Digital Speech Processing Lab (Program Elective -01 Laboratory)	n Elective -01	aboratory)	g
Laboratory Scheme:	eme:		Examination Scheme:	Scheme:	
Practical	02 Hrs/week	3.	ISE	25	
Total Credits	01		ESE	1	
Prerequisite: Sig Audacity.	mals and Systems Lab, M	Prerequisite: Signals and Systems Lab, MATLAB/Scilab, PRAAT, Python (Librosa, Speech Recognition), Audacity.	hon (Librosa, Spo	eech Recogniti	on),
Course Outcome	Course Outcomes (CO): Student will be able	able to			
CO1 Und	Understand Speech Signal Processing Concepts	ocessing Concepts.			
CO2 Impl	Implement Pitch Estimation Techniques	echniques			
CO3 Perfo	Perform Spectral and Cepstral Analysis	l Analysis			
CO4 Extr	Extract Speech Features for Processing	rocessing			
	0	Course Contents			CO
Implementation	Implementation of following concepts				
Experiment 1	Study of frame format for a .wav file. Write a and remove the silence part from the utterance	Study of frame format for a .wav file. Write a program to read a .wav file and remove the silence part from the utterance.	am to read a .wav	v file	C01
Experiment 2	Study of voiced and	Study of voiced and unvoiced speech. Record a sentence and write	sentence and wi	rite a	C01
	program to use a zero utterance.	program to use a zero-crossing method to find voiced and unvoiced part of utterance.	iced and unvoic	ed part of	
Experiment 3	Write a program to use Average magnitude of pitch period for a voiced part of the utterance	Write a program to use Average magnitude difference method to find the pitch period for a voiced part of the utterance.	ce method to fin	d the	C02
Experiment 4	Write a program to use Autoco for a voiced part of the utterance	Write a program to use Autocorrelation method to find the pitch period for a voiced part of the utterance.	find the pitch p	eriod	C02
Experiment 5	Write a program to drav	Write a program to draw a 3-D spectrogram for a .wav file	w file.		C03
Experiment 6	Write a program to dra speech utterance.	Write a program to draw a log spectrum for 256 speech samples from the speech utterance:	ech samples fron	n the	C03
Experiment 7	Write a program to dr speech utterance.	draw a Cepstrum for 256 speech samples from	ch samples fron	n the	CO3
Experiment 8	Write a program to draw a 12 MFCC speech utterance using direct command		for 256 speech samples from	n the	C04
Experiment 9	Write a program to dr speech utterance. Use I	Write a program to draw LPC graph for 256 speech samples speech utterance. Use Levinson Durbin algorithm.	ch samples from	1 the	C04
Experiment 10	Write a program to draw Formants for 2: utterance using a Cepstral domain window.	Write a program to draw Formants for 256 speech samples from the speech utterance using a Cepstral domain window.	samples from th	e speech	CO4

CO 4 3 3 1	CO3 2 3	CO2 2 3	CO 1 3 3	CO <sub>1</sub> 1 2	FO PO PO
1 2	3	2 3	2 1	4	PO PO
ω	2	. 2	2	S	PO
	1	1	ı	6	2
1	1	1	ı	7	PO
1	1	1	ı	· ∞	PO
1	,	ı	1	9	PO
1	1	1	ı	10	PO
1	ı	1	1	)t	PO
3	1	1	2		PSO
2	w	3	_	2	PSO
-	2	-	_	(J)	PSO

#### Assessment Pattern:

ISE 25 25	Task III 05 05	Task II 05 05	15	Skill Level (as Exp Exp per CAS Sheet) 1 2
25	05			p Exp
25	05	05	15	Exp 4
25	05	05	15	Exp <sub>5</sub>
25	05	05	15	Exp 6
25	05	05	15	Exp 7
25	05	05	15	Exp 8
25	05	05	15	Exp 9
25	05	05	15	Exp 10
25	05	05	15	Avg

	Third Year (Sem -	r (Sem – V) B. Tech. Electronics & Telecom	Telecommunication	mication	
EX3541: P	ython Programming	EX3541: Python Programming for Machine Learning (Program Elective -01 Laboratory)	rogram Elec	tive -01 Labo	ratory)
Laboratory Scheme:	le:	100	Examinati	Examination Scheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	1	
Prerequisite:					
Course Outcomes	Course Outcomes (CO): Students will be able	able to			
CO1 Under	Understand and Apply Python for Data Analysis	for Data Analysis.			
CO2 Analy	Analyze and Visualize Data using Statistical Methods	ing Statistical Methods			
CO3 Develo	op Machine Learning M	Develop Machine Learning Models for Data-Driven Insights	S		4
CO4 Optim	ize Machine Learning N	Optimize Machine Learning Models through Feature Engineering and Tuning	eering and Tur	ing	
	0	Course Contents			00
Implementation of	Implementation of following concepts				
Experiment 1	Introduction to Python and Data Types	and Data Types			C01
Experiment 2	Control Flow and Functions in Python	tions in Python			C02
Experiment 3	Introduction to NumPy				C02
Experiment 4	Introduction to Pandas for Data Manipulation	for Data Manipulation			CO3
Experiment 5	Data Visualization wit	Data Visualization with Matplotlib and Seaborn			C03
Experiment 6	Basic Statistics with Python	thon			CO3
Experiment 7	Exploratory Data Anal	Exploratory Data Analysis (EDA) - Univariate Analysis	ysis		C03
Experiment 8	Exploratory Data Anal	Exploratory Data Analysis (EDA) - Bivariate Analysis	SiS		CO3
Experiment 9	Feature Engineering and Data Pre-processing	nd Data Pre-processing			C02
Experiment 10	Supervised Learning - Linear Regression	Linear Regression			C03
Experiment 11	Supervised Learning -	Supervised Learning - Decision Tree Classification			CO3
Experiment 12	Supervised Learning - Random Forest	Random Forest			C03
Experiment 13	Unsupervised Learning - KMeans Clustering	y - KMeans Clustering			C04
Experiment 14	Unsupervised Learning	Unsupervised Learning - DBSCAN Clustering			C04
Experiment 15	Model Evaluation and	Model Evaluation and Hyperparameter Tuning			C04
List of Submission:					
	Of the minimum of The minimum of N	10			



CO 4	CO 3	CO 2	CO 1	CO↓	700
1		1	ယ	- 70	1
1	1	2	. 1	2	
2	S	1	1	3	200
w	2	1	-	4	***
1	<u></u>	1	1	5	-
1	-	_	-	0 0	100 MM
1		1	. 1	PO 7	
,	2	,	1	∞ PO	-
1	1	.1	1	9 9	-
1	1	1	, 1	PO 10	2000
1	1	1	1	PO	
2	2	-	1	PSO	
I -		1	2	PSO 2	-
1	1	ı	1	PSO 3	

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

# Guideline for Assessment Pattern:

Skill Level (as per	Exp	Exp	Exp	Exp	Exp	Exp	Exp	Exp	Exp	Exp	Avg
CAS Sheet)	1	2	w	4	Un ,	6	7,	∞ ,	9 .	10	
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	25	25	25	25	25	25	25	25 .	25	25	25

	Governi	Government College of Engineering, Karad	Karad		
	Third Year (Sem -\	Third Year (Sem –V) B. Tech. Electronics and Telecommunication	elecommunicat	On	
				27	
Laboratory Scheme:	ieme:		Examination Scheme:	Scheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	1	
Prerequisite: B	Prerequisite: Basic of SQL, Linux.				
Course Outcom	Course Outcomes (CO): Students will be able to	ole to			
CO1 De	Demonstrate proficiency in the installation of the L and directory operations in the Linux environment.	Demonstrate proficiency in the installation of the Ubuntu operating system and perform essential file and directory operations in the Linux environment.	ating system and	1 perform ess	ential file
CO2 Uti	lize DML, DDL, DCL and T	Utilize DML, DDL, DCL and TCL operations to manage and manipulate database structures effectively.	nanipulate datal	pase structure	es effectively.
CO3 Uti	Utilize SQL functions and operators their application in real-time scenarios.	Utilize SQL functions and operators to perform advanced data analysis and retrieval, demonstrating their application in real-time scenarios.	lata analysis and	d retrieval, o	lemonstrating
CO4 De	Develop and execute comprehensive test cases for we and utilize bug-tracking tools for defect management.	Develop and execute comprehensive test cases for web applications like Gmail, Facebook, and Twitter, and utilize bug-tracking tools for defect management.	ations like Gmai	l, Facebook,	and Twitter,
	Co	Course Contents			CO
Implementation	Implementation of following concepts				
Experiment 1	Introduction to Linux O	Introduction to Linux Operating System and Installation of Ubuntu	n of Ubuntu.		C01
Experiment 2	Perform basic file and d Implement file permissi	Perform basic file and directory operations (ls, cd, mkdir, cp, rm, etc. also Implement file permission management using chmod, chown, and ls, -l.	lir, cp, rm, etc. a chown, and ls, -	lso	C01
Experiment 3	Implementation of DDL cc table, alter table, Drop Table.	Implementation of DDL commands of SQL with suitable examples-Create table, alter table, Drop Table.	suitable examp	les-Create	C02
Experiment 4	Implementation of DM Update, Delete.	Implementation of DML commands of SQL with suitable examples Update, Delete.	itable examples	- Insert,	C02
Experiment 5	Implementation of DCL comman –Committee, Rollback and save point	CL commands of SQL with and save point	suitable	examples	C02
Experiment 6	Implementation of TCL Revoke.	Implementation of TCL commands of SQL with suitable examples Revoke.	ble examples –	-Grant and	C02
Experiment 7	Implementation of differ  Number function, Agg  Date Function	Implementation of different types of function with suitable examples  Number function, Aggregate Function, Character Function, Conversion Function  Date Function	able examples ction, Conversion	on Function	C03
Experiment 8	Implementation of different types • Arithmetic Operators, Logical C • Special Operator, Set Operation	Implementation of different types of operators in SQL  • Arithmetic Operators, Logical Operators, Comparison Operator  • Special Operator, Set Operation	Operator		CO3
Experiment 9	Study and Implementation Order by clause	Study and Implementation of Group By & having clause  Order by clause	Ö		CO3
Experiment 10	Write test cases for Gmail	il.			C04
Experiment 9	Write test cases for FACEBOOK, Twitter	EBOOK, Twitter.			C04
Experiment 10	Study of bug tracking tool (e.g. Bugzilla)	ol (e.g. Bugzilla)		/-	C04



List of Submission:	Minimum Number of experiments-8
	Group of 4 students and try to write test case according to requirement and try to develop your
	own software.

CO4	CO3	CO2	CO1	CO↓	PO →
Ъ	Ъ	ъ	ы		PO1
1	₽	ь	Ь		PO2
1	E	1	Ъ		PO3
1	1	'	1		PO4
Ъ	<u> </u>	Ь	Ь		PO5
1	,	1	1		P06
1	1	1	1		PO7
1	1	'	-1		PO8
1	1	1	1		P09
I	,1	1	1		PO10
1	1	1	1		PO11
2	2	2	Ь		PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PSO1 PSO2 PSO3
2	1	2	2		PSO2
1	Н	1	1		PSO3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

#### Assessment Pattern:

ISE	Task III	Task II	Task I	Skill Level (as per CAS Sheet)
25	5	10	10	Exp 1
25	5	10	10	Exp 1 Exp 2
25	5	10	10	Exp 3
25	5	10	10	Exp 4
25	5	10	10	Exp 5
25	5	10	10	Exp 6
25	5	10	10	Exp 7
25	5	10	10	Exp 7 Exp 8
25	5	10	10	Exp 9
25	5	10	10	Exp 10
25	5	10	10	Avg

Third Vear (Sem - V) B. Techh. Electronics and Telecommunication			g Mini Project)	Minimum number of Experiments: 10 (including Mini Project)	Minimum numbe	
Laboratory Scheme:   Deptor Intent College of Engineering   Examination						st of Submission:
Laboratory Scheme:   Do   Laboratory   Covernment   College of Engineering   Karad	C04	Cases	Database Use C	Aurora for High-Performance	Evaluate Amazon	xperiment 12
CO3   Deploy and administer virtual machines using multiple access methods to lead environment 1   Course	CO4		ase	nister an Amazon RDS Databa	Deploy and Adm	xperiment 11
Covernment College of Engineering, Nariad	C04		tle Policies	curity, Versioning, and Lifecyc	Implement S3 Se	xperiment 10
Experiment 2   Covernment College of Engineering, Nariad	CO4		tions	ge S3 Buckets with File Operat	Create and Mana	xperiment 9
Experiment 5   Experiment 7   Examination   Examination   Experiment 1   Experiment 7   Examination   Experiment 1   Experiment 7   Examination   Experiment 2   Experiment 7   Examination   Experiment 2   Experiment 7   Examination   Experiment 2   Experiment 1   Experiment 2   Experiment 3   Experiment 5   Experiment 6   Experiment 7   Experiment 8   Experiment 8   Experiment 1   Experiment 1   Experiment 1   Experiment 1   Experiment 2   Configure 1AM Users and Groups via AWS CloudShell and Run Linux Commands   Co3   Experiment 5   Experiment 2   Experiment 3   Experiment 4   Connect to EC2 via AWS CloudShell and Run Linux Commands   Co3   Experiment 5   Experiment 2   Experiment 3   Experiment 4   Connect to EC2 via AWS CloudShell and Run Linux Commands   Co3   Experiment 5   Co3   Experiment 5   Co4   Experiment 6   Connect to EC2 via AWS CloudShell and Run Linux Commands   Co3	CO3	mmands	Basic Linux Co	ince Using AWS CLI and Run	Launch EC2 Insta	xperiment 8
Experiment 6   Connect to ECC Using EcC Instance Connect and Fundation College of Engineering, Nariad    Experiment 6   Connect to ECC Using ECC Instance Connect and Fundation Commands   Consider Connect to ECC Using ECC Instance Connect and Groups.   Connect to ECC Using ECC Instance Connect and Run Linux Commands   Experiment 5   Connect to ECC Using ECC Instance Connect and Run Linux Commands   Experiment 2   Connect to ECC Using ECC Instance Connect and Run Linux Commands   Experiment	CO3	ls	Linux Command	ia AWS CloudShell and Run I	Connect to EC2 v	xperiment 7
Experiment 2   Coore	CO3	ommands	nd Run Linux Co	Jsing EC2 Instance Connect ar	Connect to EC2 \	xperiment 6
Experiment 1   Convernment College of Engineering, Karad	CO3		ommands	nect via SSH and Run Linux C	Launch EC2, con	xperiment 5
Experiment 2   Copy	CO2			ite IAM policies	Create and genera	xperiment 4
Experiment 2   Course Configure and secure cloud-based storage and database services using access policies, versioning, Experiment 1   Configure IAM Users and Groups.   Experiment 2   Course Configure IAM Users and Groups.   Configure IAM Users and Groups.   Course Configure IAM Users and Groups.   Configure	C02			ers and Groups via AWS CLI	Manage IAM Use	xperiment 3
Covernment College of Engineering, Karad	C02			Jsers and Groups.	Configure IAM L	xperiment 2
CO2 Implement and evaluate Identity and Access Management (IAM) policies, users, and gloud environment.  CO3 Organize and secure cloud-based storage and database services using access policies, versioning, Implementation of following concepts  Third Year (Sem – V) B. Tech. Electronics and Telecommunication  Examination Scheme:  Examination Sch	C01		the Console.	ree Tier Account and Explore	Create an AWS F	xperiment 1
CO2 Implement and evaluate Identity and Access Management (IAM) policies, users, and groups using best practices.  CO3 Organize and secure cloud-based storage and database services using access policies, versioning, replication, and lifecycle management.  Course Course Course outcomes (CO): Students will be able to CO3 Configure and manage a cloud account and console environment using different access methods.  CO4 Organize and secure cloud-based storage and database services using access policies, versioning, replication, and lifecycle management.  CO5 Configure and secure cloud-based storage and database services using access policies, versioning, replication, and lifecycle management.  CO6 CO7 CO8 CO9					owing concepts	nplementation of fol
CO2   Implement and evaluate Identity and Access Management (IAM) policies, users, and groups using best practices.  CO3   Deploy and administer virtual machines using multiple access methods to perform system operations, and lifecycle management.	CO			Course Contents	-	
Covernment College of Engineering, Karad		1			and lifecycle mana	replication,
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3561: Cloud Computing Foundation Laboratory (Program Elective -01 Laboratory)  Laboratory Scheme: Examination Scheme: Examination Scheme: Practical 02 Hrs/week 01 Examination Scheme: Examination Scheme: Prerequisite: Python, SQL, Linux  Course Outcomes (CO): Students will be able to Configure and manage a cloud account and console environment using different access methods. Implement and evaluate Identity and Access Management (IAM) policies, users, and groups using best practices.  CO3 Deploy and administer virtual machines using multiple access methods to perform system operations in a cloud environment.	ies, versioning,	access polici	services using		nd secure cloud-l	
CO2 Implement and evaluate Identity and Access Management (IAM) policies, users, and groups using best practices.  CO3 Deploy and administer virtual machines using multiple access methods to perform system operations in a					onment.	cloud envir
CO2 Implement and evaluate Identity and Access Management (IAM) policies, users, and groups using best practices.	operations in a	rform system	ss methods to pe	machines using multiple acces	administer virtual	
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3561: Cloud Computing Foundation Laboratory (Program Elective -01 Laboratory)  Laboratory Scheme:  Practical 02 Hrs/week 1SE 25  Total Credits 01 ESE						practices.
Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3561: Cloud Computing Foundation Laboratory (Program Elective -01 Laboratory)  Laboratory Scheme: Examination Scheme: Examination Verme: ISE 25  Total Credits 01 ESE	oups using best	users, and gr	(IAM) policies, 1	ity and Access Management (	and evaluate Ideni	
Covernment College of Engineering, Karad  Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3561: Cloud Computing Foundation Laboratory (Program Elective -01 Laboratory)  Laboratory Scheme:  Practical 02 Hrs/week	ethods.	rent access m	nent using differ	account and console environr	nd manage a cloud	
isit on				able to	): Students will be	ourse Outcomes (CC
edit   1					QL, Linux	rerequisite: Python, ?
0.0		1	ESE		01	otal Credits
Covernment College of Engineering, Karad  Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3561: Cloud Computing Foundation Laboratory (Program Elective -01 Laboratory)  Laboratory Scheme:  Examination Scheme:		25	ISE		02 Hrs/week	ractical
Covernment College of Engineering, Karad  Third Year (Sem – V) B. Tech. Electronics and Telecommunication  EX3561: Cloud Computing Foundation Laboratory (Program Elective -01 Laboratory)		Scheme:	Examination			aboratory Scheme:
Third Year (Sem – V) B. Tech. Electronics and Telecommunication	ry)	OI Laborato	gram Elective -	Foundation Laboratory (Pro	Toud Computing	EX3561: (
Government College of Engineering, Karad		ation	Telecommunic	<ul> <li>V) B. Tech. Electronics and</li> </ul>	hird Year (Sem-	
2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7 2.7			g, Karad	nment College of Engineerin	Gover	



			)	3: Substantial (High)	Substant	<u>.</u> .	n)	Mediur	2: Moderate (Medium)	2: Mod		Low)	1: Slight (Low)	1:
1	2	2	3	1	í.	1	1	2	Ü	w	2	2	2	CO 4
_	-	2	2	-	-	-	1	2	w	2	ω	2	2	CO 3
,	1	2	2	1	ı	1	1	_	2	2	2	ယ	2	CO 2
1	1	w	1	-	1	-	1	ì	2	1	1	2	w	CO 1
PSO	PSO 2	PSO 1	PO 11	PO 1 PO PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PSO 1 PSO 2 PSO 3 2	PO 9	PO 8	PO 7	PO 6	PO 5	PO 4	PO 3	PO 2	PO 1	PO → CO↓

#### Assessment Pattern:

Skill Level (as per	Exp	0									
CAS Sheet)	1	2	w	4	5	6	7	∞	9	_	0
Task I	15	15	15	15	15	15	15	15	15	15	Oi
Task II	05	05	05	05	05	05	05	05	05	05	S
Task III	05	05	05	05	05	05	05	05	05	05	01
ISE	25	25	25	25	25	25	25	25	25	25	Si

	Govern	Government College of Engineering, Karad	g, Karad		
	Third Year (Sem -	V) B. Tech. Electronics & Telecommunication	Telecommunica	tion	
jeograf	EX3571: Advanced Embedded C Programming Lab (Program Elective -01 Laboratory)	d C Programming Lab (Pro	gram Elective -	01 Laboratory)	
Laboratory Scheme:	Scheme:		Examination Scheme:	Scheme:	
Practical	02 Hrs/week		ISE	25	
<b>Total Credits</b>	01		ESE	1	
Prerequisite:	Prerequisite: Microcontroller, embedded system, computer network	stem, computer network			
Course Outco	Course Outcomes (CO): Students will be able to	ble to			
C01 I	Develop and debug C programs for embedded systems, including memory management, data	ns for embedded systems, in	cluding memory	management,	data
82	structures, and algorithms				
CO2 [	Understand and utilize advanced C features relevant to embedded systems (e.g., bitwise	d C features relevant to emb	edded systems (	e.g., bitwise	
	operations, pointers, structures, unions)	unions).		(	
CO3 I	Interface with embedded hardware peripherals (e.g., sensors, actuators, communication	are peripherals (e.g., sensors	, actuators, com	munication	
1:	interfaces) using C code.				
CO4 I	Implement communication protocols (e.g., serial, I2C, SPI) in embedded C applications	tocols (e.g., serial, I2C, SPI)	in embedded C	applications.	
	Co	Course Contents			CO
Implementat	Implementation of following concepts				
Experiment 1	Bit Manipulation and Port Control	ort Control			CO1
Experiment 2	Memory Pointers and Direct Register Access	irect Register Access		/	C02
Experiment 3	Interrupt Service Routi	Interrupt Service Routine (ISR) Implementation			C02
Experiment 4	Timer Configuration and Delay Generation	d Delay Generation			C02
Experiment 5	Pulse-Width Modulatic	Pulse-Width Modulation (PWM) for Actuator Control	ol		CO3
Experiment 6	Analog-to-Digital Conv	Analog-to-Digital Conversion (ADC) Sensor Interface	се		CO3
Experiment 7	<b>UART Serial Communication</b>	cation			CO3
Experiment 8	I2C Communication with EEPROM	th EEPROM			C04
Experiment 9	SPI Communication with Display Module	th Display Module			C04
Experiment 10		ling with FreeRTOS			C04
Experiment 11	Wireless Communication (ESP32/NRF24L01)	on (ESP32/NRF24L01)			C04
Experiment 12		Capstone Project — Embedded System Integration			C04
List of Submission:					
	Minimum number of Experiments: 10	cperiments: 10	1		

CO 4	CO 3	CO 2	1 00	PO →
1	- 1	1	1	POI
-	-	2	1	PO 2
2	w	-	-	PO 3
ယ	2	-	-	PO 4
1	1	1		PO 5
)manel.	₽	-	_	PO 6
-	,	-	-	PO 7
t	ı	í	1	PO 8
1	1	1	1	PO9
1	1	1	1	PO PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PSO 1 PSO 2 PSO 3 2
1	1	1	1	PO 11
2	2	-	1	PSO 1
w	2	1	2	PSO 2
2	2	_	2	PSO 3

# Guidelines for Assessment Pattern:

		05 05	Task II 05 05 05 05 05 05	Task I 15 15 15 15 15 15	Skill Level (as per Exp Exp Exp Exp Exp CAS Sheet)  Exp
	25	05	05	15	Exp 5
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2					13.70
	25 25	05 05	05 05	15 15	Exp Exp 8 9
	25	05	05	15	Exp 10
Exp 9 115 05 05 25	25	05	05	15	Avg

	Third Year (Sem -	(Sem - V) B. Tech. Electronics and Telecommunication	Telecommunic	ation	
T.	X3581: Digital CMOS (	EX3581: Digital CMOS Circuit Design Lab (Program Elective -01 Laboratory)	n Elective -01 I	aboratory)	
Laboratory Scheme:	me:		Examination Scheme:	Scheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	ı	
Prerequisite: Con	Prerequisite: Computer fundamentals				
Course Outcome	Course Outcomes (CO): Students will be able to	able to			
CO1 Mod	el digital components in g	Model digital components in given CMOS process to estimate their performance	ate their perform	lance.	
CO2 Desi	gn the layout of digital cir	Design the layout of digital circuits using given CMOS process	cess.		
CO3 Simu	late the layout of digital of	Simulate the layout of digital circuits in given CMOS process	SS		
CO4 Anal	yze and compare the perfo	Analyze and compare the performance of digital circuits to estimate their performance	estimate their pe	rformance.	_
	C	Course Contents			
mplementation	Implementation of following concepts				
Experiment 1	Design the layout for CMOS Inverter	CMOS Inverter.			C01
Experiment 2	Design the layout for (	Design the layout for CMOS combinational circuit.			C02
Experiment 3	Design the layout for (	Design the layout for CMOS circuit using transmission gates	ion gates.		C02
Experiment 4	Design the layout for (	Design the layout for CMOS sequential circuit.			C02
Experiment 5	Design the layout for (	Design the layout for CMOS 1-bit SRAM Cell.			C02
Experiment 6	Design of CMOS Ring Oscillator	Oscillator			CO3
Experiment 7	Design of CMOS 2:1 N	Design of CMOS 2:1 Mux using traditional transistor	Or		CO3
Experiment 8	Design of CMOS 2:1 N	Design of CMOS 2:1 Mux using Transmission gates			CO3
Experiment 9	Implementation of CM	Implementation of CMOS NAND and NOR Gate		-	CO4
Experiment 10	Implementation of CMOS D-latch	OS D-latch			CO4
Experiment 11	Implementation of MOS Half and Full Adder	S Half and Full Adder			CO4
Experiment 12	Mini Project				
List of Submission:	1:				



CO 4	CO 3	CO 2	CO 1	СО↓	PO →
1	- 1	1	1		PO 1
1	1	2	2		PO 2
1	1	ı	1		PO 3
- }	2	2	1		PO 4
2	1	. 1	, 1		PO 5
1	1	1	ı		PO 6
1	1	1	1		PO 7
ł	1	1	1		PO 8
1	1	1	1		PO 9
2	2	1	1		PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PSO 1 PSO 2 PSO 3
1	1	1	ı	**	PO 11
1	1	1	1		PSO I
2	2	2	2		PSO 2
1	1	1-	1		PSO3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

#### Assessment Pattern:

ISE	Task III	Task II	Task I	CAS Sheet)	Skill Level (as per
25	10	10	S		er Exp
25	10	10	5	2	Exp
25	10	10	5	w	Exp
25	10	10	S	4	Exp
25	10	10	5	S	Exp
25	10	10	5	6	Exp
25	10	10	5	7	Exp
25	10	10	5	∞	Exp
25	10	10	5	9	Exp
25	10	10	5	10	Exp
25	10	10	5	11	Exp
25	10	10	S	12	Exp
25	10	10	5		Avg

ms to solve basic electromagnet g fundamental laws and boundar rying fields and propagation of electror, Position and Distance Very Circular and Spherical Coordi Volume, Line, Surface, and Vour and Laplacian operation, ion of Vector Fields  Density, Gauss's Law, Application veen E and V, Linear, Isotropic, oisson's and Laplace's Differential Form), Time-Harm Dielectrics, Free Space and in  Displacement Current (Mod Differential Form), Time-Harm Dielectrics, Free Space and in  Radiating Systems, Prentice Halems in Electromagnetics'  Thomson Learning	etil
ms to solve basic electromagnetic field problems gfundamental laws and boundary conditions. Tying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume and Laplacian operation, ion of Vector Fields  CO1  Ensity, Gauss's Law, Applications of veen E and V. Linear, Isotropic, and oisson's and Laplace's  Density, Gauss's Law, Applications of veen E and V. Linear, Isotropic, and oisson's and Laplace's  Displacement Current (Modified Differential Form), Time-Harmonic  CO2  Pransmission Line Equations, Input Some Applications Sadiku Book)  Transmission Line Equations, Input Sadiku Book)  W Hill Companies, 3rd Edition,2009  Radiating Systems, Prentice Hall, India  Lems in Electromagnetics'  Thomson Learning	
ms to solve basic electromagnetic field problems gfundamental laws and boundary conditions. Tying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume and Laplacian operation, ion of Vector Fields  CO1  Ensity, Gauss's Law, Applications of veen E and V. Linear, Isotropic, and oisson's and Laplace's  Density, Gauss's Law, Applications of veen E and V. Linear, Isotropic, and oisson's and Laplace's  Displacement Current (Modified Differential Form), Time-Harmonic  CO2  Pransmission Line Equations, Input Some Applications and CO3  Dielectrics, Free Space and in Good  Pransmission Line Equations, Input Some Applications Sadiku Book)  WHIII Companies, 3rd Edition, 2009  Radiating Systems, Prentice Hall, India  lems in Electromagnetics"	3. Nathan Ida, "Electromagnetic I
mns to solve basic electromagnetic field problems gfundamental laws and boundary conditions. Trying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume and Laplacian operation, fon of Vector Fields  CO1  CO2  Density, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and obisson's and Laplace's  Displacement Current (Modified Differential Form), Time-Harmonic  Displacement Current (Modified Differential Form), Time-Harmonic CO3  Dielectrics, Free Space and in Good  Transmission Line Equations, Input Sadiku Book)  W Hill Companies, 3rd Edition,2009  Radiating Systems, Prentice Hall, India	-
Duration of ESE	1. E.C. Jordan & K.G. Balmain, E
ms to solve basic electromagnetic field problems ghindamental laws and boundary conditions.  Tying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume I and Laplacian operation, I con of Vector Fields  Density, Gauss's Law, Applications of ween E and V, Linear, Isotropic, and oisson's and Laplace's  Density, Gauss's Lourent (Modified Differential Form), Time-Harmonic  CO2  Pansity Boundary Conditions (Read Differential Form), Time-Harmonic  CO3  Transmission Line Equations, Input Some Applications Sadiku Book)  CO4  CO4  CO5  CO6  CO7  CO7  CO7  CO8  CO8  CO9  CO9  CO9  CO9  CO9  CO9	-
ms to solve basic electromagnetic field problems gfundamental laws and boundary conditions.  rying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume I and Laplacian operation, I con of Vector Fields  Oensity, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's oisson's and Laplace's oisson's and Laplace's oisson's and Laplace and I conditions (Read Differential Form), Time-Harmonic CO2  Transmission Line Equations, Input Some Applications Sadiku Book)  enth edition,Oxford University Press	3 R K Shavgaonkar Electromagn
ms to solve basic electromagnetic field problems gfundamental laws and boundary conditions.  rying fields and propagation of electromagnetic warping fields.  CO1  tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume and Laplacian operation, con of Vector Fields  CO2  Density, Gauss's Law, Applications of Veen E and V, Linear, Isotropic, and oisson's and Laplace's conditions (Read oisson's and Laplace's conditions (Read Differential Form), Time-Harmonic CO3  Dielectrics, Free Space and in Good  Transmission Line Equations, Input Some Applications Sadiku Book)	-
ms to solve basic electromagnetic field problems ginndamental laws and boundary conditions.  rying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume rul and Laplacian operation, fon of Vector Fields  Density, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's Density, grantic Boundary Conditions (Read oisson's and Laplace's S)  CO2  Petic Flux Density, greefic Boundary Conditions (Read Differential Form), Time-Harmonic CO3  Dielectrics, Free Space and in Good CO3  Transmission Line Equations, Input Sadiku Book)	Text Books
mns to solve basic electromagnetic field problems g fundamental laws and boundary conditions.  rying fields and propagation of electromagnetic warping fields and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume and Laplacian operation, ion of Vector Fields  CO2  Density, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's  Displacement Current (Modified Differential Form), Time-Harmonic  CO3  Dielectrics, Free Space and in Good  CO4	Introduction, Transmission Impedance, Standing Wave F of Transmission Lines (Read
ms to solve basic electromagnetic field problems g fundamental laws and boundary conditions.  rying fields and propagation of electromagnetic wa models, impedance transformation and matching for tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume III and Laplacian operation, ion of Vector Fields  Density, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's Displacement Current (Modified Differential Form), Time-Harmonic  CO3  Dielectrics, Free Space and in Good  Dielectrics, Free Space and in Good	Unit 6 Transmission Lines:
ms to solve basic electromagnetic field problems fundamental laws and boundary conditions.  rying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume and Laplacian operation, ion of Vector Fields  Density, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's coisson's and Laplace's pnetic Boundary Conditions (Read Differential Form), Time-Harmonic  CO2  CO3  Displacement Current (Modified Differential Form), Time-Harmonic	Unit 5 Electromagnetic Wave Propagation: Wave Propagation in Lossy Dielectrics, Lossless Conductors, Wave Polarization, Poynting Theorem (Read Application note from Sadiku Book)
ms to solve basic electromagnetic field problems fundamental laws and boundary conditions.  rying fields and propagation of electromagnetic was models, impedance transformation and matching tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume url and Laplacian operation, ion of Vector Fields  Density, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's  Density, Gauss's Lour, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's  CO2  Petic Flux Density,  gnetic Boundary Conditions (Read	-
ms to solve basic electromagnetic field problems g fundamental laws and boundary conditions.  rying fields and propagation of electromagnetic was models, impedance transformation and matching to tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume url and Laplacian operation, ion of Vector Fields  CO2  Density, Gauss's Law, Applications of veen E and V, Linear, Isotropic, and oisson's and Laplace's	
ms to solve basic electromagnetic field problems fundamental laws and boundary conditions.  rying fields and propagation of electromagnetic was models, impedance transformation and matching to tor, Position and Distance Vectors, Circular and Spherical Coordinates Volume, Line, Surface, and Volume url and Laplacian operation, on of Vector Fields	
Duration of ESE 02 Hrs 30 Min  ms to solve basic electromagnetic field problems g fundamental laws and boundary conditions. rying fields and propagation of electromagnetic wa models, impedance transformation and matching ts CO	
us, Physics Fundamentals  ill be able to ulus and coordinate systems to solve basic electromagnetic field problems. nagnetostatic fields using fundamental laws and boundary conditions. Ill's equations for time-varying fields and propagation of electromagnetic waves behavior using equivalent models, impedance transformation and matching using thods.	Unit 1 Vector Analysis:
us, Physics Fundamentals  Ill be able to  ulus and coordinate systems to solve basic electromagnetic field problems.  nagnetostatic fields using fundamental laws and boundary conditions.  sll's equations for time-varying fields and propagation of electromagnetic waves cross media interfaces.	CO4 Evaluate transmission line behave analytical and graphical methods.
us, Physics Fundamentals  Ill be able to  ulus and coordinate systems to solve basic electromagnetic field problems.  nagnetostatic fields using fundamental laws and boundary conditions.	in unbound medium and across media interfaces.
us, Physics Fundamentals  Ill be able to  uls and coordinate systems to solve basic electromagnetic field problems.	-
Duration of ESE 02 Hrs	
Duration of ESE 02 Hrs	Course Outcomes (CO): Students will be able to
Duration of ESE 02 Hrs	Prerequisite: Vector Algebra, Calculus, Physics Fundamentals
ESE	Creation (C)
	Total Credits 03
E	
Examination Scheme	g Schei
EX3601: Electromagnetic Field Theory	
VI) B. Tech. Electronics and Telecommunication Engineering	The second secon

https://archive.nptel.ac.in/courses/117/101/117101056/ https://archive.nptel.ac.in/courses/108/106/108106157/

#### Mapping of COs and POs

10	substant
10	

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	20
Apply	5	5	10
Analyse	5	S	20
Evaluate	1		
Create	,	1	
TOTAL	20	20	60



		)		
(06)	C03	Phase phase verter,	Inverter and Cycloconverter Classification of Inverters, Single Phase Half Bridge Voltage Source Inverter, Single Phase Full Bridge Inverter, Performance Parameters of Inverters, PWM Inverter, three phase Inverter the Basic Principle of Operation of Cycloconverter, Single Phase Cycloconverter, Three Phase Cycloconverter, Reduction of output Harmonics	Unit 5
(07)	C02	ectional nected or with	AC Voltage Controllers  Principle of On-Off Control, Principle of Phase Control, Single Phase Bidirectional Controller, Three Phase Full Wave Controller, Three Phase Bidirectional Delta Connected Controllers, Single Phase Transformer Connection Chargers, AC Voltage Controller with PWM Control	Unit 4
(06)	C02	tep-up verter Boost	<b>DC-DC Converters</b> Principle of Step-down Operation, Step down converter with RL load, Principle of Step-up Principle of Step-down Operation, step up converter with Resistive load, Performance Parameters, Converter Classification Switching Mode Regulators: Buck Regulators, Boost Regulators, Buck Boost Regulators of Single Stage Conversion, Multistage Conversion	Unit 3
(08)	C02	ectifier, Three er, The	Phase Controlled Converters Single Phase Half Wave Controlled Rectifier, Single Phase Full Wave Controlled Rectifier Single Phase Half Controlled Bridge Rectifier, Three Phase Controlled Converters, Three phase Fully Controlled Bridge Converter, Three Phase Half Controlled Bridge Converter, The effect of Input Source Impedance, Power Factor Improvement.	Unit 2
(06)	5	anode etion, ching ristor	Classification of power semiconductor devices, Principle of operation of SCR, Static Anode Cathode Characteristics of SCR, Two Transistor Model of SCR, Thyristor Construction, Gate Characteristics of SCR, Turn on Methods of a Thyristor, Dynamic Turn on Switching Characteristics, Turn Off mechanism, Turn Off methods. Bidirectional Diode Thyristor (Diac), Bidirectional Triode Thyristor (TRIAC), Unijunction Transistor (UJT)	
Hours	00		Power Semiconductor Devices  Course Contents	Unit 1
s, HVDC art grids.	y systems r and sma	le energy transfer	Apply power electronic solutions for real-world applications such as SMPS, renewable energy systems, HVDC transmission, and EV charging, while examining emerging trends like wireless power transfer and smart grids.	CO4
weforms,	oltage wa	utput vo	Evaluate the performance parameters of inverters and Cycloconverter by assessing output voltage waveforms harmonics, and control techniques to optimize efficiency in power conversion.	CO3
℃ voltage	, and AC	nverters	Examine the operation and performance of phase-controlled rectifiers, DC-DC converters, and AC voltage controllers to evaluate their efficiency, power factor, and impact on the power system.	CO2
diodes, S ns.	g power o	includin tronic a	Analyze the characteristics and switching behavior of power semiconductor devices, including power diodes, S CRs, DIACs, TRIACs, and UJTs, to determine their suitability for various power electronic applications.	C01
			Course Outcomes (CO): Students will be able to	Course (
	02 Hrs 30 Min	02 Hrs	Prerequisite: Analog Circuits  Duration of ESE	Prerequ
		60	03 ESE	<b>Total Credits</b>
		20	00 Hrs/week ISE	Tutorials
		me	,	Teachin
			EX3602: Power Electronics	
		2	Third Year (Sem – VI) B. Tech. Electronics and Telecommunication	
			Government College of Engineering, Karad	



		smart grids	
		inverters. Emerging Trends: Wireless power transfer (resonant converters), Microgrids and	
	24	commutated converters (LCC), Active Power Filters (APF): Harmonic compensation using	
		converters. Power Transmission & Quality: HVDC Transmission: Thyristor-based line-	
		Wind turbine converters (AC-DC-AC systems). Battery Chargers: EV chargers, bidirectional	
		supply. Energy Systems: -Renewable Energy: Solar PV inverters (grid-tied vs. off-grid),	
		Consumer Electronics: Switched-Mode Power Supplies (SMPS), Uninterrupted power	
(06)	C04	Unit 6 Power Electronics Applications	Unit 6

1e	LEXT DOORS
1.	M.D. Singh, K. B. Khanchandani,"Power Electronics", McGraw Hill Education, Second Edition, 2006 (Unit 1,2,5)
2.	Muhammad H. Rashid, "Power Electronics: Circuits, Devices, and Applications", Pearson. (Unit 3,4,5)
3.	P. C. Sen, "Power Electronics", Tata McGraw Hill Publishing Company Limited, 2003 (Unit 5)
, R.	Reference Books
1.	Bose B. K., "Modern Power Electronics and AC Drives", Prentice Hall, 2002.
2.	Issa Batarseh and Ahmad Harb, "Power Electronics: Circuit Analysis and Design", Springer, 2nd Edition, 2017.
3.	Daniel W. Hart, "Power Electronics", Tata McGraw-Hill, 2011.
4.	Yazdani Amirnaser and Reza Iravani, "Voltage-Sourced Converters in Power Systems", Wiley, 2010.
Sı	Philip T. Krein, "Elements of Power Electronics", Oxford University Press, 2nd Edition, 2015.
6.	M. H. Rashid, "Introduction to PSpice Using OrCAD for Circuits and Electronics", Pearson, 4th Edition, 2011.
Use	Useful Links
1.	http://nptel.ac.in/courses/108102157/ Advanced Power Electronics by Prof. Bhim Singh, IIT Delhi.
2.	http://nptel.ac.in/courses/108108122/ Fundamentals of Power Electronics by Prof. L. Umanand, IISc Bangalore.
ų.	http://nptel.ac.in/courses/108101170/ Power Electronics for Renewable Energy Systems Prof. B. G. Fernandes, IIT Bombay.
4.	http://nptel.ac.in/courses/108104187/ Industrial Power Electronics and DrivesProf. Santanu K. Mishra, IIT Kanpur.

1: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

	CO 4	CO 3	CO 2	CO 1	PO→ PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9
	သ	w	သ	ω	PO I
	2	2	3	2	PO 2
	ယ	2	2	1	PO3
	2	2	2	1	PO 4
	3	2	1	1	PO 5
	2	1		1	PO 6
	2		ı	1	PO 7
7	2		. 1	1	PO 8
	2	1	ı	1	PO 9
	_	1	1	1	PO 10
	2	2	1	1	PO 11
	ω	ω	w	S	PSO 1
	2	2	2	1	PSO 2
	သ	2	1		PSO 3
L					



# Assessment Pattern (with revised Bloom's Taxonomy)

					T	T	
TOTAL	Create	Evaluate	Analyze	Apply	Understand	Remember	Knowledge Level
20	1	1	5	5	5	5	MSE
20	1	1	ò	5	5	5	ISE
60	1	5	15	15	15	10	ESE

Franching Schorne   Fix John   Fix   Computer Network			WILLIAM STALLINGS Data and Committee	ILAM STAI	11
EX 3603: Computer Network  Examination Scheme    D2 Hrs/week   Examination Scheme   Examination Scheme   20				nce Books	Refere
EX 3603: Computer Network  Col Hrs/week    D2   Hrs/week   Examination Scheme   Examination Scheme   D2			ENBAUM, Computer Networks, 4th Edition, Prentice	NDREW S. TA	-
Ing Scheme  Sc			ROUZAN. Data Communications and Networking 2nd Edition Tata McGraw	EHROUZ A. F	Text B
Examination Scheme    Examination Scheme   Examination Scheme   MSE   20     ISE   20     ESE   60     Duration of ESE   02 Hrs 30 Min     Ise   Ese   60     Ese   60     Duration of ESE   02 Hrs 30 Min     Ise   Ese   60	(04)	C04	ortance. Cryptography: Definitions, Symmetric Simple modern Ciphers, Asymmetric Key tal Signatures'.		Unit 6
Examination Scheme  Examination Scheme  Examination Scheme  MSE  20  ISE  20  ESE  02  Duration of ESE  120  CO  COI  COI  COI  COI  In CO	(04)	C03	, DNS in internet, electronic mail, DHCP, SMTP, FTP, WWW, HTTP.		Unit 5
Examination Scheme  MSE  Duration of ESE  log Hrs 30 Min  Alayer functions  er.  I congestion control by the Transport Layer.  Mechanisms and Hardware security.  CO1  Components and Categories, Types of Connections SO / OSI model, Example Networks such as ATM, ansmission modes, Multiplexing, Transmission Media, Datagram Networks, Virtual Circuit Networks.  CO1  I congestion control by the Transport Layer.  Mechanisms and Hardware security.  CO2  CO1  CO3  CO1  CO1  CO1  CO1  CO1  CO1	(05)	CO3	Delivery, UDP and TCP protocols, Data Traffic, Congestion, oS, Integrated Services, Differentiated Services, QoS in Switched		Unit 4
Examination Scheme    Examination Scheme	(06)	C02	g, Address mapping, Network Layer Protocols (IP, ICMP, and Mobile IP), ulticast Routing, Intra domain and Inter domain Routing Protocols, IPv6 Datagram Format, Transition from IPv4 to IPv6.		Unit 3
Examination Scheme  Examination Scheme  MSE  1SE  20  ISE  20  ESE  Congestion control by the Transport Layer.  Mechanisms and Hardware security.  Mechanisms and Categories, Types of Connections SO / OSI model, Example Networks such as ATM, ansmission modes, Multiplexing, Transmission Media, Datagram Networks, Virtual Circuit Networks.  Examination Scheme  20  ESE  20  ESE  02 Hrs 30 Min  CO1  CO1  CO1  CO1  Datagram Networks, Virtual Circuit Networks.	(06)	C01			Unit 2
603: Computer Network  Examination Scheme  MSE  ISE  ISE  ESE  Ouration of ESE  Outer Source Contents  Examination Scheme  Examination Scheme  Examination Scheme  20  20  ESE  02 Hrs 30 Min  CO  CO  CO  CO  CO  EXAMPLE A CO  E	(05)	COI	ections ATM, Media,		Chit
603: Computer Network  Examination Scheme MSE 20 ISE 20 ESE 60 Duration of ESE 20 Hrs  clayer functions clayer functions er.  Clayer functions Mechanisms and Hardware security.	Hou	CO	Course Contents	-	
603: Computer Network  Examination Scheme  MSE  20  ISE  ESE  Ouration of ESE  cr.  l congestion control by the Transport Layer.			ledge in Network Security Mechanisms and Hardware security.		C04
Examination Scheme  MSE  ISE  EXEMINATION  A STATE OF THE COMMUNICATION.  EXAMINATION Scheme  MSE  20  ESE  BUT STATE OF THE COMMUNICATION.  Alwayer functions  Alwayer functions			ods of communication and congestion control by the Transport Layer.		CO3
603: Computer Network  Examination Scheme  MSE  ISE  ESE  Duration of ESE  02 Hrs			The intervention of the Network I aver	-	002
heme EX 3603: Computer Network  EX 3603: Computer Network  EX amination Scheme  02 Hrs/week  00 Hrs/week  02 Duration of ESE  02 Hrs			)): Students will be able to	e Outcomes (C	Cours
heme EX 3603: Computer Network  EX 3603: Computer Network  Examination Schem  02 Hrs/week  00 Hrs/week  EX 3603: Computer Network  Examination Schem  MSE  ISE  ESE			02 Hrs		
g Scheme    Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Examination Scheme   Computer Network   Computer			ESE		Total (
EX 3603: Computer Network  g Scheme    02 Hrs/week			ISE		Tutori
			MSE MSE	S OCHE	Lectur
Third Year (Sem - VI) B. Tech. Electronics and Telecommunication.			EX 3603: Computer Network	ing Schomo	
			Third Year (Sem – VI) B. Tech. Electronics and Telecommunication.		

3. L	2. D
3. LARRY L. PETERSON AND BRUCE S. DAVIE, Computer Networks: A Systems Approach, 3rd edition (2003), Morgan Kaufmann Publishers.	2. DOUGLAS E COMER, Computer Networks and Internet, Pearson Education Asia, 2000

USE	seful Links
_	http://www.rfceditor.org/rfcsearch.html
2.	http://www.e-gecaect.com
3.	http://www.cisco.cn.com.

_	CO 4	CO3	CO 2	COI	CO↓	$PO \rightarrow$
1. Slight (Low)	w	3	2	2		PO I
Tow)	1	1	2	1	2	PO
	3	3	2	1		PO3
2. Ma	3	3	1	ı		PO 4
derate	1	1	1	1		PO 5
. Moderate (Medium)	ı	ı	,	1		PO 6
m)	2	2	1	2		PO 7
		1	,	1		PO 8
Cinher	2	1	1	ı		PO 9
Substantial (High)	2	2	1	ı		PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PSO1 PSO2 PSO3
(dh)	ı	ı	1	2		PO 11
	S	2	2	2		PSO I
	,	ı	1	ı		PSO 2
	•	1	_	-		PSO 3

3: Substantial (High)

# Guideline for Assessment Pattern:

TOTAL 20 20	Create	Evaluate	Analyse 5 5	Apply 5 5	Understand 5 5	Remember 5 5	Knowledge Level MSE ISE
 0	'	_	5	5	S	5	SH

td, II nd		)		Reference Books	Refer
	The Table			EGILLOH ZUUS	
.42	ion 2014	Publicati ing Com	Ranjan Bose, "Information Theory, Coding & Cryptography", Tata McGraw-Hill Publishing Company Ltd,	Ranjan Bose,	in i
	earson	aphy", F	ArıjıtSaha, Nilotpal Manna and Surajit Mandal, "Information Theory, Coding & Cryptography", Pearson Education, Ist Edition, 2013.	ArijitSaha Education	:
			0)	Books	Text Books
		ding in H.261, aming	Linear predictive coding, MPEG Audio and Video Coding Standards, Perceptual Coding in MPEG Audio, Dolby audio coders, Video compression, Principles – Introduction to H.261, H.263, H.264, H.265, H.266, Challenges in Audio- Video Synchronization, Streaming Technologies: Progressive and Adaptive Streaming, HTTP Live Streaming (HLS)	Linear J MPEG H.263, Techno	
(07)	C04		Audio and Video Coding:		Unit 6
		Length change ds	ynamic Huffman Coding, Arithmetic Coding, Transform coding, Image Compression, Graphic rmat, Digitized Documents, Introduction to JPEG	technic Encodi format	
(07)	C04	ession	_	-	c mu
		n and ric-key hysical	ny, Plain Text, Cipher Text and key, Substitution Decryption, Symmetric-Key Cryptography, Asymmetric nown algorithms — DES, IDEA, PGP, Introduction to Physe capacity.	-	•
(07)	CO3		Cryptographic Techniques:		Unit 4
(08)	CO2	es and is such	Convolutional Codes:  Convolutional encoding – Connection representation, State representation, Tree Codes and Trellis Codes, Convolutional decoding – Maximum likelihood decoding, Algorithms such as Viterbi, Sequential, Feedback, Viterbi decoder implementation, distance properties, Minimum free distance, Turbo Codes, Turbo Decoding		Onit 3
	C01	nerator tion of rs and	Introduction to BCH Codes, Primitive elements, Minimal polynomials, Generator polynomials, some examples of BCH Code, Decoding of BCH Codes, Implementation of Galois Field, Reed-Solomon code, Implementation of Reed-Solomon Encoders and Decoders, Generator polynomial of a cyclic code, Decoding of cyclic code.		Unit 2
-	2		Control Coding	+	Ilmia
(06)	COI	metric orem, cation LZ77,	Introduction theory, Source and Channel Coding: Introduction and measure of information, channel capacity, Discrete channels – Symmetric channels, Binary Symmetric Channel, Noise –Free Channel, Source coding theorem, Channel Coding Theorem, Encoding techniques, Purpose of encoding, Classification of codes, Kraft's inequality, Coding efficiency and redundancy, Dictionary coding –LZ77, LZ78, LZW, Information Measures for Analog Sources		Unit 1
Hours	CO		Course Contents	+	**
			Analyze the compression and coding techniques.		CO4
			Understand the fundamentals of Cryptography.		CO3
			Analyze the convolutional techniques.	-	C02
			Inderstand the fundamentals of information theory	I Inder	COL
			Prerequisite: Mathematics, Computer Fundamentals	equisite: N	Prere
ח	02 Hrs 30 Min	02 Hr	Duration of ESE		
		60	ESE	Total Credits	Total
		20	03 Hrs/week         MSE         20           00 Hrs/week         ISE         20	ials	Lectures
		me		Teaching Scheme	Teac
			EX3614: Information Theory and Coding (Program Elective -02)		
		ieering	Third Year (Sem - VI) B. Tech. Electronics & Telecommunication Engineering		
			Government Conege of Engineering, Narad		



Behrouz A. Forouzan, "Cry	Watkinson J, "Compression	J C Moreira, P G Farrell, "H
Behrouz A. Forouzan, "Cryptography and Network Security", Tata McGraw-Hill.	Watkinson J, "Compression in Video and Audio", Focal Press, London.	J C Moreira, P G Farrell, "Essentials of Error-Control Coding", Wiley, Student Edition, 2006.

Use	eful Links
1.	https://onlinecourses.nptel.ac.in/noc24_ee65/preview/Prof.G_R_Javnath_IISC_Banolore
2.	https://onlinecourses.nptel.ac.in/noc20_ee90/nreview_/Prof_C_S_Sharker_Ben_HT_Modes

				High)	3: Substantial (High)	3: Sub		edium)	erate (M	2: Moderate (Medium)		(Low)	1: Slight (Low)	
												-		
1	1	1	1	1	1	ı	ı	1	1	1	ı ji	_	1	04
_	-	-	,	1	,						,			
	-	-									-	-	-	CO 3
_		,	1	1	1		ı	1	1	2	ı	ı	-	700
-		,												
_		-	,		1	ı	ı	1	ı	1	ı	2	w	8
														<b>←</b>
														00
w			jd jd	10			6							1
PSO	PSO 2 PSO	PSO I	РО	РО	PO8 PO9 PO	PO 8	РО	PO 6	PO 5	PO1 PO2 PO3 PO4 PO5 PO6 PO	PO3	PO2	PO 1	PO

# Assessment Pattern (with revised Bloom's Taxonomy)

TOTAL 20	Create -	Evaluate -	Analyse 5	Apply 5	Understand 5	Remember 5	Knowledge Level MSE
20	1	1	5	5	5	5	ISE
60	,	1	20	10	20	10	ESE

O2 Hrs 30 Min	g. Sequential Function Chart (SFC), Ladder Logic Programming grircuits, Timers, Counters, Timers and Counters: ON/OFF gramming and Counters, Timers and Counters: ON/OFF entive Timer, Up/Down Counter, Hands-on programming gramming and Control Techniques:  gramming and Controllers Principles & Application, Protocols: Malageme and Jump Instructions, Passics of Supervisory Control and Stand its role in automation, Basics of Supervisory Control and June PLC-SCADA communication, Protocols: Malageme and PLC-HMI and PLC-SCADA communication, Protocols: Malageme and PLC-Based SCADA systems in water treatment plants and power to Industry 4.0 and IoT-based PLC automation, Case studies on PLC based PLC automation, Case studies on PLC automatical PLC aut	PLC Programming Fundamentals:  Programming Languages: Ladder Logic Structured Text (ST), Sequential Function C logic gates, Latching circuits, Timers, Cou Delay Timer, Retentive Timer, Up/Dow simulation software  Unit 4 Advanced PLC Programming and Contro Arithmetic and Logical Instructions: Av. Compare, Move, Shift, Rotate Instructions, PLCs: Subroutines and Jump Instructions in PLC, Fault detection and troubleshooting Human Machine Interface (HMI) and SC. Introduction to HMI and its role in automa Acquisition (SCADA), PLC-HMI and PLC-Profibus, Ethernet/IP, Industrial case studies Industrial Applications of PLC:  PLC-based control of conveyor systems, elepackaging automation, PLC applications is systems, Introduction to Industry 4.0 and IoT world PLC applications.  Text Books  1. John W Webb, Ronald A Reis, "Programmable L. Limited 4th Edition ,2003  2. W. Bolton, "Programmable Logic Controllers", N Reference Books
O2 Hrs 30 Min	C), Sequential Function Chart (SFC), Ladder Logic Programming: Bit I opic Control of Chart (SFC), Ladder Logic Programming: Bit I opic Control of Counters, Timers and Counters: ON/OFF lentive Timer, Up/Down Counter, Hands-on programming using ogramming and Counters. Only of Counters: ON/OFF lentive Timer, Up/Down Counter, Hands-on programming using circuits, Timer, Up/Down Counter, Hands-on programming using ogical Instructions: Addition, Subtraction, Multiplication, Dividing and Jump Instructions, Data Handling and Memory Management in and Jump Instructions, PID (Proportional-Integral-Derivative).c Interface (HMI) and SCADA:  If and its role in automation, Basics of Supervisory Control and DAA), PLC-HMI and PLC-SCADA communication, Protocols: Modb P, Industrial case studies on PLC-based SCADA systems flows of PLC:  of conveyor systems, elevators, and robotic arms, Batch processing ion, PLC applications in water treatment plants and power on to Industry 4.0 and IoT-based PLC automation, Case studies of resions.  Reis, "Programmable Logic Controllers Principles & Applications" Reis, "Programmable Logic Controllers Principles & Applications"	
O2 Hrs 30 Min	C), Sequential Function Chart (SFC), Ladder Logic Programming: Bang circuits, Timers, Counters, Timers and Counters: ON/OFF lentive Timer, Up/Down Counter, Hands-on programming using ogramming and Control Techniques:  ogical Instructions: Addition, Subtraction, Multiplication, Dividit, Rotate Instructions, Data Handling and Memory Management in and Jump Instructions, PID (Proportional-Integral-Derivative). Control and troubleshooting  It and its role in automation, Basics of Supervisory Control and DAA), PLC-HMI and PLC-SCADA communication, Protocols: Modb P, Industrial case studies on PLC-based SCADA systems  fions of PLC:  of conveyor systems, elevators, and robotic arms, Batch processing ion, PLC applications in water treatment plants and power on to Industry 4.0 and IoT-based PLC automation, Case studies of regions.  Reis, "Programmable Logic Controllers Principles & Applications"	
O2 Hrs 30 Min	C), Sequential Function Chart (SFC), Ladder Logic Programming: Bang circuits, Timers, Counters, Timers and Counters: ON/OFF lentive Timer, Up/Down Counter, Hands-on programming using ogramming and Control Techniques:  ogical Instructions: Addition, Subtraction, Multiplication, Divinift, Rotate Instructions, Data Handling and Memory Management in and Jump Instructions, PID (Proportional-Integral-Derivative). Control and troubleshooting  If and its role in automation, Basics of Supervisory Control and D. (A), PLC-HMI and PLC-SCADA communication, Protocols: Modb P, Industrial case studies on PLC-based SCADA systems tions of PLC:  of conveyor systems, elevators, and robotic arms, Batch processing ion, PLC applications in water treatment plants and power on to Industry 4.0 and IoT-based PLC automation, Case studies of regions.	
CO2 Iory, CO2 Iory, CO3 Ion, CO3 Ion, CO3 Ion, CO4 Identification CO4	C), Sequential Function Chart (SFC), Ladder Logic Programming: Barng circuits, Timers, Counters, Timers and Counters: ON/OFF tentive Timer, Up/Down Counter, Hands-on programming usite ogramming and Control Techniques:  ogramming and Control Techniques: ogical Instructions: Addition, Subtraction, Multiplication, Dividit, Rotate Instructions, Data Handling and Memory Management in and Jump Instructions, PID (Proportional-Integral-Derivative) cition and troubleshooting  nterface (HMI) and SCADA:  II and its role in automation, Basics of Supervisory Control and Deva), PLC-HMI and PLC-SCADA communication, Protocols: Modb P, Industrial case studies on PLC-based SCADA systems  tions of PLC:  of conveyor systems, elevators, and robotic arms, Batch processing ion, PLC applications in water treatment plants and power on to Industry 4.0 and IoT-based PLC automation, Case studies of resions.	
CO2 CO3	C), Sequential Function Chart (SFC), Ladder Logic Programming: Bang circuits, Timers, Counters, Timers and Counters: ON/OFF lentive Timer, Up/Down Counter, Hands-on programming using ogramming and Control Techniques:  ogramming and Control Techniques: ogical Instructions: Addition, Subtraction, Multiplication, Dividit, Rotate Instructions, Data Handling and Memory Management in and Jump Instructions, PID (Proportional-Integral-Derivative).c tion and troubleshooting  nterface (HMI) and SCADA: II and its role in automation, Basics of Supervisory Control and DAA), PLC-HMI and PLC-SCADA communication, Protocols: ModbP, Industrial case studies on PLC-based SCADA systems  tions of PLC:	
CO2 CO3	T), Sequential Function Chart (SFC), Ladder Logic Programming: Barng circuits, Timers, Counters, Timers and Counters: ON/OFF lentive Timer, Up/Down Counter, Hands-on programming using ogramming and Control Techniques:  ogramming and Control Techniques: ogical Instructions: Addition, Subtraction, Multiplication, Divided Instructions, Data Handling and Memory Management in and Jump Instructions, PID (Proportional-Integral-Derivative).ction and troubleshooting  nterface (HMI) and SCADA: Il and its role in automation, Basics of Supervisory Control and DAA), PLC-HMI and PLC-SCADA communication, Protocols: Modb P, Industrial case studies on PLC-based SCADA systems	
CO2 CO2 CO3 CO3	O), Sequential Function Chart (SFC), Ladder Logic Programming: Barng circuits, Timers, Counters, Timers and Counters: ON/OFF lentive Timer, Up/Down Counter, Hands-on programming usicons ogramming and Control Techniques:  Ogramming and Control Techniques:  Ogical Instructions: Addition, Subtraction, Multiplication, Divinift, Rotate Instructions, Data Handling and Memory Management in and Jump Instructions, PID (Proportional-Integral-Derivative) of the Addition of the Counter of the	
CO2 CO3 CO2	T), Sequential Function Chart (SFC), Ladder Logic Programming: Bang circuits, Timers, Counters, Timers and Counters: ON/OFF tentive Timer, Up/Down Counter, Hands-on programming usice of the country of the counter of	
Hrs 30 Min CO CO1 f CO2 ing CO3 CO3	T), Sequential Function Chart (SFC), Ladder Logic Programming: Bang circuits, Timers, Counters, Timers and Counters: ON/OFF tentive Timer, Up/Down Counter, Hands-on programming using ogramming and Control Techniques:	
Hrs 30 Min  CO  CO1  ing  CO2  CO3  CO2	T), Sequential Function Chart (SFC), Ladder Logic Programming: Bang circuits, Timers, Counters, Timers and Counters: ON/OFF tentive Timer, Up/Down Counter, Hands-on programming usi	
CO2 Try, CO2 CO3 CO3 CO2	C), Sequential Function Chart (SFC), Ladder Logic Programming: Ba	
Hrs 30 Min CO CO1 CO2 ry, CO2	Logic (LD) Functional	
Hrs 30 Min CO CO1 CO2 ry, CO2	g Fundamentals:	+
CO1	PU, Input/output Modules, Power Supply, 1 Modules: Digital I/O, Analog I/O, Special Functions, actuators, and industrial devices,	PLC Hardware Components: C Communication Ports, Types of I/C Modules, Interfacing PLC with techniques and signal conditioning
CO1	nd Interfacing:	Unit 2   PLC Hardware and Interfacing:
CO CO	Evolution and need for PLCs in industrial automation, Basic architecture and working of PLC, Types of PLCs: Compact, Modular, and Rack-mounted, Advantages and limitations of PLCs, Selection criteria for industrial applications	
02 Hrs 30 Min	Course Contents	Unit 1 Introduction to D
02 Hrs 30 Min	Integrate PLCs with HMI, SCADA, and Industry 4.0 Applications.	CO4 Integrate PLCs wii
02 Hrs 30 Min	Develop and Implement PLC Programs Using Various Programming Languages.	
02 Hrs 30 Min	Describe PLC Architecture, Components, and Interfacing Techniques.	CO2 Describe PLC Arc
02 Hrs 30 Min	Explain the Evolution and Role of PLCs in Industrial Automation.	CO1 Explain the Evolui
02 Hrs 30 Min	udents will be able to	Course Outcomes (CO): Students will be able to
02 Hrs 30 Min		Prerequisite: Basic Electronics
00	Duration of ESE	
20		Total Credite 03
20		
eme	Examination Scheme	g Scheme
re -02)	EX3624: Programmable Logic Controllers (PLCs) (Program Elective -02	EX3624
Ingineering	Sem - VI) B. Tech. Electronics and Telecommunication Engineering	Third Year (Sem -
	Government College of Engineering, Karad	

Useful Links w 1. https://archive.nptel.ac.in/courses/108/105/108105088/ Madhuchhanda Mitra & Samarjit Sen Gupta, "Programmable Logic Controllers and Industrial Automation: An Introduction, Edition. Second · Publisher. Penram International Publishing (India) Pvt. Ltd. · 12 July 2017 Kevin Collins, "PLC Programming for Industrial Automation" Exposure Publishing, November 2006.

#### Mapping of COs and POs

1: Sli	(	32
1: Slight (Low)	_	
ow)	-	
	. 2	
2: Mo	1	
derate (		
2: Moderate (Medium)	1	
m)	1	
	1	
3: Substantial (High)		1
tantial	1	1.
High)	1	1
	-	_
	2	2
	1	1

## Guideline for Assessment Pattern:

TOTAL 20	Create -	Evaluate -	Analyse 5	Apply 5	Understand 5	Remember 5	Knowledge Level MSE
20		T	5	5	5	.5	ISE
60	ı	ı	20	10	20	10	ESE

Computer Fundamentals  Jomputer Fundamentals  Jomet John John John John John John John John	CO4	Pearson, 4rd Edition.		Rafael C. Gonzalez, Ri	I. Ka
MSE   20     ISE   20     ESE   20     ESE   20     ESE   20     ESE   20     Duration of ESE   22 Hrs 30 Min     Duration of ESE   20 Hrs 30 Min     ECOntents   CO1     Itimage processing and processing and processing and processing and processing and fields     CO1     Image processing Herniques-histogram processing and fields     CO2     Inition, Parametric predictive coding, Transform     CO2     Inition, Pearson, 2021. (Unit 1.2)     Edition, PHI, 2011. (Unit 6)     Edition, PHI, 2011. (Unit 6)     Duration of ESE   20 Hrs 30 Min     CO3     CO4     CO4     CO4     CO4     CO4     CO5     CO6     CO7     CO7     CO8     CO9     CO1     CO1     CO1     CO1     CO2     CO3     CO3     CO4     CO4     CO4     CO5     CO6     CO7     CO7     CO8     CO9     CO1     CO1     CO1     CO1     CO2     CO3     CO3     CO4     CO4     CO5     CO6     CO7     CO7     CO8     CO9     CO1     CO1     CO1     CO1     CO1     CO1     CO2     CO3     CO3     CO4     CO4     CO4     CO5     CO6     CO7     CO7     CO8     CO8     CO9     CO1     CO1     CO1     CO2     CO3     CO3     CO4     CO4     CO5     CO6     CO7     CO8     CO8     CO9     CO1     CO1     CO1     CO1     CO2     CO3     CO3     CO4     CO4     CO5     CO6     CO7     CO8     CO8     CO9     CO9     CO1     CO1     CO1     CO2     CO3     CO4     CO5     CO6     CO7     CO8     CO8     CO9     CO9     CO1     CO1     CO2     CO3     CO4     CO6     CO7     CO8     CO9     CO9     CO1     CO1     CO2     CO3     CO4     CO6     CO7     CO8     CO8     CO9     CO9     CO1     CO1     CO2	CO4	т.(Ошго)	chard E. Woods, Digital Image Processing		
MSE   20     ISE   20     ESE   20     ESE   20     Duration of ESE   20     ESE   20     Duration of ESE   20     CO1     Image processing and processing	, CO4			Reference Books	eferenc
transforms and probability theory in image processing nentals like enhancement, encoding, feature extraction, and singge processing. Elements of visual perception, and ger processing. Elements of visual perception, and ger processing. Elements of visual perception, and commander processing. Applications and fields digital image processing. Applications and fields fourier, DCT and wavelet transform, Image dels, Inverse filtering, Weiner filtering. CO2  g. Quantizers, Predictive coding, Transform coessing:  CO2  g. Quantizers, Predictive coding, Transform coessing:  CO3  filter, spatial frequency response, Motion feature matching, Parametric motion estimation, ger filtering, Parametric motion estimation, temperature and the parametric motion estimation, leading over IP  CO4  GC6  CO5  GC7  CO6  CO7  CO7  CO8  CO8  CO9  CO9  CO9  CO9  CO9  CO9	CO4	11 (This 6)	and Transducers" by, 2nd Edition, PHI 201	Patrnabis, "Sensors	3. D.
transforms and probability theory in image processing rentals like enhancement, encoding, feature extraction, and ssing.    CO   CO1	, CO4	1 (Tinit: 3 4 5)	tal Design", Prentice Hall, 3rd Edition, 200	Morris Mano, "Digi	1
transforms and probability theory in image processing nentals like enhancement, encoding, feature extraction, and e Contents  E Contents  E Contents  E Contents  E Contents  I domain techniques-histogram processing and fields digital image processing. Weiner filtering. Image dels, Inverse filtering, Weiner filtering. Image hased segmentation, Region based h. Morphological operations, Use of motion in feature matching, Parametric motion estimation, Video over IP  CO4  INSE  20  20  CO6  CO1  CO1  CO1  CO1  CO2  CO2  CO2  CO3  CO3  CO2  CO3  CO3	, CO4	(5.1.7.17) 100	ectronics Devices" 9th Edition Dearson 20	omas, L. Floyd, "Flo	1. Thor
transforms and probability theory in image processing rentals like enhancement, encoding, feature extraction, and ssing.  ECO1  ISE  Duration of ESE  O2 Hrs 30 Min  Duration of ESE  O2 Hrs 30 Min  Duration of ESE  O2 Hrs 30 Min  CO1  Is image processing  E Contents  E Contents  CO1  Image processing:  Image processing algorithms appropriate for pra  E Contents  Application, representing and Quantization, representing and Quantization, representing digital image processing. Applications and fields  CO1  Image processing Elements of visual perception, representing and Quantization, representing and contents  CO1  Image processing Elements of visual perception, representing and representing and Quantization, representing and fields  CO1  Image processing Elements of visual perception, representing and representing and perception, representing and representing and representing and representing and representing and representation, representing and r	3	ompression, H.263/MPEG-4 VC/H.264 video compression ideo over IP	ompression: MPEG-1, MPEG-2 video cc cc. Compression efficiency, MPEG-4 Aving (SVC), Error-resilient compression, Vi	MC-DCT video covideo compressior Scalable video codi	
MSE  ISE  ISE  ISE  ISE  ISE  ISE  ISE	C02,	ite, color, dynamic Range, bit frequency response, Motion Parametric motion estimation	gital Video and Video Processing: gital Video- spatial resolution, Frame ra cessing- Video sampling, flicker, spatial nation, Block matching, feature matching, interlacing, And Denoising.	Introduction to Di Introduction to Di depth. Video Proc modeling and estin Video filtering, De	Unit 6
transforms and probability theory in image processing nentals like enhancement, encoding, feature extraction, and ssing.  ECOntents  ECOntents  ECOntents  ECOntents  COI  Inage processing. Elements of visual perception, septs in Sampling and Quantization, representing digital image processing. Applications and fields  Fourier, DCT and wavelet transform, Image dels, Inverse filtering, Weiner filtering. Image  S, point, Edge based segmentation, Region based  MSE  20  ESE  02 Hrs 30 Min  COI  COI  COI  COI  COI  COI  COI  CO	C02	coding,	izers,	Image Compression and coding: Data redundancies Variable-len coding, Image compression standa	Unit 4
MSE  MSE  20  ISE  ESE  Duration of ESE  02 Hrs 30 Min  Duration of ESE  102 Hrs 30 Min  Duration of ESE  103 Hrs 30 Min  Duration of ESE  104 Hrs 30 Min  CO Image processing  Essing.  E Contents  CO Image processing, Elements of visual perception, and fields digital image processing. Applications and fields  COI Id domain techniques-histogram processing and Fourier, DCT and wavelet transform, Image dels, Inverse filtering, Weiner filtering. Image	C02	based segmentation, Boundar segmentation, Region based operations, Use of motion i	on tionships between pixels, point, Edge l and representation, Threshold based ture based segmentation. Morphological	Image Segmentation Some Basic Relation detection, extraction segmentation, Textur segmentation.	Unit 3
MSE  MSE  20  ISE  ESE  Duration of ESE  02 Hrs 30 Min  Duration of ESE  rentals like enhancement, encoding, feature extraction, and simage processing.  Is image and video processing algorithms appropriate for prace Contents  CO  image processing:  CO  c	CO1	iques-histogram processing an ind wavelet transform, Image tering, Weiner filtering. Imag	ent and Restoration: y transformation, Spatial domain techni y domain techniques -Fourier, DCT a construction -Noise models, Inverse filt n projection	Image Enhancement and Res. Basics of intensity transform filtering, Frequency domain restoration and reconstruction reconstruction from projection	Unit 2
ESE 20  ESE 60  Duration of ESE 02 Hrs 30 Min  transforms and probability theory in image processing nentals like enhancement, encoding, feature extraction, and ssing.  sce Contents  CO  CO  CO  CO  CO  CO  CO  CO  CO  C	CO	g:  , Elements of visual perception  g and Quantization, representin  ocessing. Applications and field	imental steps in Digital image processing imental steps in Digital image processing lacquisition, Basic Concepts in Sampling thematical tools used in digital image prog	Origins and Fundan Image sensing and a digital images. Matl	
reek   MSE   20  reek   ISE   20  reek   ESE   60  reck   Duration of ESE   02 Hrs 30 Min    reck   ESE   O2 Hrs 30 Min    reck   Duration of ESE   O2 Hrs 30 Min    reck   ESE   O2 Hrs 30 Min    reck   Duration of ESE   O2 Hrs 30 Min    reck   MSE   20  Reck   ESE   O2 Hrs 30 Min    reck   Duration of ESE   O2 Hrs 30 Min    reck   ESE	-		Course Contents	Interdiction and	I nit 1
reek	priate for practica	o processing algorithms approp	deritically evaluate various image and vide	Analyze, apply and applications	C04
reek MSE 20  reek ISE 20  reek ISE 20  regek			of motion in video processing	Learn the concents	CO3
MSE 20  ISE 20  ESE 60  Duration of ESE 02 Hrs	raction, and	ncement, encoding, feature extra	image processing fundamentals like enhan	Understand digital segmentation	C02
MSE   20	Opening.	prohability theory in image proc	nly knowledge of various transforms and n	Understand and an	CO1
MSE   20			Computer Fundamentals	Outcomes (CO): St.	Prerequ
MSE ISE	Hrs 30 Min	ition of ESE 02			
MSE MSE				edits 03	Total Credits
					Lectures
December 2		Examination Scheme		g Scheme	Teachin
EX3634: Digital Image and Video Processing (Program Elective -02)	1	ing (Program Elective -02)	34: Digital Image and Video Processi	EX36	
r (Sem - VI) B. Tech. Electronics and Telecommunication Engineering	eering	Telecommunication Engine		Third Year (Sem -	

Use	Useful Links
-	http://nptel.ac.in/courses/117105080/Prof. D. Roychoudhury IIT Kharagpur.
2.	http://nptel.ac.in/courses/117106086/Prof. S. Srinivasan IIT Madras.
در	https://1:

4.00	COS	CO 2	COI	PO →
3	ى د	S	3	- PO
u	ىن د	w	2	PO 2
S	نا	2	2	PO 3
J.	ı u	ယ	2	PO 4
3	, w	3	2	PO 5
ı	1	1	,	PO 6
ı	ī		ı	PO 7
1	1	1	1	PO 8
ω.	2	2	1	PO9
2	1	1	1	PO 10
S	2	2	2	= PO
3	w	- ω	2	PSO 1
w	2	2	2	PSO 2
2	2	2	S	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern:

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	ı	1	5	5	5	5	MSE
20	1	1	5	5	5.	5	ISE
60	1	ı	20	10	20	10	ESE



	Unit 6 Model Performance and Real-World Applications:  Performance evaluation of deep learning models using precision, recall, F1-score, and ROC curves, model compression techniques including pruning and quantization, introduction to TensorFlow for deep learning, case studies on deep learning applications in healthcare, finance, and autonomous systems.	Unit 5 Generative Models and Reinforcement Learning:  Introduction to generative adversarial networks (GANs) and their working, types of GANs including DCGAN and CycleGAN, applications of GANs in image synthesis and data augmentation, reinforcement learning and deep Q-networks (DQN), combination of deep learning with reinforcement learning.	Unit 4 Recurrent Neural Networks (RNN) and Attention  Recurrent neural networks and their limitations, vanishing gradient problem in RNNs, long short-term memory (LSTM) and gated recurrent units (GRU), bidirectional RNNs, attention mechanism in deep learning, transformers and self- attention, overview of BERT and GPT models, applications of RNNs in time-series forecasting and natural language processing.	Unit 3 Convolutional Neural Networks:  Concept of convolution operation, filters and feature maps, padding and stride, pooling techniques such as max pooling and average pooling, architectures of CNNs including LeNet, AlexNet, VGG, and ResNet, transfer learning and fine- tuning of pretrained models, applications of CNNs in image classification, object detection, and segmentation.	Unit 2 Deep Neural Networks and Regularization:  Training strategies for deep neural networks, issues of vanishing and exploding gradients, initialization techniques such as Xavier and He initialization, overfitting and underfitting problems, regularization techniques including L1 and L2 regularization, dropout and batch normalization, hyperparameter tuning using grid search and random search, introduction to autoencoders and feature extraction.	Definition and scope of deep learning, differences betwee learning, perceptron model and multi-layer perceptron, active ReLU, Tanh, and SoftMax, loss functions including mean s forward propagation, and backpropagation algorithm, techniques like gradient descent, Adam, and RMSprop.	-		CO3 Evaluate different architectures and methods for training deen learning models	CO2 Apply concepts of Linear Algebra, Calculus, and Probability to deep learning models  CO2 Analyze different types of neural networks and ontimization techniques	Course Outcomes (CO): Students will be able to		edits 03	Lectures 03 Hrs/week MS	g Scheme	EX3644: Neural Networks and Deep Learning (Program Elective -02)	Third Year (Sem – VI) B. Tech. Electronics & Telecommunication
	Applications:  ng models using precision, recall, F1-score, an s including pruning and quantization, introduc studies on deep learning applications in hea	networks (GANs) and their working, types of applications of GANs in image synthesis ar and deep Q-networks (DQN), combination of the combination o	and Attention imitations, vanishing gradient problem in RNN recurrent units (GRU), bidirectional RNNs, are ners and self- attention, overview of BERT are series forecasting and natural language proces	ilters and feature maps, padding and stride, average pooling, architectures of CNNs in ansfer learning and fine-tuning of pretrained feation, object detection, and segmentation.	ization: etworks, issues of vanishing and exploding greer and He initialization, overfitting and unducluding L1 and L2 regularization, dropout an using grid search and random search, introdu	Neural Networks:  Ing, differences between machine learning and layer perceptron, activation functions such as setions including mean squared error and cross-apagation algorithm, introduction to optim, and RMSprop.	Course Contents		nethods for training deen learning models	alculus, and Probability to deep learning model	to	Duration of ESE	ESE	MSE	Examination Scheme	rks and Deep Learning (Program Electiv	) B. Tech. Electronics & Telecommunica
1	1 ROC thoare,	GANs d data f deep	s, long tention d GPT ing.	ooling cluding nodels,	ndients, rfitting 1 batch ction to	ing and deep th as sigmoid, cross-entropy, optimization		evaluation metrics		•		02 Hrs	00	20	eme	-02)	ion
3	CO4	C02, C03	C02	C02	C01	COI	СО	n metric				30 Min					
	(07)	(07)	(07)	(07)	(07)	(07)	Hours	cs and		-							

ů.	2.	-	Use	w	2.	-	Ref	<u></u>	2.	1.	Tex	
https://onlinecourses.nptel.ac.in/noc21_cs76/preview	https://archive.nptel.ac.in/courses/106/106/106106184/	https://onlinecourses.nptel.ac.in/noc20_cs62/preview	Useful Links	Chris Bishop, "Pattern Recognition and Machine Learning," Springer, 2006.	Charu Aggarwal, "Neural Networks and Deep Learning: A Textbook," Springer, 2018.	Michael Nielsen, "Neural Networks and Deep Learning," 2015.	Reference Books	Simon Haykin, "Neural Networks and Learning Machines," Pearson Education, 3rd Edition.	François Chollet, "Deep Learning with Python," Manning, 2017.	lan Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning," MIT Press, 2016.	Text Books	

			_			
CO 4	CO3	CO 2	CO 1	CO↓	1	PO
t	1	.1.	-			PO I
1	1	သ	1			PO2 PO3 PO4 PO5 PO6 PO6 PO8 PO9
2	w	1	w			PO 3
	1	1	1			PO 4
10	-1	,	2			PO 5
1	ı	1	- 1			PO 6
1		1	T			PO 6
1	1	1	ī			PO 8
1	1		1			PO 9
1	ı	1	1		0	PO
1		1	1		=	РО
2	2	1	1		)aanne	PSO
	1	1	2		2	PSO
	1	1	1		w	PSO
					_	

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern:

	Create	Evaluate	Analyse 5 5	Apply 5 5	Understand 5 5	Remember 5 5	Knowledge Level MSE ISE
03	1	1	20	10	20	10	ESE



Teaching Scheme Lectures    D3 Hrs/week   Examination Scheme   Examination Scheme			חסווצווכת, בטבט				
tichenne:    Di Hrs/week   Examination Scheme   20   20   20   20   20   20   20   2			hiblished 2020	m Scratch", Independently	Automation Testing from	ul Shetty, "REST API	
ichemie   Ex 3654; API Testing (Program Elective -02)   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   20   00   Hrs/week   20   Hr			shing 2021	with Postman" Packt Publi	esting and Developmen	e Westerveld, "API T	. Dav
Ing Scheme  ss   03 Hrs/week   Examination Scheme   ss   03 Hrs/week   Scheme   ss   03 Hrs/week   Scheme   ss   03 Hrs/week   Scheme   ss   04 Hrs/week   Scheme   ss   05 Hrs/week   Scheme   ss   06 Hrs/week   Scheme					QL in Backend Testing	oins, set Operators. S	Park Hank
ing Scheme  ss    O3 Hrs/week   EXamination   Examination   Examination   Scheme   S	(07)	C04	tegrity, Data Joins, Outer	ng: aints Testing, Referential In Operations: Self Joins, Cross	ntegrity Testing: Constr Advanced Joins & Set (	Data Validation & In Consistency Checks.	
Ing Scheme  Sex   03 Hrs/week   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   Scheme   Examination Scheme   Scheme   Examination Scheme   Scheme			1.	ctions, Reporting API Test I	le Test Scripts and Colle	rganization, Reusabl	-
EX 3654: API Testing (Program Elective -02)  Ing Scheme  ss    03 Hrs/week			7	URL, Missing Headers), Tro API Testing with Postman	Errors (e.g., Incorrect s, Best Practices for	Common API Testing	
heme   D3 Hrs/week   Examination Scheme   D0 Hrs/week   Examination Scheme   D0 Hrs/week   Examination Scheme   D0 Hrs/week   D0	(06)	CO3		API Testing:	ng and Best Practices in	Basic Troubleshooting	
EX 3654; API Testing (Program Elective -02)  heme   Col Hrs/week   Examination Scheme   O3 Hrs/week   Examination Scheme   O3 Hrs/week   O4 Hrs/week   O5 Hr			uest and Test	text or value), Using Pre-rec in Postman.	(e.g., Check for specific troduction to Assertions	Scripts in Postman, In	10. 7
EX 3654: API Testing (Program Elective -02)  heme			C), Validating	esponse Codes (e.g., 200 OI	ple Tests to Validate R	ostman, Writing Sin	
heme Examination (Program Elective -02)  heme 03 Hrs/week 20  OHrs/week 20  COUTSE Contents 20  OHrs/week 20  OHrs/week 20  COIT Testing: In API (Application Programming Interface)? Importance of API Testing in Invare Development, Types of APIs: REST and SOAP, Basics of API ware Development, Types of APIs: REST and SOAP, Basics of API testing. Interface, PATCH, HTTP Status Codes: 200, 400, 404, 500. Key Concepts in API ting: Request, Response, Endpoint, Difference between UI Testing and API Testing. Interface, Collection to Postman Tool:  Toduction to Postman Tool: COI  Titing: Request, Response Time, and Response Body. Headers, and Cookies, Basic Error Handling in API Response in Postman: UI COI  In Postman: COI  In Postman: COI  In Postman: API Request in Postman: OHerstanding of Query Parameters and path parameter in Postman, Understanding on Organizing API Request in Collections, Introduction to Postman and COI  COI  COI  COI  COI  COI  COI  COI			est Scrints in	Postman Introduction to T	nalysing Test Results in	Collection Runner, A	
heme   Ex 3654; API Testing (Program Elective -02)			to Postman	Collections, Introduction	izing API Requests in	Creating and Organ	10
heme   Examination Scheme   Examination Scheme   O3 Hrs/week   20   00   MSE   20   00   03   ESE   20   00   ESE   20   ESE   ESE   20   ESE   2	(08)	C03			ning Tests in Postman	Organizing and Run	-
heme:    CO2			sponses (e.g.,	c Error Handling in API Rest types.	ders, and Cookies, Basi between different reque	Response Body, Head 404, 500), Difference	
heme    Discrete   CO1   Examination Scheme   Discreting (Program Elective -02)			n Body Data,	Simple POST Request wit	ET Request, sending a	Inderstanding of On	
heme    Discrime   Examination Scheme   Examination Scheme   O3 Hrs/week   D0 Hrs/week	(06)	C02			in Postman:	Basic API Requests	
heme    CO2   Day Hrs/week   CO2   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   20   MSE   20   ISE   20			e in Postman:	Onderstanding AFI Kespons	se Time, and Response	Status Codes, Respon	
heme    CO1   Examination Scheme   Examination Scheme   Examination Scheme   O3 Hrs/week   O3 Hrs/week   O3 Hrs/week   O3 Hrs/week   O3 Hrs/week   O3 Hrs/week   O5 Hrs/were   O5 Hrs/we			POST, PUT,	uest Types in Postman: GET	ons, Environments, Req	Workspaces, Collection	
heme   EX 3654: API Testing (Program Elective -02)  heme   O3 Hrs/week   Examination Scheme   O3 Hrs/week   MSE   20   O0 Hrs/week   ISE   20   O0 Hrs/week   ISE   O0 Hrs/week   ISE   O0 Hrs/week   O0 Hrs/week   ISE   O0 Hrs/week   O0 Hrs/w	(07)	CO2	ice Overview:	up Postman. Postman Interf	man Tool: an, Installing and Setting	Introduction to Postm Introduction to Postm	
heme    CO1   Festing   Program Elective -02)			API Testing.	ence between UI Testing and	sponse, Endpoint, Differ	Testing: Request, Res	-
heme    CO			rosi, Poi, ncepts in API	00, 400, 404, 500. Key Co	HTTP Status Codes: 20	DELETE, PATCH, I	
heme    CO  Hrs/week   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   Examination Scheme   20			sics of API	and SOAP,	ent, Types of APIs	Software Developm	
heme    Course   Ex 3654: API Testing (Program Elective -02)	(08)	C01	PI Testing in	Interface)? Importance of A	lesting: plication Programming	Introduction to API What is an API (Ap)	
Teaching Scheme Lectures  O3 Hrs/week Tutorials  O0 Hrs/week  Total Credits  O3  Total Credits  O3  Total Credits  O3  Total Credits  O3  Total Credits  O4  Total Credits  O5  Total Credits  O5  Total Credits  O6  Total Credits  O6  Total Credits  O7  Total Cr	Hou	СО		ontents	Course C		-
Teaching Scheme Lectures  O3 Hrs/week Tutorials  O0 Hrs/week Total Credits  O3 Hrs/week Total Credits  O4 Hrs/week Total Credits  O5 Hrs/week Total Credits Total	backen	ns to ensure	nd complex joir	llidation, integrity testing, a	L techniques for data value of the learning of	Apply advanced SQI data consistency and	
Teaching Scheme  Lectures  O3 Hrs/week  Tutorials  Total Credits  O3  Prerequisite:  CO01  Describe API concepts, communication methods (REST, SOAP), and the importance of API testing.  CO3  Organize, automate, and troubleshoot API tests in Postman using collections, variables, test scripts, and					API issues.	resolving common A	2
Teaching Scheme  Lectures  O3 Hrs/week  Total Credits  O3  Prerequisite:  CO01  Describe API concepts, communication methods (REST, SOAP), and the importance of API testing.  EX 3654: API Testing (Program Elective -02)  MSE  Examination Scheme  MSE  20  Duration of ESE  02 Hrs 30 Min  Duration of ESE  02 Hrs 30 Min  Describe API concepts, communication methods (REST, SOAP), and the importance of API testing.	and	test scripts,	ons, variables,	sts in Postman using collect	and troubleshoot API to	Organize, automate,	CO3
EX 3654: API Testing (Program Elective -02)           Teaching Scheme         Examination Scheme           Lectures         03 Hrs/week         MSE         20           Tutorials         00 Hrs/week         ISE         20           Total Credits         03         ESE         60           Prerequisite:         Duration of ESE         02 Hrs 30 Min           Prerequisite:           Course Outcomes (CO): Students will be able to         Duration of ESE         02 Hrs 30 Min	,		alyse responses	OST, PUT, DELETE) and an	API requests (GET, PO	Use Postman to send	CO2
EX 3654: API Testing (Program Elective -02)		API testing	importance of	hods (REST, SOAP), and the	pts, communication met	Describe API conce	C01
EX 3654: API Testing (Program Elective -02)     Examination Scheme					ents will be able to	utcomes (CO): Stud	Course O
heme         EX 3654: API Testing (Program Elective -02)           03 Hrs/week         Examination Scheme           00 Hrs/week         ISE         20           03         ESE         60		s 30 Min	02	Duration o		site:	Prerequis
			60	ESE		_	Total Cred
g Sche			20	ISE			Tutorials
Teaching Scheme EX 3654: API Testing (Program Elective -02)  Examination Scheme			20	MSE		03 Hrs/week	Lectures
FX 3654 API Testing (Program Floritys -02)			on Scheme	The contract of the contract o	在 · 在 · 在 · 在 · 在 · 在 · 在 · 在 · 在 · 在 ·	Scheme ·	Teaching
Manual or a second section of the second section of the second section of the second section s		g	0	ting (Program Flactive -07	EX 3654. API Tes		

<ul> <li>Reference Books  I. Leonard Richardson, Mike Amundsen, Sam Ruby, "RESTful Web APIs", O'Reilly Media, 2013</li> <li>2. Mark Winteringham, "Testing Web APIs: Build API Test Automation with Postman and REST Assured" Manning Publications, 2022.</li> <li>3. Brenda Jin, Saurabh Sahni, Amir Shevat, "Designing Web APIs", O'Reilly Media, 2018.</li> <li>Useful Links  1. https://academy.postman.com/postman-api-fundamentals-student-expert-certification-1</li> <li>https://astqb.org/istqb-api-testing-certification/</li> <li>3. https://onlinecourses.nptel.ac.in/noc22_ee10/preview/ Prof. Abhishek Dixit IIT Delhi</li> </ul>
ıred",

-					
CO 4	CO 3	CO 2	CO 1 .	CO↓	75
ယ	2	2	W	3	70
2	2	2	3	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9	200
2	သ	2	2	POs	200
ω	1	1	-	2	2
2	· (3)	w	2	3	1
2	1	1		PO6	7
1		1	ı	ð	1
1	2	1	1	PO 8	1
1	2	်ယ	1		2
1	w	1	1	10	1
2	w	2	2	PO	
2	w	ω	2	PSO	
2	ယ	2	2	PSO 2	
w	ယ	ယ	S	PSO 3	

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern:

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	ı	1	5	5	5	. 5	MSE
20	1	-	5	5	5	5	ISE
60	1	-	20	10	20	10	ESE

(06)	C02	I I Lists W W yer teway ractical	VPC, Networking, and Cloud Integration -Virtual Private Cloud (VPC) & Networking Basics Definition and benefits of a Virtual Private Cloud, CIDR blocks, private vs. public IP addresses, Subnets: Public, private, and isolated, Internet Gateway, NAT Gateway, and routing tables, Elastic IPs and dynamic IP management -Security in VPC: Security Groups: Stateful firewalls for EC2, Network Access Control Lists (NACL): Stateless traffic filtering, Comparison: Security Groups vs. NACLs, VPC Flow Logs for traffic monitoring, Use-cases: Isolating application tiers, exposing only web layer-VPC Peering and Endpoints: VPC Peering: Secure communication between VPCs, Gateway endpoints for services like S3 and DynamcDB, Interface endpoints and Private Link, Practical scenarios for using endpoints	VPC, Networking, and Cla-Virtual Private Cloud (VPC) Private Cloud, CIDR blocks, isolated, Internet Gateway, Nemanagement Security in VPC: Security G (NACL): Stateless traffic filtal Logs for traffic monitoring, U-VPC Peering and Endpoints endpoints for services like S3 scenarios for using endpoints	Unit 2
(06)	9	essness- lls apps d-based blishers, al-time pattern	Definition and benefits of serverless architecture -Key features of AWS Lambda: event-driven, auto-scaling, billing per execution, statelessness- Execution model: Max 15 minutes, limited resources, cold star -Invocation patterns: Synchronous, Asynchronous, Polling -Applications: RESTAPIs, File processing, IoT backends, automation -Limitations: No persistent state, timeout limits, cold starts for infrequent calls -When Lambda is not suitable: Long-running tasks, stateful applications, tight latency apps -Cloud Integration using SNS (Simple Notification Service) Introduction to cloud-based integration and messaging, Overview of AWS SNS architecture: topics, publishers, subscribers, supported protocols: Email, SMS, Lambda, HTTP, Use-cases: Real-time alerting, fan-out architecture, triggering workflows, Simple demo: Publish-subscribe pattern for notifications, Role of SNS in decoupling components and enabling scalability		
Hours	CO		Course Contents	+	Il'nit 1
Explorer, ve cloud	Dashboard, Cost Exand cost-effective	Dashboai and co	e, and optimize cloud usage and billing with AWS tools like Billing Control Tower, and apply governance best practices for secure	Track, estimat Budgets, and management.	C04
ud-native	grate clo	ınd inte	Configure secure virtual networks using AWS VPC, implement security policies, and integrate cloud-native services like SNS for scalable and decoupled communication	Configure sec	C03
dopment.	late deve	nd temp	Manage infrastructure as code using AWS CloudFormation, including stack creation and template development	Manage infra	C02
building	mbda for	WS La	Understand the principles of server less computing, key features and limitations of AWS Lambda for building scalable, event-driven applications.	Understand the scalable, even	COI
			Course Outcomes (CO): Students will be able to	se Outcomes (C	Cours
	02 Hrs 30 Min	02 Hr	Prerequisite: Basic Computer Fundamentals  Duration of ESE   02   1	quisite: Basic C	Prere
		60		Total Credits 03	Total
		20	ISE		Tutorials
		20	03 Hrs/week MSE 20	0	Lectures
	( ( )	me	Examination Scheme	Teaching Scheme	Teach
	-102)	Flootive	EX3664: Cloud Infrastructure Management and Automation (Program Flortive 107)	EX3664:	
		fion	Third Year (Sem - VI) R. Tech. Electronics and Telecommunication	T	
			Government College of Engineering, Karad		



Could Cost Management and Governance  AWS Billing and Cost Estimation Tools Overview of AWS Billing Console, AWS Pricing Calculator, and Cost Explorer. Understanding consolidated billing, service usage breakdown, and cost optimization strategies. Configuring thresholds, notifications via SNS, and testing budget alarms. Cost Visibility and Forecasting Monthly cost tracking, analyzing service-wise spending, forecasting usage trends. Introduction to AWS Cost and Usage Reports (CUR).  AWS Organizations and Account Management Introduction to AWS Organizations structure – root, OUs, member accounts. Role of consolidated billing and benefits of shared volume discounts.  AWS Control Tower Overview of Control Tower as a multi-account governance tool. Landing zone concepts, guardrails, auditing, and centralized account provisioning  Infrastructure as Code with AWS Cloud Formation Introduction to Infrastructure as Code (IaC) Concepts of IaC, benefits of automation consistency, and version control.  AWS CloudFormation Overview Declarative syntax to define infrastructure, template structure (YAML/JSON), resources, parameters, outputs.  AWS CloudFormation Console & Composer Creating and deploying stacks using prebuil or custom templates, drag-and-drop interface of Infrastructure Composer.  Creating a Cloud Formation Stack Basic step: selecting template, defining stack name configuring options, launching resources (e.g., EC2, S3, IAM).  Template Development and Lifecycle Anatomy of a CloudFormation template and templates.  Benefits and Best Practices Cost tracking, productivity, reusability, scalability, rollback or failure and templates.	
Pricing Calculator, and Cost Expreakdown, and cost optimization strat d alerts using AWS Budgets.  I testing budget alarms.  e spending, forecasting usage to IR).  ot, OUs, member accounts. Role me discounts.  ernance tool.  entralized account provisioning  ation  concepts of IaC, benefits of autoroncepts.  syntax to define infrastructure, te utputs.  eating and deploying stacks using prastructure Composer.  selecting template, defining stack 2, S3, IAM).  my of a CloudFormation tempong deleting and reviewing stacks.	-Benefits and Best Practices Cost tracking, productivity, reusability, scalability, rollback on failure, and tagging
Pricing Calculator, and Cost Expreakdown, and cost optimization strat d alerts using AWS Budgets. I testing budget alarms.  e spending, forecasting usage to the spending. Role me discounts.  ermance tool.  ermance tool.  entralized account provisioning  ation  Concepts of IaC, benefits of autor concepts of IaC, benefits of autor syntax to define infrastructure, te utputs.  eating and deploying stacks using p frastructure Composer.  selecting template, defining stack 2, S3, IAM).	-Template Development and Lifecycle Anatomy of a CloudFormation template Resources, Mappings, Outputs, Conditions, Undating deleting and reviewing stacks
Pricing Calculator, and Cost Explereakdown, and cost optimization strated alerts using AWS Budgets.  I testing budget alarms.  e spending, forecasting usage tropy.  OUs, member accounts. Role me discounts.  ernance tool.  entralized account provisioning  ation  Concepts of IaC, benefits of auton contents to define infrastructure, tentputs.  eating and deploying stacks using presenting and deploying stacks using present account composer.	-Creating a Cloud Formation Stack Basic step: selecting template, defining stack name configuring options, launching resources (e.g., EC2, S3, IAM).
Pricing Calculator, and Cost Exploreakdown, and cost optimization strate; d alerts using AWS Budgets. I testing budget alarms.  The spending forecasting usage trees, OUs, member accounts. Role me discounts.  The ernance tool.  The intralized account provisioning ation  Concepts of IaC, benefits of autom syntax to define infrastructure, ten utputs.	-AWS Cloud-formation Console & Composer Creating and deploying stacks using prebuilt or custom templates, drag-and-drop interface of Infrastructure Composer.
Pricing Calculator, and Cost Exploreakdown, and cost optimization strateg d alerts using AWS Budgets.  I testing budget alarms.  e spending, forecasting usage trer (R).  nt, OUs, member accounts. Role me discounts.  ernance tool.  ntralized account provisioning  ation  Concepts of IaC, benefits of automa	-AWS CloudFormation Overview Declarative syntax to define infrastructure, template structure (YAML/JSON), resources, parameters, outputs.
Pricing Calculator, and Cost Exploreakdown, and cost optimization strateg d alerts using AWS Budgets.  I testing budget alarms.  e spending, forecasting usage tren (R).  ot, OUs, member accounts. Role me discounts.  ernance tool.  entralized account provisioning  ation	consistency, and version control.
Pricing Calculator, and Cost Explorereakdown, and cost optimization strategical dalerts using AWS Budgets. I testing budget alarms.  e spending, forecasting usage tren (R).  or of the counts of the counts of the counts.  remance tool.  ernance tool.  intralized account provisioning	Infrastructure as Code with AWS Cloud Formation
Pricing Calculator, and Cost Explorer reakdown, and cost optimization strategies d alerts using AWS Budgets. I testing budget alarms.  e spending, forecasting usage trends. (R).  It, OUs, member accounts. Role me discounts.	Landing zone concepts, guardrails, auditing, and centralized account provisioning
Pricing Calculator, and Cost Explor reakdown, and cost optimization strategi d alerts using AWS Budgets. I testing budget alarms.  e spending, forecasting usage trengler) (R).  ot, OUs, member accounts. Role me discounts.	Overview of Control Tower as a multi-account governance tool.
Pricing Calculator, and Cost Explor reakdown, and cost optimization strategi d alerts using AWS Budgets. I testing budget alarms.  e spending, forecasting usage tren (R).  ot, OUs, member accounts. Role me discounts	-AWS Control Tower
Pricing Calculator, and Cost Explorerakdown, and cost optimization strategid alerts using AWS Budgets. I testing budget alarms.  e spending, forecasting usage trents.	Introduction to AWS Organizations structure – root, OUs, member accounts. Role of consolidated billing and benefits of shared volume discounts
Pricing Calculator, and Cost Explorreakdown, and cost optimization strategidalerts using AWS Budgets. I testing budget alarms. e spending, forecasting usage trend (R).	-AWS Organizations and Account Management
Pricing Calculator, and Cost Explorereakdown, and cost optimization strategical dalerts using AWS Budgets. I testing budget alarms.	Introduction to AWS Cost and Usage Reports (CUR).
Pricing Calculator, and Cost Explore reakdown, and cost optimization strategical alerts using AWS Budgets.	Monthly cost tracking, analyzing service-wise spending, forecasting
Pricing Calculator, and Cost Explor reakdown, and cost optimization strategidalerts using AWS Budgets.	-Cost Visibility and Forecasting
Pricing Calculator, and Cost Explorreakdown, and cost optimization strategi	-budgeting and Alerts Setting up cost budgets and alerts using AWS Budgets. Configuring thresholds, notifications via SNS, and testing budget alarms
ricing Calculator, and Cost Explor	Understanding consolidated billing, service usage breakdown, and cost optimization strategies.
	Overview of AWS Billing Console, AWS Pricing Calculator, and Cost Explorer.
	-AWS Billing and Cost Estimation Tools
	Cloud Cost Management and Governance



2021. (Units 3, 4, 5)  3. J. Minichino, Data Analytics in the AWS Cloud. John Wiley & Sons, 2023. (Unit 6)  Reference Books  1. Barrie Sosinsky, "Cloud Computing Bible", Wiley, 2011  2. Anthony T. Velte, Toby J. Velte, "Cloud Computing: A Practical Approach", McGraw-Hill, 2010  Useful Links	2. Alberto	Alberto Artasanchez, "AWS for Solutions Architects: Design your cloud infrastructure"
<ol> <li>J. Minichino, Data Analytics in the AWS Cloud. John Wiley &amp; Sons, 2023.(Unit 6)</li> <li>Reference Books</li> <li>Barrie Sosinsky, "Cloud Computing Bible", Wiley, 2011</li> <li>Anthony T. Velte, Toby J. Velte, "Cloud Computing: A Practical Approach", McGraw-Hill, 201</li> <li>Useful Links</li> </ol>	2021. (	1. (Units 3, 4, 5)
<ol> <li>Reference Books</li> <li>Barrie Sosinsky, "Cloud Computing Bible", Wiley, 2011</li> <li>Anthony T. Velte, Toby J. Velte, "Cloud Computing: A Practical Approach", McGraw-Hill, 201</li> <li>Useful Links</li> </ol>	3. J. Mini	linichino, Data Analytics in the AWS Cloud. John Wiley & Sons. 2023.(Unit 6)
<ol> <li>Barrie Sosinsky, "Cloud Computing Bible", Wiley, 2011</li> <li>Anthony T. Velte, Toby J. Velte, "Cloud Computing: A Practical Approach", McGraw-Hill, 201</li> <li>Useful Links</li> </ol>	Reference I	e Books
2. Anthony T. Velte, Toby J. Velte, "Cloud Computing: A Practical Approach", McGraw-Hill, 201 Useful Links	<ol> <li>Barrie</li> </ol>	rie Sosinsky, "Cloud Computing Bible", Wiley, 2011
Useful Links	2. Anthor	hony T. Velte, Toby J. Velte, "Cloud Computing: A Practical Approach", McGraw-F
	Useful Link	inks

#### ocumentation

- CloudFormation: https://docs.aws.amazon.com/cloudformation/
- SNS: https://docs.aws.amazon.com/sns/
- CloudWatch: https://docs.aws.amazon.com/cloudwatch/
- EventBridge: https://docs.aws.amazon.com/eventbridge/
- CloudTrail: https://docs.aws.amazon.com/cloudtrail/
- AWS Billing & Cost Management: https://docs.aws.amazon.com/awsaccountbilling/
- AWS Organizations & Control Tower: https://docs.aws.amazon.com/organizations/
- AWS Glue: https://docs.aws.amazon.com/glue/
- AWS Athena: https://docs.aws.amazon.com/athena/
- AWS CLI: https://docs.aws.amazon.com/cli/
- AWS Boto3: https://boto3.amazonaws.com/v1/documentation/api/latest/index.html AWS Step Functions: https://docs.aws.amazon.com/step-functions/

### Mapping of COs and POs

CO 4	CO 3	CO 2	CO 1	100	3 ↓	PO
2	2	2	ယ			PO
2	2	ω	2		2	PO
2	ω	2	2		Ç	PO
ω	2	2	1		4	PO
3	ω	2	2		S	PO
2	2	1	1		6	PO
-	1	ı	1		7	PO
1	1	ı	1		00	PO
1	-	1	1		9	PO
1	1	1	1		10	PO
w	2	2	1		=	PO
2	2	2	3		_	PSO
2	-	1	7		- 13	PSO
-	-	1	1		w	PSO

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Board of Studies-E&TC Chairman

# Assessment Pattern (with revised Bloom's Taxonomy)

Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
1	1	5	5	2	S	MSE
ı	1	5	5	5	5	ISE
ı	5	15	15	15	10	ESE
		Ite	se 5 5	se 5 5	stand 5 5 5 see 5 5 see 5 5 5 5 5 5 5 5 5 5 5	nber 5 5 5 stand 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5

CO4 (06)	Vano	2.html	- efu	1 :   5
004	vano		2. "Embedded Systems: Intro Jseful Links	1
04	vano			- C
04		"Embedded Systems: Introduction to ARM Cortex-M Microcontrollers" Jonathan W. Valvano		2.
04		"The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors" Joseph Yiu	-	-
04			Reference Books	77
04		"Real-Time Operating Systems for ARM Cortex-M Microcontrollers" Jonathan W. Valvano	-	2.
	er G. Dean	"Embedded Systems Fundamentals with ARM Cortex-M Based Microcontrollers" Alexander G.	-	-
,			Text Books	E
	RTOS	or FreeRTOS.	or FreeRTOS.	
	RTOS	Real-time Systems and Case Study Real-time system characteristics and timing constraints. Introduction to ARM CMSIS RTOS	Real-time systems and Case Study Real-time system characteristics and	
		and display interfacing via STM32/NXP SDKs.Bluetooth/Wi-Fi (ESP8266/ESP32) integration with ARM-based platforms for IoT applications.		=
COS	SPI	UART serial communication - transmission and reception using ARM Cortex-M boards. SPI and I2C protocol implementation using ARM CMSIS drivers. External EEPROM, sensor,	UART serial communi and I2C protocol imple	
CO2 (08)		faces	Unit 5 Communication Interfaces	C
CO2 (07)		Peripheral Interfacing and Timers  GPIO configuration and control using ARM-based microcontrollers. Timer setup and interrupts with NVIC support. PWM generation for motor control using ARM timers.  ADC/DAC setup and data acquisition using CMSIS/HAI, drivers	Unit 4 Peripheral Interfacing and Timers GPIO configuration and control usin interrupts with NVIC support. PWM ADC/DAC setup and data acquisition	
CO2 (08)	mory abort,	Memory Organization and Exception Handling Memory Organization in ARM Cortex processors. Stack, heap, and static memory Memory map and organization in ARM Cortex processors. Stack, heap, and static memory allocation. Exception handling: reset, undefined instruction, SWI, prefetch abort, data abort, IRQ, and FIQ. NVIC (Nested Vectored Interrupt Controller).	Unit 3 Memory Organizatio Memory map and orga allocation. Exception I IRQ, and FIQ. NVIC (	
CO1 (07)	ons in C	ARM Instruction Set & Assembly Programming Data processing, branch, load/store instructions. Arithmetic, logical, and shift operations ARM. Assembly language syntax, directives, and subroutines. Inline assembly within C code.	Unit 2 ARM Instruction Set  Data processing, branc  ARM. Assembly languages  code.	-
(00)	ther	Overview of ARM family (ARM7, Cortex-M, Cortex-A). RISC vs. CISC, ARM vs. other architectures. ARM programming model — registers, status flags, modes. Introduction to the ARM pipeline and Thumb instruction set.		
CO1 Hours		Architecture	Unit 1 Introduction to ARM Architecture	
-		Analyze memory organization, stack handling, and interrupt processing.		
		Implement peripherals like timers, ADC, UART, SPI, and I2C using ARM MCUs.	CO3 Implement periphera	
		Develop Assembly and C programs using ARM Cortex series microcontrollers.		
		Explain ARM processor architecture, pipeline, and instruction sets.	CO1 Explain ARM proces	
d electronics.	nd digita	its will be able to	Course Outcomes (CO): Students will be able to	0
Hrs 30 Min	02 Hrs			5
	60		Total Credits 03	1
	20			-
	20	MSE 2	Lectures 03 Hrs/week	L
, 100	ne	Examination Scheme	Teaching Scheme	janua)
2)	O-dying	EX3674: Embedded System Design with ARM Processors (Program Flective -07)	EX3674: Embed	
	011	Third Year (Sem - VI) B. Tech. Electronics & Telecommunication	Third Ye	

CO 4	CO 3	CO 2	CO 1	CO Į	1	PO
ı	1	.1	1			POI
-	1	w	1			PO 2
2	w	_	w		4	PO3
1	1	1				PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9
ı	1	î .	.2			PO 5
1	1	,	1			PO 6
ı	ı	1	1			PO7
1	1	1	1			PO 8
1	1		1			PO9
1	T.	1	1		10	PO
1	ı	ı	1		11	PO
2	2	1	1		-	PSO
1	r	1	2		2	PSO
					w	PSO

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

# Assessment Pattern (with revised Bloom's Taxonomy)

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	ı	1	5	. 5	5	S	MSE
20	1		5	5	5	5	ISE
60			20	10	20	10	ESE

Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective, eaching Scheme  Examination Scheme  Ex		16006-25	ition 1000	yout, and Simulation", PHI, (2nd Edit	R.J.Baker, H. W. Li, D. E. Boyce, "CMOS Circuit Design, Layout, and Simulation", PHI, (2nd Edition).	Z. R.J.Ba
Third Year (Sem – Vf) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  Be sweek  Ol Hes/week  Ol He			12).	ta McGraw-Hill , (2nd Edition), (2002	avi, "Design of Analog CMOS Integrated Circuits", Tat	1. B. Raz
CO 2.  CO 1 Introduction to Analog VLSI:  Analog meters (remit periodical experiment mirrors, Advance parameter surgement references, Banding preferences, Avance unpilifier.  CO 1 Introduction to Analog VLSI:  Analog integrated circuit design, Circuit design consideration for MOS, challenges in analog sub-circuit design, Circuit		,(1986).	y and Sons	its for Signal Processing John Wiley	ooks	Reference I
EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)    EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)   Examination Scheme   20   Oo Hrsweek   20   Oo Hrsweek		9.	on), (2012	Oxford University Press, (3rd Editio	len and D.R.Holberg, "CMOS Analog Circuit Design"	
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)    Comparison of Essential Comparison of Essential Collision Scheme   Collision MSE   Collision MSE   Collision Scheme   Collision MSE   Col						Text Books
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  ense (CO): Statents will be able to the low frequency, high frequency MOS models and calculate various parameters sign MOS based analog sub-circuits and calculate performance parameter strick and signal sub-circuits and calculate performance parameter sign MOS based amplifier structure and calculate performance parameter scribe mixed signal sub-circuits and calculate performance parameter scribe sub-circuits and calculate performance parameter scribes and calculate performance parameter scribes sub-circuits and calculate performance parameter scribes and calculate performance parameter scribes and calculate performance parameter scribes sub-circuits and calculate		CO 4	Biasing atching, ulation:	rational amplifiers in the design, I derations for analog blocks: mai fiset analysis, Post-layout simud optimization, Final observation	sistor ladders, Integration of differential and open nd reference voltage generation, Layout consideration, Layout consideration, shielding, Noise, linearity, and of surformance parameters, Power, area, and speed supparison with commercial design practices, etc.	0 11 8 2 11
CO 2.  Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective –02)  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective –02)  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective –02)  EXA684:CMOS Analog Sub-circuits — Examination Scheme –	(08)	CO 1,	efinition	nverter (ADC or DAC): 8-bit R-2R DAC, Specification def	'ase Study – Design of a CMOS-Based Data Coelection of target circuit: 4/8 bit SAR based ADC / a system-level architecture. Design of CMOS are	
CO 2.  CO 3. Exaded: Comparing the College of Engineering, Karad  Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  Examination Scheme  03 Hrs/week  03 Hrs/week  03 Hrs/week  04 Hrs 20  05 Hrs/week  05 Hrs/week  06 Examination Scheme  MSE  20  20  20  20  20  21  22  20  21  22  23  24  25  26  27  27  28  28  29  20  20  21  20  21  21  22  23  24  25  26  27  27  28  28  29  20  20  21  21  22  23  24  25  26  27  28  28  29  20  20  21  21  22  23  24  25  26  27  28  28  29  20  20  21  21  22  23  24  25  26  27  28  28  29  20  20  21  21  22  23  24  25  26  27  27  28  28  29  20  20  21  20  21  21  22  23  24  25  26  27  27  28  28  29  20  20  21  21  21  22  23  24  25  26  27  27  28  28  29  20  20  21  21  21  22  23  24  25  26  27  27  28  28  29  20  20  21  21  21  22  20  21  21  22  21  22  23  24  25  26  27  27  28  28  29  20  20  21  21  21  22  20  21  21  22  21  22  23  24  25  26  27  27  27  28  29  20  20  20  21  21  21  22  20  21  21	(08)	C0 2	age Op- ımp as a	Op-Amplifier, Analysis of two sta MOS Op-amp applications: Op-an	MOS Operational Amplifier: lock diagram of Op-amplifier, characteristics of camplifier, Frequency response of Op-Amplifier, Comparator, ADC, DAC.	
CO 2, rent Surec, Current and Voltage references, Bandgap references.  CO 3  CO 4  CO 4  CO 4  CO 4  CO 5  CO 4  CO 4  CO 4  CO 5  CO 4  CO 5  CO 4  CO 5  CO 4  CO 5  CO 4  CO 4  CO 5  CO 6  CO 7  CO 8  CO 9  CO 1  CO 9  CO 1  CO 9  CO 1  CO 9  C	(07)	CO 3, CO 4	ejection	nt source load, Common mode re rror load.	MOS Differential Amplifier: Differential signalling, source coupled pair, Currentio, CMOS Differential amplifier with current mi	
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  eme	(07)	C0 3	on gate lifier.	mmon source amplifier, Commo of amplifiers and stability of ampli	MOS Amplifiers: erformances matrices of amplifier circuits, Co mplifier, Cascade amplifier, Frequency response o	
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  eme   Examination Scheme   Examination Scheme   Examination Scheme   20    03 Hrs/week   MSE   20    03 Hrs/week   Examination Scheme   20    03 Hrs/week   Examination Scheme   20    03 Hrs/week   Duration of ESE   20    alyze the low frequency, high frequency MOS models and calculate various parameter   20    alyze the low frequency, high frequency MOS models and calculate various parameter   20    alyze MOS based analog sub-circuits and calculate performance parameter   20    alyze MOS based amplifier structure and calculate performance parameter   20    course Contents   Course Contents   Course Contents   CO    roduction to Analog VLSI:   Course Contents   CO    roduction to Analog VLSI circuit design consideration for MOS, challenges in analog suit design, Recent trends in analog VLSI circuits, Analog MOSFET Modelling: MOS   MOSFET Models, High frequency MOSFET Models, High frequency MOSFET Models, Inperature effects in MOSFET, Noise in MOSFET.	(07)	CO 2, CO 4	Advance	resistor, Basic current mirrors, Andgap references.	EMOS Analog Sub-Circuits: Eurrent Source, current Sinks, MOS Diode/Active current mirror, Current and Voltage references, Ba	
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  EX3684:CMOS Analog and Mixed Circuit			n analog g: MOS Models,	usideration for MOS, challenges in uits, Analog MOSFET Modelling High frequency MOSFET NET.	hnalog integrated circuit design, Circuit design con ircuit design, Recent trends in analog VLSI circuits design, Recent trends in MOSFET Models, cansistor, Low frequency MOSFET Models, comperature effects in MOSFET, Noise in MOSFI	
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  eme  03 Hrs/week  00 Hrs/week  03  03  ESE  00  Duration of ESE  20  20  20  20  20  20  20  20  20  2	Hours	CO		ents		-
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  eme  03 Hrs/week  00 Hrs/week  03  03  Duration of ESE  20  Durat					Describe mixed signal sub-circuits	-
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  eme  03 Hrs/week  00 Hrs/week  03  00 Hrs/week  00 Hrs				ate performance parameter	unalyze MOS based amplifier structure and calcul	
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  eme  03 Hrs/week  00 Hrs/week  03 Gradents will be able to  mes (CO): Students will be able to  alvze the low frequency high frequency MOS models and calculate various parameters  alvze the low frequency high frequency MOS models and calculate various parameters			HICKOLO	ite performance parameter	Design MOS based analog sub-circuits and calcula	
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication			meters	nodels and calculate various paran	analyze the low frequency, high frequency MOS r	COI
Third Year (Sem – VI) B. Tech. Electronics and Telecommunication  EX3684:CMOS Analog and Mixed Circuit Design(Program Elective -02)  eme					comes (CO): Students will be able to	Course Ou
heme 0		30	02 Hrs	Duration of ESE		Prerequisi
Scheme			60	ESE		Total Cred
g Scheme			20	ISE	00 Hrs/week	Tutorials
				Examination Schen	cheme 03 Hrs/week	Leaching
Government College of Engineering, Karad  Third Year (Sem – VI) B. Tech. Electronics and Telecommunication			tive -02)	Freuit Design (Frogram Electi	1	3
Government College of Engineering, Karad			ation	lectronics and Telecommunica	Third Year (Sem - VI) B. Tech. El	
				of Engineering, Karad	Government College o	

1: Slight(Low)	CO 4	CO3	CO 2	CO 1	COJ	PO →
(Low)	1	1	1	2		PO I
	1	ı	1	1		PO 2
2: N	1	1	1	1		PO 2 PO 3 PO 4 PO 5 PO 6 PO 6 PO 8 PO 9
[odera	ı	r	1	,		PO 4
Moderate(Medium)	1	L	1	1		PO 5
lium)	1	1	1	1		PO 6
		1	1			9 Od
3:8	. 1	1	1	1		PO 8
3: Substar	1	1	1	1		PO 9
ıtial(High)	1	1	1	1	10	PO
igh)	1	1	1	1	<u></u>	РО
	1	1	1	1		PSO
	2	ü	S	3	2	PSO
	1	1	1	1	دن	PSO

Assessment Pattern (with revised Bloom's Taxonomy)

Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
			10	S	5	MSE
		S	S	10		ISE
		20	20	10	10	ESE
	Create	Evaluate Create	S	10 5	5 10 10 5 5	5 10 10 5

rerequisite: Microcontroller, Em Jourse Outcomes (CO): Students CO1 Explain the architecture a CO2 Identify and use different CO3 Develop simple IoT appli CO4 Analyze IoT security thre Perception, Network, and deployment template, M: Perception, Network, and deployment template, M: Init 2 IoT Hardware and Embe Introduction to microcontr Sensors and actuators in Io microcontroller. Interfacing device and collecting senso Init 3 Internet of Things Protoc Introduction to OSI model, as Internet of Things reference Communication criteria, In Bluetooth IEEE 802.11 ah, Communication for cloud storag web applications and Pro Smart cities, smart agricult enabled automation system and evaluation of IoT proje xt Books  Raj Kamal, "Internet of Things Raj Kamal, "Internet of Th	CO <sub>4</sub> CO <sub>2</sub>	Layer: IF of Things MQTT 02.15.4e al model -on: IoT -on: IoT eb API. eb API. sentation es Press	ting sensor data.  gs Protocols  SI model and different layer protocols Internet of Things Network Laysings network layer, 6LoWPAN, 6Lo, 6TiSCH, RPL Internet of Trings application transport methods, CoAP, Noriteria, Internet of Things access technologies IEEE802.15.4, IEEE802.02.11ah, IEEE 1901.2a, NB- Internet of Things  gs reference model, Domain model, information model, functional model, Core functional stack, Dat management stack, Hands-on mentation.  ger and cloud offering  oud storage models and communication, WAMP- AutoBahn for IoT, Pramework (Django), Xively cloud for IoT, Designing a RESTful Web, and Project Work  t agriculture, industrial IoT, Healthcare and environmental monitoring on systems, Student mini-projects on real-world IoT problems, Presen IoT projects.  gy Madisetti, "Internet of Things: A Hands-on Approach," Universities I tof Things: Architecture and Design Principles," McGraw Hill.  kim Cassimally, "Designing the Internet of Things," Wiley.  lof: https://nptel.ac.in/courses/106105166	Introduction to Cas Internet of T Application Laye Communication Bluetooth IEEE 8  4 Iof Architecture implession architecture implession to classify web application to classify web application For Application For Application For Application For Application of Smart cities, sman enabled automatic and evaluation of Books  Books  Arshdeep Bahga, Viji ence Books  Raj Kamal, "Interne Adrian McEwen, Hall Links  NPTEL Courses of Target Architecture in the courses of the control of the courses of the course of the courses of the course of the	Unit 4  Unit 4  Unit 5  Unit 6  Unit 6
Third Year (Sem – VI) B. Tech. Electronics & Telecommunication  EX3605: Internet of Things  BEAmination Scheme  BO3 His/week  OHHS/week  OHHS/w	CO4 CO2	Layer: IF of Things MQTT 02.15.4e al model on: IoT ceb API. ing, IoT- sentation es Press	ting sensor data.  gs Protocols  SI model and different layer protocols Internet of Things Network Lay ungs network layer, 6LoWPAN, 6Lo, 6TiSCH, RPL Internet of T  r: Internet of Things application transport methods, CoAP, N  riteria, Internet of Things application transport methods, CoAP, N  riteria, Internet of Things application transport methods, CoAP, N  riteria, Internet of Things application transport methods, CoAP, N  riteria, Internet of Things application transport methods, CoAP, N  riteria, Internet of Things application transport methods, CoAP, N  riteria, Internet of Things application transport methods, CoAP, N  riteria, Internet of Things  gs reference model, Domain model, information model, functional r  nodel, Core functional stack, Dat management stack, Hands-on  mentation.  rer and cloud offering  oud storage models and communication, WAMP- AutoBahn for IoT, P  ramework (Django), Xively cloud for IoT, Designing a RESTful Web.  and Project Work  t agriculture, industrial IoT, Healthcare and environmental monitoring  n systems, Student mini-projects on real-world IoT problems, Presen  loT projects.  yMadisetti, "Internet of Things: A Hands-on Approach," Universities I  t of Things: Architecture and Design Principles," McGraw Hill.  kim Cassimally, "Designing the Internet of Things," Wiley.	Introduction to C as Internet of T Application Laye Communication Bluetooth IEEE 8  4 IoT Architecture Internet of Thing communication architecture imple Introduction to cl web application of IoT Applications Smart cities, sman enabled automatic and evaluation of Books Arshdeep Bahga, Viji rence Books Raj Kamal, "Interne Adrian McEwen, Ha Adrian McEwen, Ha All Links	Unit 3 Unit 5 Unit 5 Unit 5
Third Year (Sem – VI) B. Tech. Electronics & Telecommunication  EX3605: Internet of Things  BE STATION Scheme  Of Hrs/week  Of Things Hrs/week  Of Things Protocols  Internet of Things application transport methods, CoAP, MQTT, dication model, Tork internet of Things application transport methods, CoAP, MQTT, dication model, Core functional stack, Dat management stack, Hands-on: IoT and collecting reference model, Domain model, information model, functional model, information model, Core functional stack, Dat management stack, Hands-on: IoT will be the Hrs/weight of Hrs/weight of Hrs/Hrs/weight of Hrs/Hrs/Hrs/Weight of Hrs/Hrs/Weight of Hrs/Hrs/Hrs/Weight of Hrs/Hrs/Hrs/Hrs/Hrs/Hrs/Hrs/Hrs/Hrs/Hrs/	CO4 CO2	Layer: IF of Things MQTT 02.15.4e al model -on: IoT -on: IoT -ch API ing, IoT- sentation es Press	ting sensor data.  gs Protocols  SI model and different layer protocols Internet of Things Network Layer, Internet of Things application transport methods, CoAP, Noriteria, Internet of Things application transport methods, CoAP, Noriteria, Internet of Things access technologies IEEE802.15.4, IEEE802.02.11ah, IEEE 1901.2a, NB-Internet of Things  gs reference model, Domain model, information model, functional respectively. Core functional stack, Dat management stack, Hands-on mentation.  The ramework (Django), Xively cloud for IoT, Designing a RESTful Web, and Project Work  t agriculture, industrial IoT, Healthcare and environmental monitoring on systems, Student mini-projects on real-world IoT problems, Presentof Things: A Hands-on Approach," Universities It of Things: Architecture and Design Principles, "McGraw Hill.  kim Cassimally, "Designing the Internet of Things: Willey Internet of Things: Willey Internet of Things in McGraw Hill.	Introduction to Cas Internet of TApplication Laye Communication Bluetooth IEEE 8  4 IoT Architecture Internet of Thing communication architecture imple architecture imple Introduction to classes Introduction for Application For Introduction For Internet For In	Unit 4 Unit 5 Unit 6 Unit 6 Refere 1.   A
Third Year (Sem – VI) B. Tech. Electronics & Telecommunication  EX3665; Internet of Things  ne  OB Hrs/week  OCO  On and characteristics of IoT Applications of IoT in various domains, IoT architecture:  On Network, and Application Isasce Security measures.  EIOT security threats and implement basic security measures.  EIOT security threats and implement basic security measures.  EIOT security threats and implement basic security measures.  EIOT Applications using microcoontrollers and sensors.  EIOT Applications of IoT in various domains, IoT architecture:  On Network, and Application Isasce Footenets  EXE Do. CO1  CO1  on and calcators in IoT, Power management in IoT devices, Interfacing peripherals to introduct Interfacing bot devices, Interfacing peripherals to introduct Interfacing bot devices, Interfacing peripherals to introduct Interfacing bot devices with cloud platforms, Hands-on: Setting up an IoT and collecting sensor data.  CO2 Things Protocols  OC1 Things Protocols  Interface of Things Network Layer: Interface of Things Interface	CO <sub>4</sub> CO <sub>2</sub>	Layer: IF of Things MQTT 02.15.4e al model -on: IoT -on: IoT -ch API ing, IoT- sentation es Press	iting sensor data.  gs Protocols  SI model and different layer protocols Internet of Things Network Laybrings network layer, 6LoWPAN, 6Lo, 6TiSCH, RPL Internet of Tr. Internet of Things application transport methods, CoAP, Noriteria, Internet of Things access technologies IEEE802.15.4, IEEE802.02.11ah, IEEE 1901.2a, NB- Internet of Things  gs reference model, Domain model, information model, functional model, Core functional stack, Dat management stack, Hands-on model, Core functional stack, Dat management stack, Hands-on mentation.  ver and cloud offering  oud storage models and communication, WAMP- AutoBahn for IoT, Pramework (Django), Xively cloud for IoT, Designing a RESTful Web.  and Project Work  t agriculture, industrial IoT, Healthcare and environmental monitoring on systems, Student mini-projects on real-world IoT problems, Presen IoT projects.  y Madisetti, "Internet of Things: A Hands-on Approach," Universities I	Introduction to Case Internet of Tapplication Laye Communication Bluetooth IEEE 8  4 IoT Architecture Internet of Thing communication architecture imple architecture imple surface and explication for classical serious application for appl	Unit 4 Unit 5 Unit 6 Unit 6 Refere
Scheme  EX3605: Internet of Things Scheme  Discrete of Things Scheme  EX3605: Internet of Things  O3 Hrs/week  O3 Hrs/week  O4 Hrs/week  O5 Hrs/week  O5 Hrs/week  O6 Hrs/week  D0 Hrs/week  D0 Hrs/week  D0 Hrs/week  D0 Hrs/week  D0 Hrs/week  Examination Scheme  MSE  D0 USE  C0 USE  Scheme  C0 U	CO2 CO4	Layer: IF of Things MQTT 02.15.4e al model on: IoT ceb API. ing, IoT-sentation	ting sensor data.  gs Protocols  SI model and different layer protocols Internet of Things Network Laynings network layer, 6LowPAN, 6Lo, 6TiSCH, RPL Internet of Trings application transport methods, CoAP, Noriteria, Internet of Things access technologies IEEE802.15.4, IEEE802.202.11ah, IEEE 1901.2a, NB- Internet of Things  gs reference model, Domain model, information model, functional model, Core functional stack, Dat management stack, Hands-on mentation.  rer and cloud offering  oud storage models and communication, WAMP- AutoBahn for IoT, Pramework (Django), Xively cloud for IoT, Designing a RESTful Web and Project Work  t agriculture, industrial IoT, Healthcare and environmental monitoring on systems, Student mini-projects on real-world IoT problems, Presen IoT projects.	Introduction to Cas Internet of TApplication Laye Communication Bluetooth IEEE 8  4 IoT Architecture Internet of Thing communication architecture implessed in the production to close the production of the polication of the production of the produ	Unit 4 Unit 5 Unit 6
Ing Scheme  EX3605: Internet of Things  Examination Scheme  EX3605: Internet of Things  Examination Scheme  Examination Scheme  Examination Scheme  BEX 605: Internet of Things  Internet of Things  Internet of Things  Internet of Things  Introduction to lof  Introduction to lof  Introduction to microcontroller, and Exhausted in John Scheme Introduction to microcontroller and development basic security measures.  Internet of Things Protocols  Internet of Things Protocols  Internet of Things application and devices and Embedded Systems  Introduction to DS Internet of Things application layers lof evices with cloud platforms, Hands-on: Setting up an lof device and collecting sensor data.  Internet of Things Protocols  Internet of Things application transport methods, CoAP, MQTT, Communication Layer: Internet of Things application transport methods, CoAP, MQTT, Communication to application stack, Dat management stack, Hands-on: Iof Internet & Design  Introduction to cloud storage models and communication, Web application transport methods, CoAP, MQTT, Communication criteria, Internet of Things application transport methods, CoAP, MQTT, Communication model, Core functional stack, Dat management stack, Hands-on: Iof Internet mplementation.  Iof Architecture & Design  Introduction to cloud storage models and communication, WAMP-AutoBahn for Iof, Python web application systems, Student mini-projects on real-world Iof problems, Presentation and evaluation of Iof projects, Student mini-projects on real-world Iof problems, Presentation  CO4  Introduction of Of Topicets, Student mini-projects on real-world Iof problems, Presentation  Examination of Iof projects, Student mini-projects on real-world Iof problems, Presentation  CO4	CO2 CO4	Layer: IF of Things MQTT 02.15.4e  al model on: IoI  (, Python eb API. ing, IoT- sentation	ting sensor data.  gs Protocols  SI model and different layer protocols Internet of Things Network Layings network layer, 6LoWPAN, 6Lo, 6TiSCH, RPL Internet of Trings application transport methods, CoAP, Noriteria, Internet of Things  202.11ah, IEEE 1901.2a, NB- Internet of Things  3. & Design  3. **Things application model, information model, functional reproduction.  3. **Things application model, functional reproduction.  3. **Things application model, functional reproduction.  3. **Things application model, functional reproduction.  4. **Things application model, functional reproduction.  4. **Things application model, functional reproduction.  4. **Things application model, functional reproduction.  5. **Things application methods.  5. **Things application methods.  6. **Things appli		Unit 5 Unit 6
Introduction to IoT  Definition and template, MZM, and Application layers for earlier template, MZM, and actuators in IoT, Power management in IoT aevices and collecting sensor data.  Internet of Things Perotocols  Introduction to OSI model and different layer protocols Internet of Things reference model, Domain model, functional stack, Dar Hands-on: IoT  Internet of Things reference model, Domain model, information model, functional model, core internet of Things reference model, Domain model, information model, functional model, application in stack, Ppthon  Explain the architecture and working principles of IoT.  EXPLAIN the Microcontroller, Embedded system, Computer Network  ESE  Outcomes (CO): Students will be able to  ESE  Examination Scheme  MSE  20  ESE  Outcomes (CO): Students will be able to  ESE  COI  Defailts defacts and implement basic security measures.  COI  Introduction to one incrocontroller, metastics of IoT in various domains, IoT architecture: COI  Introduction to COI moticoontroller and development boards (Arduino, ESP8266, Raspberry Pi), Sensors and actuators in IoT, Power management in IoT devices, Interfacing peripherals to microcontrollers and development boards (Arduino, ESP8266, Raspberry Pi), Sensors and actuators in IoT, Power management in IoT devices, Interfacing peripherals to microcontrollers and evices with cloud platforms, Hands-on: Setting up an IoT device and collecting sensor data.  Internet of Things Protocols  Introduction to OSI model and different layer protocols Internet of Things Network Layer. Ip a Internet of Things access technologies IEEE802.15.4, IEEE802.15.4, IEEE802.15.4, IEEE802.15.4, IEEE802.15.4,	CO2	Layer: IF of Things MQTT 02.15.4e 02.15.4e al model, on: IoT -on: IoT	ting sensor data.  gs Protocols  SI model and different layer protocols Internet of Things Network Laynings network layer, 6LowPAN, 6Lo, 6TiSCH, RPL Internet of Trier: Internet of Things application transport methods, CoAP, Noriteria, Internet of Things access technologies IEEE802.15.4, IEEE802.02.11ah, IEEE 1901.2a, NB- Internet of Things  & Design  gs reference model, Domain model, information model, functional model, Core functional stack, Dat management stack, Hands-on model, Core functional stack, Dat management stack, Hands-on model cloud offering  oud storage models and communication, WAMP- AutoBahn for IoT, Pramework (Django), Xively cloud for IoT, Designing a RESTful Web.		Unit 4
Ing Scheme  EX3605: Internet of Things  Ing Scheme  EX3605: Internet of Things  Examination Scheme  EX3605: Internet of Things  Introduction to IoT  Internet of Things Protocols  Introduction to OSI model and different layer protocols Internet of Things Network layer. Internet of Things application transport methods, CoAP, MQTT, Communication model, Ioternet of Things application transport methods, CoAP, MQTT, Communication model. Core functional stack, Dat management stack, Hands-on: IoT  Internet of Things reference model, Domain model, information model, functional model, communication.  Internet of Introduction Iotal stack, Dat management stack, Hands-on: IoT  Internet of Things reference model, Domain model, information model, functional model, communication model. Core functional stack, Dat management stack, Hands-on: IoT  Internet of Iotal stack, Hands-on: IoT  Internet of Iotal stack, Hands-on: IoT  Internet of Iotal stack, Dat management stack, Hands-on: IoT  Internet of Iotal s	CO2	Layer: IF of Things MQTT 02.15.4e	gs Protocols  SI model and different layer protocols Internet of Things Network Layings network layer, 6LoWPAN, 6Lo, 6TiSCH, RPL Internet of Things application transport methods, CoAP, Noriteria, Internet of Things access technologies IEEE802.15.4, IEEE802.02.11ah, IEEE 1901.2a, NB- Internet of Things  Sk Design  Sk Design  gs reference model, Domain model, information model, functional model, Core functional stack, Dat management stack, Hands-on mentation.		Unit ?
B. Tech. Electronics & Telecommunication  605: Internet of Things    Examination Scheme   20	3 3 00 70	Layer: IF of Things MQTT 02.15.4e	Interfacing loT devices with cloud platforms, Hands-on: Setting up a ting sensor data.  In the sensor data of the sensor data of the sensor data of the sensor data.  In the sensor data of the sensor data		Unit
B. Tech. Electronics & Telecommunication    Examination Scheme   20   20     ISE   20   20     ISE   60   02 Hrs 30 Min     Inciples of IoT.   2	C02		nterfacing loT devices with cloud platforms, Hands-on: Setting up a ting sensor data.		
B. Tech. Electronics & Telecommunication  605: Internet of Things    Examination Scheme   20     MSE   20     ISE   60     Duration of ESE   02 Hrs 30 Min     Computer Network   20     ESE   60     Duration protocols.   20     Duration of ESE   02 Hrs 30 Min     Computer Network   20     ESE   60     Duration of ESE   02 Hrs 30 Min     COT   COT   COT   COT     COT   COT   COT     COT   COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT     COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   COT     COT   COT   CO	C01	berry Pi) bherals to ip an IoT	nd Embedded Systems ucrocontrollers and development boards (Arduino, ESP8266, Raspber ators in IoT, Power management in IoT devices, Interfacing peripher		Unit
B. Tech. Electronics & Telecommunication  605: Internet of Things    Examination Scheme   20     MSE   20     ISE   60     ESE   60     Duration of ESE   02 Hrs 30 Min     Inciples of IoT.   20     Ist   20     Is	COI	hitecture	aracteristics of IoT Applications of IoT in various domains, IoT archite aracteristics of IoT Applications of IoT in various domains, IoT archite ork, and Application layers IoT enabling technologies, IoT level plate, M2M, difference between IoT and M2M.		Unit
B. Tech. Electronics & Telecommunicatio 605: Internet of Things  Examination Schem MSE  ISE  ESE  Duration of ESE  niciples of IoT.  cation protocols. nicrocontrollers and sensors. nent basic security measures.			Course Contents	-	
B. Tech. Electronics & Telecommunicatio 605: Internet of Things  Examination Schem  MSE  ISE  ESE  Duration of ESE  nciples of IoT. ation protocols. nicrocontrollers and sensors.			urity threats and implement basic security measures.		CO4
B. Tech. Electronics & Telecommunicatio 605: Internet of Things  Examination Schem  MSE  ISE  ISE  ESE  Duration of ESE  nciples of IoT.  ation protocols.			IoT applications using microcontrollers and sensors.		CO3
B. Tech. Electronics & Telecommunicatio 605: Internet of Things  Examination Schem  MSE  ISE  ESE  Duration of ESE  , Computer Network			different IoT communication protocols.		C02
B. Tech. Electronics & Telecommunicatio 605: Internet of Things  Examination Schem  MSE  ISE  ESE  Duration of ESE  Computer Network			Students will be able to students will be able to	1 Explain the arch	COL
Third Year (Sem – VI) B. Tech. Electronics & Telecommunicatio   EX3605: Internet of Things   Examination Schem			oller, Embedded system, Computer Network	equisite : Microcont	Prere
Third Year (Sem – VI) B. Tech. Electronics & Telecommunicatio  EX3605: Internet of Things  Examination Schem  03 Hrs/week  00 Hrs/week  ISE	rs 30 Min	02 H		I Cieurs 03	10141
Third Year (Sem – VI) B. Tech. Electronics & Telecommunicatio  EX3605: Internet of Things  g Scheme Examination Schem  O3 Hrs/week MSE		20		-	Tutor
		20			Lectu
Third Year (Sem – VI) B. Tech. Electronics & Telecommunication  EX3605: Internet of Things		leme	Examination Schen	thing Scheme	Teacl
Third Year (Sem - VI) B. Tech. Electronics & Telecommunication			EX3605: Internet of Things		
		ation	rd Year (Sem - VI) B. Tech. Electronics & Telecommunication	jamen j	



CO 4	CO 3	CO 2	COI	PO→ CO↓
ı		1	1	PO 1
1	1	w	1	PO2
2	ယ	_	ယ	PO2 PO3 PO4
ì	1	1	1	PO 4
1	,	1	2	PO 5
1	1	1	1	PO 6
1	1	ī	1	PO 6
1	1	1	1	8 Od
1	ı	1	г	PO 5 PO 6 PO 8 PO 9
1	r	1	t	PO
1	1	1	1	PO II
2	2	_	1	PSO 1
1	ı	1	2	PSO 2
1	1	2	1	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

### Guideline for Assessment Pattern:

TOTAL	Create	Evaluate	Analyse	Apply	Understand	Remember	Knowledge Level
20	1	1	5	5	5	5	MSE
20	ı		5	5	5	5	ISE
60	1	1	20	10	20	10	ESE

CO2   CO3   CO4   CO5	https://nptel.ac.in/courses/117101051 Prof.Bikash Kumar Dey IIT Bombay https://onlinecourses.nptel.ac.in/noc22_ee61/preview Prof.Goutam Das IIT kharagpur.	2. https://onl
20 60 E 02 Hrs 30 Min CO1 odulation. 1 (PM): Basic CO1 mn, Digital K), Phase shift CO2 mnmunication mmunication CO3 of Optical CO3 of Optical CO3 d trajectorie, CO4  Ta McGraw.	tel.ac.in/courses/117101051 Prof.Bikash Kumar Dev IIT Bombay	
SE 02 Hrs 30 Min  CO SE 02 Hrs 30 Min  CO1 Dodulation. In (PM): Basic CO1 Dom, Digital SK), Phase shift CO2 Dommunication CO3 S of Optical CO3 And trajectorie, CO4 Ata McGraw.	A CONTRACTOR OF THE CONTRACTOR	1. https://npt
SE 02 Hrs 30 Min  CO SE 02 Hrs 30 Min  CO1 Dodulation. In (PM): Basic CO1 Dom, Digital SK), Phase shift CO2 CO3 CO3 S of Optical CO3 And trajectorie, CO4  ata McGraw.	The same of the sa	Useful Links
SE 02 Hrs 30 Min  CO SE 02 Hrs 30 Min  CO1 DOUBLETON CO1 DOUBLETON CO1 DOUBLETON CO1 DOUBLETON CO2 DOUBLETON CO3 S of Optical CO3 And trajectoric, CO4 CO4 CO4 CO5 CO6 CO7	Theodore S. Rappaport "Wireless Communications: Principles and Practice	3. Theodore
of ESE   02 Hrs 30 Min   60   CO1   CO1   CO1   CO1   CO1   CO1   CO1   CO2   CO3   Ations of Optical   CO3   CO3   Ations of Optical   CO3   CO3   CO3   CO3   CO4   CO4   CO4   CO4   CO4   CO5   CO4   CO4   CO4   CO4   CO5   CO	Anil K. Maini, "Satellite Technology: Principles and Applications" – Varsha Agrawal	
of ESE   02 Hrs 30 Min   60   CO   CO1   CO1   CO1   CO1   CO1   CO1   CO1   CO2   CO3   Ations of Optical   CO3   Ations of Optical   CO3   CO3   Ations of Optical   CO3   CO3   CO4   Vices   CO4   CO4   CO4   CO4   CO4   CO5	Carlson "Communication Systems" Athadition McCommunication Systems	1. A. Bruce
of ESE   CO   CO1   CO1   CO2   CO2   CO3   CO3   CO3   CO3   CO3   CO4   CO5   CO5	rence Books	E-
ESE 02 Hrs 30 Min  CO  CO1  modulation. ion (PM): Basic  CO1  fSK), Phase shift  FSK), Phase shift  CO2  communication communication communication communication communication communication communication communication CO3  and trajectorie,  CO4  es  CO4	J. Senior "Ontical Fiber Communications Principle and Provide 11 in 11 i	+
20 20 20 60 CO1 odulation. a (PM): Basic n, Digital K), Phase shift CO2 ommunication ommunication of Optical of Optical CO3 ad trajectorie, CO4	BEHROUZ A FOROUZAN Data Communication and Naturalism 2-15-15.	-
SE 02 Hrs 30 Min  CO SE 02 Hrs 30 Min  CO1 In (PM): Basic In (PM):		1 P D Loth
30 Min 30 Min CO CO1 CO3 CO3	OSI, TCP/IP models, Types of networks, Network topologies, Networking devices	OSI, T
30 Min CO CO1 CO1 CO3	multiple access technique in satellite communication.	Thit 6 Came
30 Min CO1 CO1 CO2	Fundamentals and Advantages of satellite communication. satellite	Funda
30 Min CO CO1 CO1 CO3	Satellite Communication:	Unit 5 Satell
30 Min CO CO1 CO1	Advantages, Applications and	
30 Min CO CO1 CO2	Optical Fiber Communication:	Unit 4 Optic
30 Min CO1 CO1	and wired communication. Application and challenges, Types of wireless communication cellular communication, Wi-Fi, Bluetooth and IoT communication	and w
30 Min CO CO1	Wireless Communication:	Unit 3 Wirel Evolu
30 Min CO1 CO1	keying (PSK)	
Hrs 30 Min CO CO1 Basic	Difference between analog and digital communication, Sampling and Quantization, Digital modulation technique: Amplitude shift keying (ASK), Frequency shift keying (FSK), Phase shift	
Hrs 30 Min CO CO1 Basic	to Communication	Unit 2 Digit.
20 60 n of ESE 02 Hrs 30 Min	Overview of communication system, Introduction to modulation, Types of modulation.  Amplitude modulation (AM), Frequency modulation (FM), Phase modulation (PM): Basic Principle and Comparison with AM FM and PM	
20 60 n of ESE 02 Hrs 30 Min	Anglog Communication:	I nit 1 Anal
n of ESE	Analyze communication network and protocols.	CO4 Ana
n of ESE	Explain the principles of optical fiber and satellite communication.	-
n of ESE	Demonstrate knowledge of modern wireless communication technologies.	-
tion of ESE	Understand fundamental concept of communication system.	
tion of ESE	Course Outcomes (CO): Students will be able to	ourse Outco
tion of ESE	Prerequisite: Mathematics, Analog and digital electronics.	rerequisite:
	02 ESE	<b>Total Credits</b>
		Tutorials
	02 Hrs/week MSE	Lectures
Examination Scheme	Scheme Exa	Teaching Sch
linary Vinor-14)	EX3606: Communication System (Multi-Disciplinary Minor-04)	
unication Engineering	Third Year (Semester-VI) B. Tech. Electronics and Telecommunication Engineering	Th
Karad	Government College of Engineering, Karad	



CO 4	CO3	CO 2	COI	CO L	PO→
2	w	w	w	juma	PO
W	2	2	2	2	PO
2	3	2	1	(J.)	PO
w	2	2	_	4	PO
S	2	w	2	S	PO
1	1	t	1	6	PO
ı		ı	1	7	PO
ı	ı	1	1	~	PO
w	1	2	1	9	PO
2	_	1	1	10	PO
w	2	3	2	1	PO
w	2	w	2	<b></b>	PSO
ယ	3	3	3	2	PSO
w	2	2	2	w	PSO

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern:

TOTAL 20	Create -	Evaluate -	Analyse 5	. Apply 5	Understand	Remember 5	Knowledge Level MSE
20		1	5	5	5	5	SE ISE
60	1	1	20	10	20	10	ESE

#### Teaching Scheme Dractical 4 H Practical Total Credits Course Outcome (CO): Government College of Engineering Karad Third Year (Semester VI) B. Tech. Electronics and Telecommunication Hr/week EX3607: Mini Project Examination Scheme 50 25

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

LO I Identity and conceptualize innovative ideas using surveys and research.
CO 2 Design solutions using multidisciplinary knowledge.
CO 3 Develop and implement a functional product or system.
CO 4 Present and evaluate project outcomes effectively.

minor project. The steps involved for completion of minor project includes, but not limited to: the process involved in making product from idea. Not more than two students may carry out the minor collaborative efforts and communication skills in students. The aim is also to make students aware with Guidelines for Project Selection:

The main aim of this course is to demonstrate the important attributes like critical thinking, creativity, project together. One supervisor from the department shall be assigned three project batches of the

- interaction with community or industry, socio-economic survey etc. Conceptualization of innovative idea through literature and market survey, sight visits,
- Design of product, processes, methods and systems using multidisciplinary knowledge
- Fabrication of product, development of software, measurement methods etc.
- 4 Deployment, implementation and demonstration of project.
- S Presentation of project

Project work shall be based on any of the following:

- Design of any equipment /test setup/product.
- Hardware/numerical or theoretical analysis /review of survey study/research and development
- w The subject content of the minor project shall be from emerging/thrust areas, topic of current
- 4 of semester. The completion of work, the submission of the report and assessment should be done at the end

### Project Report Format:

Project report should be of 15 to 20 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.

- Page Size: Trimmed A4
- Top Margin: 1.00Inch
- 3. Bottom Margin:1.32Inches
- Left Margin: 1.5 Inches
- . Right Margin: 1.0Inch

6. Para Text: Times New Roman 12 Point Font

- Line Spacing: 1.5Lines
- 8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
- Headings: Times New Roman, 14 Point Bold Face
- should have signatures of Guide, Head of Department and Principal/Director. department. Certificate should be awarded to batch and not to individual student. Certificate Certificate: All students should attach standard format of Certificate as described by the
- 11. Index of Report:



- a. Title Sheet
- b. Certificate
- Acknowledgement
- d. Table of Contents
- e. List of Figures
- f. List of Tables

References: References should have the following format For Books: "Title of Book", Authors, Publisher, Edition. For Papers: "Title of Paper", Authors, Journal/Conference Details, Year

#### List of Submission:

- Working model of the project
- Project Report

Presentation and demonstration of project in exhibition

Mapping of Course outcome with Program Outcomes

C04	CO3	CO2	COI	СО↓	<b>\</b>	PO
1	_	1	_		101	100
2	1	3	ı		101	cOa
S	1	1	1		TOJ	r.Oa
1	1	1	1		101 +01	200
2	1	2	2		COI	DO2
ı	1	_	3		LOO	DOC.
1	2	1	ı		O FO/	DO 7
1	S	_	1		FUO	nOo
T	2	1	2		ruy	000
2	1	2	2		FOID	n 0 1 0
	1	2	_		roll	n Ca
2	ı	2	1		FOID FOIL PSOI	DCO 1
2	ı	2	1		POOL POOL	
S	,_	w	1		ROOS	3000

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

### Guideline for Assessment Pattern:

- critical thinking, creativity, collaborative efforts and communication skills in students. The continuous assessment shall be done by the supervisor based on attributes like
- 2 The end semester assessment shall be done by external referee one week before the
- S. same day) of the minor projects done by students and the referee will judge the project work in accordance with the outcomes of the course by interacting with students and The department shall arrange exhibition (all department will arrange the exhibition on
- 4 marks will be awarded to individual student.

  This exhibition will remain open for all students, parents, and other citizens visiting the exhibition.

	Minimum number of Experiments: 10	Minimum number
		List of Submission.
CO4	Study of EV Charger and Bidirectional Converter	Experiment 12 Study of EV Char
CO4	Study of Solar PV Inverter (Grid-tied and Off-grid Systems)	Experiment 11 Study of Solar PV
СОЗ	Analyze Performance of Single-Phase Series Inverter	Experiment 10 Analyze Performa
CO3	Analyze Performance of Single phase PWM inverter using MOSFET	Experiment 9 Analyze Performa MOSFET
CO3	Performance measurement and analysis of DC-DC boost regulator	Experiment 8 Performance mea
CO2	Performance measurement and analysis of DC-DC buck regulator	Experiment 7 Performance mea
CO2	Demonstrate DC Motor Speed Control Using a Chopper	Experiment 6 Demonstrate DC
CO2	Analyze a Three-Phase SCR-Controlled Bridge Converter	Experiment 5 Analyze a Three-
CO2	Performance Measurement and Analysis of three phase AC-DC Controlled Bridge Rectifier	Experiment 4 Performance Measurement Controlled Bridge Rectifier
C02	Test a Single-Phase SCR-Controlled Rectifier	Experiment 3 Test a Single-Pha
CO1	Demonstrate Forced Commutation Techniques for SCRs	Experiment 2 Demonstrate Ford
CO1	Operate and Analyze an SCR Firing Circuit	Experiment 1 Operate and Anal
	pts	Implementation of following concepts
CO	Course Contents	
gration and electric vehicle	power electronic systems in renewable energy integration and electric vehicle	Examine the role of pow infrastructure.
wer electronic converters	Test and interpret the output characteristics of PWM inverters and various power electronic converters	CO3 Test and interpret the outp
motor control and industrial	of AC-DC and DC-DC converters used in	Analyze the performance applications.
yze firing and commutation	Apply the knowledge of power semiconductor devices to operate and analyze circuits for SCRs.	CO1 Apply the knowledge of circuits for SCRs.
	s will be able to	Course Outcomes (CO): Students will be able to
		Prerequisite: Semiconductor, Electronics Circuits
		edits
	ISE 25	Practical 02 Hrs/week
	Examination Scheme:	Laboratory Scheme:
	EX3608: Power Electronics Laboratory	
	B. Tech. Electronics and Telecommunication	Third Year (Semester VI) B.
	Government College of Engineering Karad	0

	CO 4	CO 3	CO 2	CO	CO↓	PO→ POI
1. 61: 1. 6	2	ω	S	33		POI
	2	2	3	2	2	PO
	3	2	2	. 2	3	Od
	2	2	2	. 1	4	PO
	. 1	. 1	-	1	S	PO
	2	-	_	1	6	PO
	2	1		1	7	PO
	-	-	- 1	. 1	00	PO
	1	2	2	1	9	PO
	2 .	2	1			Od   01 Od
	3	2	2	2	Ξ	PO
	ω	ω	ω	ယ	<u> </u>	PSO
	2	'	1	1	2	PSO
	w	w	ယ	2	w	PSO

#### Assessment Pattern:

Skill Level (as per CAS Sheet) Task I	Exp 1 15	Exp 2 15	Exp 3 15	Exp 4 15	Exp - 5 15	Exp 6 15	Exp 7 15 05	Exp 8 15		Exp 9 05	
	05	15	15	15	05	15	15 05		15		05
	05	05	05	05	05	05	05		05		
	. 25	25	25	25	25	25	25		25	25 25	25

	Governme	Government College of Engineering, Karad	Karad		
	Third Year (Sem - VI) B.	Year (Sem - VI) B. Tech. Electronics and Telecommunication Dept.	ecommunicatio	n Dept.	
	EX3609:	EX3609: Computer Network Laboratory	atory		
Laboratory Scheme:			Examination Scheme:	cheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	1	
Prerequisite: Con	Prerequisite: Computer fundamentals				
Course Outcomes	Course Outcomes (CO): Students will be able to	to			
CO1 Apply	Apply data link layer framing techniques and error detection algorithms	niques and error detection a	lgorithms.		
CO2 Evaluate ti	Evaluate the performance and configuration of a network by using essential networking tools	nfiguration of a network	by using essent	al networkir	ng tools and
CO3 Critic	Critically evaluate network topologies interpret the routing tables and optimize network paths based	gies interpret the routing i	ables and ontin	ize network	nathe haser
on alg	on algorithmic outputs.		H		I
CO4 Demo	Demonstrate creativity and technical proficiency in designing complex network	al proficiency in designing	complex networl		
	Cour	Course Contents			CO
Implementation o	Implementation of following concepts				
Part I:					
Experiment 1	Implement the data link layer framing methods such as character, character stuffing and bit stuffing	r framing methods such as	character, charac	ter	C01
Experiment 2	Implement on a data set of characters the three CRC polynomials – CRC 12 CRC 16 and CRC CCIP.	haracters the three CRC po	ynomials - CRC	12,	C01
Experiment 3	Implement Dijkstra 's algorithm to compute the shortest path through a graph	thm to compute the shortes	path through a	ranh.	CO2
Experiment 4	Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table at each node using dictang table.	ph with weights indicating	delay between n	odes. Now	C02
	algorithm.	c	0		
Experiment 5	Execution of Windows Networking Commands such s Ping, Netstat ARP, Netstat Hostname, Tracert, Ipconfig, Lookup, Route, PathPing, NetDiag, Telnet, FTP, Netsh Execution of Linux Networking Commands such as ifconfig, ip, trace route, tracepath, ping, netstat, ss, dig, nslookup, route, host, arp, iwconfig, hostname, Experiment 3 curl or wget, mtr, whois, ifplugstatus, iftop, tcpdump.	of Windows Networking Commands such s Ping, Netstat ARP, Netstat Tracert, Ipconfig, Lookup, Route, PathPing, NetDiag, Telnet, FTP ution of Linux Networking Commands such as ifconfig, ip, trace route ping, netstat, ss, dig, nslookup, route, host, arp, iwconfig, hostname t 3 curl or wget, mtr, whois, ifplugstatus, iftop, tcpdump.	Ping, Netstat AR ng, NetDiag, Te as ifconfig, ip, t t,arp, iwconfig, p, tcpdump.	P, Netstat, Inet, FTP, race route, hostname,	C02
PART II:					
Experiment 6	Introduction to Cisco Packet tracer Simulator	t tracer Simulator	.3		C02
Experiment 7	Initial Configuration of switch and router	tch and router			CO3
Experiment 8	Working with static and dynamic IP addressing	namic IP addressing			CO3
Experiment 9	Design star, bus, ring topology using packet tracer	ogy using packet tracer			C03
Experiment 10	Design a network using NAT and tunneling concept	T and tunneling concept.			CO4
Experiment 11	Decion a wireless I AN				257
The survey of the	Design a Wilciess LAIN				04



CO 4	CO 3	CO 2	CO 1	PO → CO↓
ı	1	,	w	PO 1
_	-	2	ı	PO 2
2	ယ	ı	ı	PO 3
w	2	.1	1	
ı	1	1	1	PO 4 PO 5
1	1	1	1	PO 6
_	1	1	1	PO 7
ı	-	1	ı	PO 8
1	1	1	I.	PO 8 PO 9
1	ı	ı	r	PO 10
	1	1	ı	PO 10 PO 11
2	2	1	1	PSO J
	1	1	2	PSO 2
_	,	1	1	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern:

ISE	Task III	Task II	Task I	CAS Sheet)	Skill Level (as per
25	05	05	15	1	Exp
25	05	05	15	2	Exp
25	05	05	15	w	Exp
25	05	05	15	4	Exp
25	05	05	15	S	Exp
25	05	05	15	6	Exp
25	05	05	15	7	Exp
25	05	05	15	8	Exp
25	05	05	15	9	Exp
25	05	05	15	10	Exp
25	05	05	15		Avg

			xneriments: 10	Minimum number of Experiments: 10	
				on:	List of Submission:
C04	using MQTT	Exchange data between two IoT devices (e.g., ESP32, Raspberry Pi) using MQTT protocol.	wo IoT devices (e.	Exchange data between protocol.	Experiment 12
C04	rage, and	Students build an IoT system integrating multiple sensors, cloud storage, and Real-time monitoring.	stem integrating m	Students build an IoT sy Real-time monitoring.	Experiment 11
C04			ystem	1. Smart Lighting System 2. Smart irrigation 3. Smart healthcare 4. Smart home etc	Experiment 10
C04			g Google Firebase	Controlling devices using Google Firebase	Experiment 9
C04		se .	hing Speak/Firebas	Sending sensor data to Thing Speak/Firebase	Experiment 8
CO3		32	nication using ESP	Bluetooth-based communication using ESP32	Experiment 7
CO3		otor with PWM)	(e.g., Servo/DC M	Motor control using IoT (e.g., Servo/DC Motor with PWM)	Experiment 6
CO3	to a cloud server.	Use an analog ultrasonic sensor to measure water levels and send data to a cloud server.	sensor to measure	Use an analog ultrasonic	Experiment 5
C02	plication	Using LDR sensor and required actuator Create a home automation application	equired actuator Cre	Using LDR sensor and re	Experiment 4
CO3	oring and	control system	d required actuator	control system	Experiment 3
CO3			MQTT/Web	Controlling an LED via MQTT/Web	Experiment 2
C01	ry Pi)	Introduction to microcontrollers (Arduino, ESP8266, ESP32, Raspberry Pi)	ntrollers (Arduino, I	Introduction to microcor	Experiment 1
				Implementation of following concepts	Implementation
CO			Course Contents		
			loud Platforms	Integrate IoT Systems with Cloud Platforms	CO4 Inte
			on Protocols	Implement IoT Communication Protocols	CO3 Im <sub>l</sub>
		S	ors with IoT Device	Interface Sensors and Actuators with IoT Devices	CO2 Inte
			& Components	Understand IoT Architecture & Components	CO1 Un
			able to	Course Outcomes (CO): Students will be able to	Course Outcom
		etwork	system, computer no	Prerequisite: Microcontroller, embedded system, computer network	Prerequisite: M
	25	ESE		01	Total Credits
	25	ISE	(	02 Hrs./week	Practical
	Examination Scheme:	Examinati		heme:	Laboratory Scheme:
		of Things Lab	EX3610: Internet of Things Lah		
	cation	Tech. Electronics & Telecommunication		Third Year (Sem – VI) B.	
		Government College of Engineering, Karad	nment College of I	Cover	

	t	3	3 6	CO3	0	¢ 0 ↓	PO →
			-	- (	u		PO 1
	-		1	)		2	PO
	7	) U	, ,				PO 3
	s.	2	-		-		PO 4
	ī	-	1	1			PO 5
	_	-	-		-		PO3 PO4 PO5 PO6 I
	-			-	-		PO 7
	ı	1	ı	ı			PO7 PO8 1
	1	1	1	1			PO 9
	1	1	1	1			PO 9 PO 10
		,	,	,			PO 11
	2	2	_	,			PSO I
)	1	1	1	2			PSO 2
	_	_	ı	,			PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

## Guideline for Assessment Pattern:

ISE	Task III	Task II	Task I	CAS Sheet)	Skill Level (as per
25	05	05	15	_	Exp
25	05	05	15	2	Exp
.25	05	05	15	3	Exp
25	05	05	15	4	Exp
25	05	05	15	S	Exp
25	05	05	15	6	Exp
25	05	05	15	7	Exp
25	05	05	15	∞	Exp
25	05	05	15	9	Exp
25	05	05	15	10	Exp
25	05	05	15		Avg

					- 1	ict of Culturation
		,	(	compression	com	
CO1, CO4	ם	PC) for speech	Matlab implementation of Linear Predictive Coding (LPC) for speech	lab implementation		Experiment 10
				compression	com	
CO1, CO2	ge	DCT) for Imag	Matlab implementation of Discrete cosine Transform (DCT) for Image	lab implementation		Experiment 9
CO1, CO2			Matlab implementation of Run-Length Encoding	lab implementation		Experiment 8
CO1, CO2		ing	Matlab implementation of Turbo Encoding and Decoding	lab implementation		Experiment 7
CO1, CO2	П	iterbi Decoder	Matlab implementation of Convolution Encoder and Viterbi Decoder	lab implementation		Experiment 6
CO1, CO2		Decoding	Matlab implementation of Cyclic Code Encoding and Decoding	lab implementation		Experiment 5
CO1, CO2		nd Decoding	Matlab implementation of Reed-Solomon Encoding and Decoding	lab implementation		Experiment 4
CO1, CO2		gn	Matlab implementation of BCH Encoding and Decoding	lab implementation		Experiment 3
CO1, CO3	g Code)	Jsing Hammin	Matlab implementation of Channel coding Theorem (Using Hamming Code)	lab implementation		Experiment 2
CO1, CO3	g)	uffman Coding	Matlab implementation of Source coding Theorem (Huffman Coding)	lab implementation		Experiment 1
				Implementation of following concepts	ation of follo	Implement
CO			Course Contents			
		nedia.	Apply these techniques in wireless communication and multimedia.	techniques in wire	Apply these	CO4
		coding	Understand the real word applications of source and Channel coding	the real word appl	Understand	CO3
		efficiency.	Analyze trade-offs between compression, error correction and efficiency	de-offs between co	Analyze tra	CO2
			Gain hands-on experience with Matlab in coding theory.	on experience with	Gain hands	C01
			ble to	Course Outcomes (CO): Students will be able to	tcomes (CO)	Course Ou
				Prerequisite: Computer fundamentals	te: Computer	Prerequisi
	1	ESE		01	ts	Total Credits
	25	ISE		02 Hrs/week		Practical
	n Scheme:	Examination Scheme:			y Scheme:	Laboratory Scheme
oratory)	ive -02 Lab	ogram Electi	EX3611: Information Theory and Coding Laboratory (Program Elective -02 Laboratory)	nation Theory a	3611: Infor	EX
	nication	Telecommu	Third Year (Sem - VI) B. Tech. Electronics & Telecommunication	rd Year (Sem -	process margin model	
		g, Karad	Government College of Engineering, Karad	Governi		
				-ann-		

2 3 1 - 1 1 1				b)	ntial (High)	Substan	ري ::	)	ledium	rate (M	2: Moderate (Medium)		W	. Sugni (Low	3110.1
PO   PO   PO   PO   PO   PO   PO   PO		1	1	1	1	1	1	1	_	,		_	<u> </u>		1. 61:
1 2 3 7 PO PSO 1 PSO 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Ţ	1								4			-	CO 4
7 PO		-	1	ı	ı	1	ı	1	1	1	<u></u>	-	-	-	000
1 2 3 7 PO 4 PO 5 PO 6 PO PO 8 PO 9 PO 10 PO PSO 1 PSO 2 1 1 1 1		_	,									4	1	_	COS
1 2 3 7 PO 4 PO 5 PO 6 PO PO 8 PO 9 PO 10 PO PSO 1 PSO 2 1 1		-				1		ı	1	ı	1	ı	-	_	700
1 2 3 7 PO 4 PO 5 PO 6 PO PO 8 PO 9 PO 10 PO PSO 1 PSO 2 1 1 - 1 1 - 1 1 1 1 1 1 1 1 1 1 1 1 1			-								-			-	000
1 2 3 PO 4 PO 5 PO 6 PO PO 8 PO 9 PO 10 PO PSO 1 PSO 2					ı	1	1	_	ı	I	ı	1	_	U	100
1 2 3 PO 4 PO 5 PO 6 PO PO 8 PO 9 PO 10 PO PSO 1 PSO 2				TT									-	)	202
PO PSO 1 PSO 2			.4	1.1	10			7				L	7	<b>,</b> ——	_ C
FO FO FO PO 50 PO 60 PO PO 80 PO 10 PO 1 PSO 1 PSO 2	7	1007	LOCI		010	1	4	1	_	1		,	)		3
	7.0	2000	000	ם כ	00 10	DO 0	D 0 0	00	<u> </u>	700	PO 4	70	FO	70	101

#### Assessment Pattern:

ISE	I ask III	Task II	Task I	Task I	Skill Level (as per
25	05	05	15	-	Exp
25	05	05	15	2	Exp
25	05	05	15	w	Exp
25	05	05	15	4	Exp
25	05	05	15	S	Exp
25	05	05	15	6	Exp
25	05	05	15	7	Exp
25	05	05	15	~	Exp
25	05	05	15	9	Exp
25	05	05	15	10	Exp
3,25	05	05	15		Avg

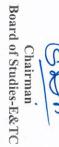
		Cavernm	Covernment College of Engineering Karad	ner Karad		
	Third Y	ear (Sem – VI) B. Te	Third Year (Sem – VI) B. Tech. in Electronics & Telecommunication Engineering	communica	tion Engineer	E G
EX3	621: Pr	ogrammable Logic	EX3621: Programmable Logic Controller Laboratory (Program Elective -02 Laboratory	rogram Ele	ctive -02 Labo	ratory)
Laboratory Scheme:	Scheme			Examinat	Examination Scheme:	
Practical		02 Hrs/week		ISE	25	
<b>Total Credits</b>	S	01		ESE	1	
Prerequisite:	e:				-	
Course Out	tcomes (	Course Outcomes (CO): Students will be able to	ole to			
C01	Underst	Understanding PLC Hardware and Software	and Software.			
C02	Design	and Implementation of I	Design and Implementation of Industrial Automation Circuits	ls.		
CO3	Real-Ti	Real-Time Process Automation and Control	and Control.			
CO4	Integrat	Integration of PLC with Advanced Interfaces	ced Interfaces.			
		Ca	Course Contents			CO
Experiment 1		Study of PLC Hardware and Software	and Software			C01
<b>Experiment 2</b>		Basic Logic Gates Implementation Using PLC	mentation Using PLC			C01
Experiment 3		Latching and Interlocking Circuits in PLC	g Circuits in PLC		5	C01
Experiment 4		Implementation of Timers in PLC	rs in PLC			CO2
Experiment 5		Implementation of Counters in PLC	ters in PLC			CO2
Experiment 6		Sequential Motor Control Using PLC	l Using PLC			CO2
Experiment 7		Traffic Light Control System Using PLC	stem Using PLC			CO2
Experiment 8		Water Level Control System Using PLC	tem Using PLC			CO3
Experiment 9		Conveyor Belt Automation Using PLC	on Using PLC			CO3
Experiment 10		Temperature Control System Using PLC	stem Using PLC			CO3
Experiment 11		LC Interfacing with HN	PLC Interfacing with HMI (Human-Machine Interface)	e)		CO3
Experiment 12		PLC-Based SCADA System Implementation	tem Implementation			C04
List of Submission:	mission:					
		Minimum number of Experiments: 10	xperiments: 10			
	The second secon					

CO 4	CO 3	CO 2	CO 1	CO↓
1	1	-	S	PO I
_	_	2	1	PO 2
2	သ	1	1	PO 3
သ	2	-	_	PO 4
1	-	1	1	PO S
1	1	-	-	PO 6
_	1	_	1	PO 7
i	1	1	1	PO 8
1	1	ı	1	PO 9
		1	1	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PSO 1
-	ı	ı	-	PO 11
2	2	1	ı	PSO I
1	1	ı	2	PSO 2
1	t	. 1	2	PSO 3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)



## Guideline for Assessment Pattern:

	3131313		9 15 05 05 25
Exp Exp	 Exp Ex	Exp Exp Exp	Exp

4	Governm	Government College of Engineering, Karad	arad	
Th	ird Year (Sem - VI) B. Te	Third Year (Sem - VI) B. Tech. in Electronics & Telecommunication Engineering	nunication Engineeri	mg
EX3631	: Digital Image and Video	EX3631: Digital Image and Video Processing Laboratory (Program Elective -02 Laboratory)	am Elective -02 Lab	oratory)
Laboratory Scheme:	cheme:	Exa	Examination Scheme:	
Practical	02 Hrs/week	ISE	25	
Total Credits	01	ESE		
Prerequisite:	Prerequisite: Mathematics & Linear Algebra, Digital Signal Processing	-		
Course Outco	Course Outcomes (CO): Students will be able to	ole to		
CO1 A	Analyze Image Intensity and Statistical Properties	atistical Properties		
CO2 E	inhance and Restore Images Us	Enhance and Restore Images Using Filtering and Transform Techniques	iques	
CO3 P	Perform Edge Detection and Image Segmentation	age Segmentation		
CO4 A	pply Transform-Based Techni	Apply Transform-Based Techniques for Image and Video Processing	ng	
	S Co	Course Contents		CO
Implementation	Implementation of following concepts	y		
Experiment 1	Obtaining row profile of	Obtaining row profile of a given row of an image in MATLAB	AB .	C01
Experiment 2	Plotting histogram of an image in MATLAB	mage in MATLAB		C01
Experiment 3	Adjusting the brightness	Adjusting the brightness of an image using a constant value in MATLAB	in MATLAB	C02
Experiment 4	Calculating mean and var	Calculating mean and variance of an image in MATLAB		C02
Experiment 5	Histogram Equalization of an image in MATLAB	fan image in MATLAB		C02
Experiment 6	Spatial Filtering: Applyin MATLAB	Spatial Filtering: Applying low pass, high pass and median filters on an image in MATLAB	ilters on an image in	C03
Experiment 7	Pseudo Coloring an image	Pseudo Coloring an image using sinusoidal transforms in MATLAB	ATLAB	CO3
Experiment 8	Detection of edges of an in MATLAB.	Detection of edges of an image using Canny Edge Detection algorithm in MATLAB.	algorithm in	C03
Experiment 9	Image Thresholding using	Image Thresholding using OTSU Thresholding algorithm in MATLAB	MATLAB.	CO3
Experiment 10		Region-based Image Segmentation using region growing in MATLAB	MATLAB.	C04
Experiment 11		Apply Discrete Cosine Transform (DCT) on an image in MATLAB	TLAB.	C04
Experiment 12		Motion Estimation for video sequence using full search algorithm.	ithm.	C04
List of Submission:	sion:			
	Minimum number of Experiments: 10	periments: 10		

	1	200	000	200	700	000		201	↓ O J	3 5	00
1: Slight (Low)	0	2	3	٥	ن	٥	3	٥		IOI	5
it (Low	-	1	u	٥	Ü	٠	u	٥		PO Z	200
)	7	٥	u	,	u	)	^	)		FUZ PUS	
2: N	C.	,	2	,	2	,	2	,		PU4	7
loderate	C.	,	در	,	w		2			POS	
(Medium	1		1		1		,			PO 6 PO 7 PO 8	
um)	ı		1		ı	-	Ĺ			PO 7	
	1		ı		1		,			PO 8	
3: Subst	w	t	S		2		_			PO 9	
antial (F	2		_	,			_				
(High)	သ	1	)	t	)		2			PO 10 PO 11	
1	2	J	'n		u		2			PSO 1	
3	w	١	٥	1	٥		2			PSO 2	
57	သ	U	2	C	2		2			PSO 3	

## Guideline for Assessment Pattern:

Skill Level (as per	Exp	Avg									
CAS Sheet)	1	2	ω	4	S	6	7	∞ ,	9,	10	
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE	.25	25	25	25	25	25	25	25	25	25	25

	Governm	Government College of Engineering, Karad	ng, Karad		
	Third Year (Sem - \	Third Year (Sem - V) B. Tech. Electronics & Telecommunication	Telecommun	ication	
EX3641: Neu	ral Networks and De	EX3641: Neural Networks and Deep Learning Laboratory (Program Elective -02 Laboratory)	(Program Ele	ctive -02 Lab	oratory)
Laboratory Scheme:	e:		Examination Scheme:	n Scheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits			ESE	I	
rerequisite: Pytho	Prerequisite: Python, Machine Learning				
ourse Outcomes (	Course Outcomes (CO): Students will be able to	ole to			
CO1 Unders	tand tensors, computation	Understand tensors, computational graphs, and basic neural networks using TensorFlow and Keras	networks using	TensorFlow an	ıd Keras.
CO2 Apply	data pre-processing techi	Apply data pre-processing techniques like handling missing data, normalization, and encoding	data, normalizat	tion, and encod	ing.
CO3 Implen	nent CNNs, transfer learn	Implement CNNs, transfer learning, data augmentation, and object detection for images	object detection	for images.	
CO4 Develo	p and deploy advanced r	Develop and deploy advanced models like RNNs, LSTMs, GANs, and Autoencoders	GANs, and Auto	encoders.	
	Co	Course Contents			CO
mplementation of	Implementation of following concepts				
Experiment 1	Introduction to TensorFlow and Karas	ow and Karas			C01
Experiment 2	Building a Simple Neural Network with Keras	l Network with Keras			C02
Experiment 3	Data Preprocessing for Deep Learning	eep Learning			CO2
Experiment 4	mage Classification with	Image Classification with Convolutional Neural Networks (CNNs)	vorks (CNNs)		CO3
Experiment 5	Transfer Learning with Pretrained Models	retrained Models			CO3
Experiment 6	Data Augmentation for Image Classification	nage Classification			CO3
Experiment 7	Text Classification with 1	Text Classification with Recurrent Neural Networks (RNNs	RNNs	8-	CO3
Experiment 8	Sequence Modeling with	Sequence Modeling with Long Short-Term Memory (LSTM)	(LSTM)		CO3
Experiment 9	Time Series Forecasting	Time Series Forecasting with Gated Recurrent Units (GRU)	(GRU)		C02
Experiment 10	Object Detection using YOLO or Faster R-CNN	OLO or Faster R-CNN	7		CO3
Experiment 11	Generative Adversarial N	Generative Adversarial Networks (GANs) for Image Generation	Generation		CO3
Experiment 12	Autoencoders for Anomaly Detection	ly Detection			CO3
Experiment 13	Hyperparameter Tuning with Keras Tuner	with Keras Tuner			CO4
Experiment 14	Model Deployment using TensorFlow Serving	TensorFlow Serving			CO4
Experiment 15	Federated Learning with TensorFlow	TensorFlow			CO4
sion					

1 01:	CO 4	CO 3	CO 2	CO 1	СО↓	PO →
01: 1. 7	1		-	ω		PO
	1	1	2		12	PO
	2	သ	1	1		PO
	ယ	2	-	_	4	РО
	1	1	- 1	1	S	PO
	-	-	1	_	0	РО
	-	-1	1	_	7	PO
	L	1	. 1	1	∞	PO
	1	1	1	1	9	PO
	1	1	ı	1		PO 10
	1	1	ı	ı	journell journell	PO
	2	2	1	1	Bosson	PSO
	1	1	ı	2	2	PSO
	1	1	ı	1	w	PSO

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)



### Assessment Pattern:

25	25	25	25	25	25	25	25	25	25	25	ISE
	05	05	05	05	05	05	05	05	05	05	Task III
05	05	05	05	05	05	05	05	05	05	05	Task II
15	15	15	15	15	15	15	15	15	15	15.	Task I
_	10	9	8	7	6	5	4	3	2	1	CAS Sheet)
) Avg	Exp	Skill Level (as per									

	Governi	Government College of Engineering, Karad	ig, Karad		
Third	Year (Sem - VI) B. T	Third Year (Sem - VI) B. Tech. in Electronics & Telecommunication Engineering	communicatio	n Engineerii	ng
	EX 3651: API Testin	EX 3651: API Testing Laboratory (Program Elective -02 Laboratory)	ective -02 Labo	ratory)	
Laboratory Scheme:	eme:		Examination Scheme:	Scheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	1	
Prerequisite: Con	Prerequisite: Computer fundamentals				
Course Outcome	Course Outcomes (CO): Students will be able to	able to			
CO1 Demo	onstrate proficiency in usi	Demonstrate proficiency in using the Postman tool to perform API testing, including installation, request	m API testing, ir	cluding instal	lation, reque
handl	ing (GET, POST, PUT, D	handling (GET, POST, PUT, DELETE, PATCH), and response validation.	se validation.	a	Las fra
CO2 Imple	ment variables and auther	Implement variables and authentication in Postman for secure API testing	API testing.		
CO3 Apply	API chaining and data-dr	Apply API chaining and data-driven testing techniques in Postman	itman.		
CO4 Imple	ment SQL joins and store	Implement SQL joins and stored procedures for backend data validation	validation.		
		Course Contents			00
Implementation	Implementation of following concepts				
Experiment 1	Introduction to postman	Introduction to postman tool and installation procedure			C01
Experiment 2	To study and implementation of 5 request t PATCH) in postman and validate response.	To study and implementation of 5 request types (GET, POST, PUT, DELETE, PATCH) in postman and validate response.	POST, PUT, DE	ELETE,	C01
Experiment 3	To study and implement	To study and implementation of different types of variables in postman tool	ables in postman	tool	COI
Experiment 4	To study and Implement Postman.	To study and Implementation of PM Assertions for Response Validation in Postman.	sponse Validatio	n in	C02
Experiment 5	To study and Implement	To study and Implementation of Different Authentication Processes in APIs	on Processes in	APIs	CO2
Experiment 6	To study and Implement	To study and Implementation of API chaining concept.			CO3
Experiment 7	To study and Implement	To study and Implementation of Data-Driven Testing Using Postman Tool.	Jsing Postman T	ool.	CO3
Experiment 8	To study of implementation of joins in SQL: <ul><li>Inner Join</li><li>Outer Join</li></ul>	ion of joins in SQL:			C04
Experiment 9	To study of implementation of joins in SQL:	ion of joins in SQL:			C04
Experiment 10 List of Submission:	To study and implementant	To study and implementation of store procedure in SQL:			CO4
	Minimum number of Experiments: 08	xperiments: 08			
,					

400	200	300	COD	100	200	¢	200	101
J	2 1	)	٥	L	١		101	30
7	7 /	) 1	٥	~	,		101	7
7	) u	1	)	2	,		100	5
C.	) 1	1		1			104	
2	0	, u	,	w		100	100	1
1	1	-		ı			PO 6	1
1	ı	1		ı		(	PO 7	
ı	2	1		'		(	PO x	
1	2	2	ı	)			PO Q	
1	2	r		'		1 0 10	DO 10	
2	2	2	1	<b>)</b>		TIOI	DO	
w	2	2	1	)	_	_	COL	000
2	ယ	3	0	2	1	ى	LOC	Coa
2	3	w	1	٥	U	٠	LOC	Coa

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)



### Guideline for Assessment Pattern:

-			- CONT. CO.			The second second	00000		
	25	25	25	25 ·	25	25	25	25	ISE
	05	05	05	05	05	05	05	05	Task III
	05	05	05	05	05	05	0.5	05	Task II
- 1	15	15	15	15	15	15	15	15	Task I
	Exp 8	Exp 7	Exp 6	Exp 5	Exp 4	Exp 3	Exp 2	Exp 1	Skill Level (as per CAS Sheet)

	Governi	Government College of Engineering,	g, Karad		
	Third Year (Sem - V	VI) B. Tech. Electronics and Telecommunication	d Telecommunica	tion	
EX3661: Clo	ud Infrastructure Ma	EX3661: Cloud Infrastructure Management and Automation Laboratory (Program Elective	Laboratory (Pro	ogram Elec	ctive -02
Laboratory Scheme:	me:	Store and the store of the stor	Examination Scheme:	neme:	
Practical	02 Hrs/week		ISE 2	25	
Total Credits	01				
Prerequisite: Bas	Prerequisite: Basic Computer Fundamentals	ls			
Course Outcome	Course Outcomes (CO): Students will be able	able to			
CO1 Imple	Implement server less functions using	s using AWS Lambda integrated with	ed with S3 and SNS	IS to process objects.	s objects,
handle	handle triggers, and send notifications				
CO2 Constr	ruct infrastructure as code	Construct infrastructure as code using AWS Cloud Formation Designer to visualize and provision cloud	Designer to visualiz	ze and provis	sion cloud
resources	ces.		(		
CO3 Configure	monitoring and	auditing using Cloud Watch, I	Event Bridge and	CloudTrail	to track
infrast	ure events.				
CO4 Manag	Manage cloud costs and data services using	vices using AWS cost tools, G	AWS cost tools, Glue and Athena for optimization.	optimization	7
Course Contents				0	60
Implementation of following	of following concepts				
Experiment 1	Create a lambda function and access S3 objects	n and access S3 objects.		0	CO1
Experiment 2	Trigger a Lambda Func	Trigger a Lambda Function Using S3 Object Upload		C	COI
Experiment 3	Trigger Lambda Triggered parquet, json, avro, xml)	ered by S3 using a different	file format.	(excel, .csv, Ct	C01
Experiment 4	Implement Event-Drive	Implement Event-Driven Notifications Using S3, Lamb	Lambda, and SNS	CO	CO1
Experiment 5	Implement Lambda functions within VPC	tions within VPC		CC	CO2
Experiment 6	Visualise Infrastructure	Visualise Infrastructure using AWS CloudFormation Designer	esigner	CC	CO2
Experiment 7	Configure CloudWatch metrics, alarms and logs	netrics, alarms and logs		CC	CO3
Experiment 8	Automate Event Routing	Automate Event Routing with Amazon Event Bridge		CC	CO3
Experiment 9	Track User Activity with AWS CloudTrail	AWS CloudTrail		C02	02
Experiment 10	Create AWS glue crawle	Create AWS glue crawler and access catalog table using	Athena	C03	23
Experiment 11	Orchestrate Lambda wor	Orchestrate Lambda workflows using Step Functions		C04	04
Experiment 12	Configure AWS cost budgets and alerts	gets and alerts		C04	04
List of Submission:				-	
	Minimum number of Experiments: 10	periments: 10			



1: Sli	CO 4	CO 3	CO 2	COI	PO →
1: Slight (Low)	2	2	2	ω	PO
W	2	2	သ	2	PO 2
2	2	3	2	-	PO 3
: Mode	ယ	2	2	1	PO 4
2: Moderate (Medium)	ω	w	2	2	PO 5
Mediur	2	2	-		PO 6
	-	'	1	1,	PO 7
u	I	1	Į.	1	PO 8
3: Substantial (High)	1	1	1		PO 9
ntial (Hig	1	-	1	1	PO 10 PO
h)	ω	2	2	1	PO 1
	2	2	2	3	PSO 1
	2	1	ı	1	PSO 2
	1	1	1	1	PSO 3

Assessment Pattern:

ISE	Task III	Task II	Task I	Skill Level (as per CAS Sheet)
25	05	05	15	Exp 1
25	05	05	15	Exp 2
25	05	05	15	Exp 3
25	05	05	15	Exp 4
25	05	05	15	Exp 5
25	05	05	15	Exp 6
25	05	05	15	Exp 7
25	05	05	15	Exp 8
25	05	05	15	Exp 9
25	05	05	15	Exp 10
25	05	05	15	Avg

	Government College of Engineering, Karad		
	Third Year (Sem - VI) B. Tech. Electronics & Telecommunication	ication	
EX3671:	EX3671: Embedded System Design with ARM Processors Lab (Program Elective -02 Laboratory)	Elective -02 Lab	oratory)
Laboratory Scheme:	y Scheme: Examina	Examination Scheme:	8 /
Practical	02 Hrs./week ISE	25	
Total Credits	01	1	
Prerequisito	: Microcontroller, embedded system, computer network		
Course Out	Course Outcomes (CO): Students will be able to		
C01 I	Develop Assembly and Embedded C programs for ARM-based microcontrollers to perform data	ntrollers to perforn	n data
ı	manipulation and bit-level operations.		
CO2 1	Interface and control peripherals such as GPIOs, timers, PWM, ADC, and DAC using	DAC using ARM 1	ARM processors.
CO3 I	Implement interrupt handling routines for both internal and external events to ensure efficient, non-blocking program execution.	s to ensure efficien	,†
C04 [	Design and establish communication between ARM processors and external devices using UART, SPI, and I2C protocols.	ternal devices usin	1g
	Course Contents		8
Implementa	Implementation of following concepts		
Experiment 1	ARM Assembly Basics: Write Assembly programs to add, subtract, and multiply numbers.	and	C01
Experiment 2			C02
Experiment 3			C02
Experiment 4			CO2
Experiment 5		ry the	C03
Experiment 6	t 6 UART Communication: Send and receive data from PC using UART.	T	CO3
Experiment 7			CO3
Experiment 8	t 8 I2C EEPROM: Read and write data to an I2C EEPROM.		CO4
Experiment 9		ol.	CO4
Experiment 10	3.12	RTOS on	C04
Experiment 11	t11 Wireless Communication: Send sensor data wirelessly using ESP32 module	module.	CO4
Experiment 12		— like a data	CO4
List of Submission:	nission:		
	Minimum number of Experiments: 10		



1: Sli	CO 4	CO3	CO 2	CO 1	СО↓	PO →
1: Slight (Low)	1	1	1	S		PO I
ow)	1	1	2	1		PO2
2	2	w	_	2		PO 3
2: Moderate (Medium)	3	2	1	1		PO 4
erate (I	1	-	1	1		PO 5
Mediu	-	-	-	1		PO 6
n)	_	. 1	-	1		PO 7
3: S	1	1	1	1	3	PO 8
3: Substantial (High)	1	1	1	1		PO 9
ıl (High)				,		PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PSO 1 PSO PSO
	ı	1	1	1		PO 11
	2	2	1	_		PSO I
	2	-	_	2	2	PSO
	w	2	-	_		PSO 3

### Assessment Pattern:

ISE	Task III	Task II	Task I	Skill Level (as per CAS Sheet)
25	05	05	15	Exp 1
25	05	05	15	Exp 2
25	05	05	15	Exp 3
25	05	05	15	Exp 4
25	05	05	15	Exp 5
25	05	05	15	Exp 6
25	05	05	15	Exp 7
25	05	05	15	Exp 8
25	05	05	15	Exp 9
25	05	05	15	Exp 10
25	05	05	15	Avg

	Gover	Government College of Engineering, Karad	ng, Karad		
	Third Year (Sem -	Third Year (Sem - VI) B. Tech. Electronics and Telecommunication	d Telecommun	ication	
EX368	1: CMOS Analog and M	EX3681: CMOS Analog and Mixed Circuit Design Lab (Program Elective -02 Laboratory)	Program Elec	tive -02 Labor	atory)
Laboratory Scheme	heme:		Examination Scheme:	Scheme:	
Practical	02 Hrs/week		ISE	25	
Total Credits	01		ESE	1	
Prerequisite: (	Prerequisite: Computer fundamentals				
Course Outcon	Course Outcomes (CO): Students will be able to	able to			
C01 M	odel analog components in (	Model analog components in CMOS process to estimate their performance in circuits	ir performance i	n circuits.	
CO2 De	esign and simulate the analog	Design and simulate the analog sub-circuits using given CMOS process	OS process.		
CO3 De	esign and simulate the ampli	Design and simulate the amplifier circuits using given CMOS process.	S process.		
CO4 Ar	Analyze and compare the performance of CMOS circuits	ormance of CMOS circuits.	,		
		Course Contents			
Implementatio	Implementation of following concepts				
Experiment 1	To design, simulate and 6	To design, simulate and estimate frequency response of common source amplifier	f common source	e amplifier	CO3
Experiment 2	To design, simulate and e	To design, simulate and estimate frequency response of common Drain amplifier	f common Drain	amplifier	CO3
Experiment 3	To design, simulate and e	To design, simulate and estimate frequency response of common Gate amplifier	f common Gate	amplifier	CO3
Experiment 4	To design, simulate and e	To design, simulate and estimate frequency response of Cascade amplifier	f Cascade ampli	fier	СОЗ
Experiment 5	Design the MOS based current mirror circuit	arrent mirror circuit			CO1
Experiment 6	To design and implement	To design and implement Differential L-C amplifier			CO2
Experiment 7	To design and implement	To design and implement voltage-controlled Oscillator			CO2
Experiment 8	Design the bandgap referenced circuit	enced circuit			CO1
Experiment 9	Analyze the performance	Analyze the performance of CMOS differential amplifier for various load	er for various lo	ad.	C04
Experiment 10	-	Analyze the performance of two stage Op-Amp circuits			CO4
Experiment 11	Mini-Project				
List of Submission:	sion:				
	Minimum number of Experiments: 10	eriments: 10			

'n.							
· Clight (I our)	CO 4	CO 3	002	01	3	CO↓	PO →
	_	_	-	-			PO I
٥	1	1	2	1			PO 2
Mada	1	2	1	1			PO3
1	1	1	1	1			PO 4
2. Madameta (Madi	1	1	1	1			PO 5
	ŀ	. 1	1	1			PO 6
,	ı	ı	- 1	1			PO 7
2	1	1	1	1			PO 8
	1	1	I	1			PO 9
	1	2	2	2			PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PSO 1 PSO 2 PSO 3
	2	I	1	1			PO 11
	1	ı	- 1	ŀ			PSO 1
	2	w	ယ	ယ			PSO 2
	1	1	1	. 1			PSO3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)



### Assessment Pattern:

ISE	Task III	Task II	Task I	CAS Sheet)	Skill Level (as per
25	10	10	5	-	Exp
25	10	10	5	2	Exp
25	10	10	S	3	Exp
25	10	10	5	4	Exp
25	10	10	5	.5	Exp
25	10	10	5	6	Exp
25	10	10	5	7	Exp
25	10	10	5	∞	Exp
25	10	10	5	9	Exp
25	10	10	5	10	Exp
25	10	10	5	11	Exp
25	10	10	5		Avg