Tulsiramji Gaikwad Patil College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION

Programme: Electronics & Communication Engineering

Scheme of Instructions: Final Year B. Tech. in Electronics & Communication Engineering

Semester – VII

Sr. No.	Course Category	CourseCode	Course Title	L	T	P	Contact Hrs./Wk	Credits	CT1	CT2	TA/CA	ESE	TOTAL
									EXAM SCHEME				
1	PCC	BEC4701	Computer Communication Network	3	-	-	3	3	15	15	10	60	100
2	PCC	BEC4702	CMOS VLSI Design	3	1	-	4	4	15	15	10	60	100
3	PEC	BEC4703-5	Program ElectiveV	3	-	-	3	3	15	15	10	60	100
4	OEC	B$$XX01-16	Open Elective-III	3	-	-	3	3	15	15	10	60	100
5	OEC	B$$XX01-16	Open Elective-IV	3	-	-	3	3	15	15	10	60	100
6	OEC	B$$XX01-16	Open Elective-V	3	-	-	3	3	15	15	10	60	100
7	PCC	BEC4706	Computer Communication Network Lab	-	-	2	2	1	-	-	25	25	50
8	PCC	BEC4707	CMOS VLSI Design Lab	-	-	2	2	1	-	-	25	25	50
9	PROJ	BEC4708	Seminar	-	-	2	2	1	-	-	25	25	50
10	MCC	AU4710	Innovations and Society	2	-	-	2	Audit	-	-	-	-	-
			Total	20	1	6	27	**22**	90	90	135	435	750

*There will be two presentations, based on seminar topic to be selected in consultation with guide preferably based on emerging trends.

L- Lecture   T-Tutorial   P-Practical

CT1- Class Test 1   TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2   ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (E+ngg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	--	--	--	9	03	09	01	Yes
Cumulative Sum	05	24	24	47	12	06	04	--

PROGRESSIVE TOTAL CREDITS :122++22 =144

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Tulsiramji Gaikwad-Patil
College Of Engineering &
Technology, Nagpur

Principal
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College Of Engineering &
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SCHEME OF INSTRUCTION

Programme: Electronics & Communication Engineering

Scheme of Instructions: Final Year B. Tech. in Electronics & Communication Engineering

Semester – VIII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	CT1	CT2	TA/CA	ESE	TOTAL
									EXAM SCHEME				
1	PROJ	BEC4801	Industry Based Project /Internship	-	-	26	26	13	-	-	75	75	150
2	PROJ	BEC4802	Comprehensive Viva-voce	-	-	-	-	4	-	-	-	100	100
3	HSMC2	BEC4803	Extra-Curricular Activities / Competitive Exam/Co-Curricular activities	-	-	4	4	2	-	-	100	-	100
4	MCC	BAU4808	Project Based Science, Technology Social Design and Innovation	2	-	-	2	Audit	-	-	-	-	-
			Total	2	-	30	32	**19**	-	-	175	175	350

L- Lecture T-Tutorial P-Practical

CT1- Class Test 1 TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2 ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	02	--	--	--	--	--	17	Yes
Cumulative Sum	05	24	24	56	15	15	05	--

PROGRESSIVE TOTAL CREDITS :144+19 =163

Program Elective- I	Program Elective- II	Program Elective- III
Semester V	Semester V	Semester VI
BEC3506 Digital System Design	**BEC3509** Introduction to MEMS	**BEC3603** Antenna and Microwave Engineering
BEC3507 Embedded Systems	**BEC3510** Information Theory and Coding	**BEC3604** Optical Communication
BEC3508 Power Electronics	**BEC3511** Biomedical Instrumentation	**BEC3605** Mechatronics

Program Elective-IV	Program Elective-V
Semester VI	Semester VII
BEC3606 PLC SCADA	**BEC4703** Robotics & Automation
BEC3607 Wireless & Sensor Network	**BEC4704** Machine learning
BEC3608 Speech Processing	**BEC4705** Satellite Communication

	List of Open Elective				
Sr. No.	Course Code	Course Title	Sr. No.	Course Code	Course Title
1	BCSXX01	Cyber Law and Ethics	9	BMEXX09	Nanotechnology and Surface Engineering
2	BCSXX02	Block chain Technology	10	BMEXX10	Automobile Engineering
3	BITXX03	Cyber Security	11	BEEXX11	Power Plant System
4	BITXX04	Artificial Intelligence	12	BEEXX12	Electrical Materials
5	BECXX05	Internet of Things	13	BAEXX13	Avionics
6	BECXX06	Embedded Systems	14	BAEXX14	Unmanned Aerial Vehicles
7	BCEXX07	Introduction to Art and Aesthetics	15	BBTXX15	Biomaterials
8	BCEXX08	Metro Systems and Engineering	16	BBTXX16	Food and Nutrition Technology

B. Tech Fourth Year (Semester-VII) Electronics and Communication Engineering

BEC4701: Computer Communication Network

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		**CT-1**	15 Marks
Tutorial	-		**CT-2**	15 Marks
Total Credit	3		**CA**	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE:03 Hrs 00 Min.	

Course Contents

Unit I	Introduction to Networks, Network Topology, Network Devices Types of communication: -simplex, half duplex, full duplex, Network Classification:- LAN,MAN,WAN, Network Architecture, Protocols, OSI Reference Model, TCP/IP Reference Model. Transmission Media:-Guided Media, Unguided
Unit II	Design Issues, Framing methods, Flow Control and Error Control, Stop-and-wait flow control, Sliding-window flow control, Stop-and-wait ARQ, Go-back-N ARQ, Selective- repeat ARQ, HDLC, MAC sub layer: ALOHA
Unit III	Network layer duties, Routers, IP addressing and its classification, IPv4 address, IPv6 address, Mask and Subnet, Routing algorithms like Shortest path routing, Djkstra's algorithm, Bellman Ford Algorithm, Distance Vector Routing, Dynamic Routing. Routing protocols
Unit IV	Transport layer services, Connection oriented & Connectionless, Three-way handshaking, UDP model, TCP:- TCP header format, comparison between UDP and TCP, Need of Congestion control, Principal of congestion, Quality of Service (QoS), Token bucket and leaky bucket algorithm
Unit V	Application Layer: DNS, Electronic Mail, File Transfer (FTP), WWW, HTTP, SNMP, SMTP. Introduction to Cryptography, Secret key algorithm, public key algorithm, Digital Signature, Enterprise network security:DMZ,NAT

Text Books

T.1	Computer Networks: Andrew Tanenbaum, 4th Edition, PHI.
T.2	Computer Communication Networks : Frouzan, 4th Edition, Tata Mc-Graw Hill
T.3	William Stallings, "computer Networks and Cryptography", 3rd edition, Pearson Education

Reference Books

R.1	Telecommunication Switching systems & Networks: Vishwanathan , 3rd Edition,PHI.
R.2	Computer Communication: W. Stanlling

	R.3	Communication Networks: Leon-Gracia

Course Code	Course Outcomes	CL	Class Sessions
BEC4701.1	**Explain** the fundamentals of Computer Network and Network topologies.	4	9
BEC4701.2	**Interpret** Flow control & Error control protocols of Data Link Layer with ARQ .	2	9
BEC4701.3	**Illustrate** the concept of IP Addressing techniques and Routing protocols of Network Layer.	4	9
BEC4701.4	**Analyze** the transport layer services, protocol Headers and congestion control protocols.	4	9
BEC4701.5	**Determine** the function of Application Layer and Presentation layer protocols.	3	9

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B. Tech Fourth Year (Semester-VII) Electronics and Communication Engineering

BEC4702: CMOS VLSI DESIGN

Teaching Scheme				Examination Scheme	
Lectures	3 Hrs/week			**CT-1**	15 Marks
Tutorial	-			**CT-2**	15 Marks
Total Credit	3			**CA**	10 Marks
				ESE	60 Marks
				Total	100 Marks
				Duration of ESE:03 Hrs 00 Min.	

Course Contents

Unit I	**MOS TRANSISTORS** nMOS enhancement and pMOS enhancement transistor, threshold voltage, body effect, MOS effect, MOSdevice equations, small signal model for MOS transistor.
Unit II	**CMOS INVERTER** Principle of operation, dc characteristics, transient characteristics, β_n/β_p ration, noise margin, static load MOS inverter, transmission gate, introduction to Bi-CMOS inverter.
Unit III	**STUDY OF CMOS LOGIC** Study of combinational logic, gates, compound gates, multiplexers, and memory elements using CMOStechnology.
Unit IV	**CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION** Resistance and capacitance estimation, switching characteristics, power dissipation, charge sharing.
Unit V	**VLSI DESIGN** VLSI processing integration, layout design rules, and stick diagram representation latch up, CMOS circuits and logic design: transistor sizing, fan-in, fan-out and physical design of simple logic gates, CMOS logic structures and clocking strategies.

Text Books

T.1	Principal of CMOS VLSI design", Neil H. E. Weste, K. Eshraghian, Addison Wesley VLSI Series.
T.2	"Digital Interrogated circuits, A Design Perspective" , J. M. Rabaey, A. Chandrakasan, and B. Nikolic.,PHI Publications .
T.3	"CMOS VLSI Design" , Pucknell & K. Eshraghain, PHI Publications

Reference Books

R.1	"VLSI Technology", S.M. Sze, McGraw Hill Publications	
R.2	"VLSI Design Technologies for Analog & Digital Circuits", Randall L Gei , McGraw Hill Publications	
R.3	Communication Networks: Leon-Gracia	

Useful Links

1	https://nptel.ac.in/courses/106/105/106105080/
2	https://nptel.ac.in/courses/117/105/117105076/
3	http://nptel.ac.in/courses/117103064

Course Code	Course Outcomes	CL	Class Sessions
BEC4702.1	**Explain** the fundamentals of Computer Network and Network topologies.	4	9
BEC4702.2	**Interpret** Flow control & Error control protocols of Data Link Layer with ARQ .	2	9
BEC4702.3	**Illustrate** the concept of IP Addressing techniques and Routing protocols of Network Layer.	4	9
BEC4702.4	**Summarize** the transport layer services, protocol Headers and analyze the congestion control protocols.	2	9
BEC4702.5	**Determine** the function of Application Layer and Presentation layer protocols.	3	9

B. Tech Fourth Year (Semester-VII) Electronics and Communication Engineering

BEC4703: Robotics and Automation

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		**CT-1**	15 Marks
Tutorial	-		**CT-2**	15 Marks
Total Credit	3		**CA**	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 03 Hrs 00 Min.	

Course Contents

Unit I	Introduction to Robotics: Types and components of a robot, Classification of robots, closed loop and open-loop control systems, Kinematics systems, Definition of mechanisms and manipulators, Social issues and safety.
Unit II	Robot Kinematics and Dynamics: Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation
Unit III	Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation,Euclidean/Similarity/Affine/Projective transformations, Vision applications in robotics
Unit IV	Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID Non-linear and advanced controls, Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.
Unit V	Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications

Text Books

T.1	Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
T.2	Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill.
T.3	Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi.

Reference Books

R.1	Craig, J.J., "Introduction to Robotics: Mechanics and Control", Pearson, New Delhi, 2009
R.2	Steve Heath, "Embedded System Design", 2 nd Edition, Newnes, Burlington, 2003
R.3	Ghosal, A., "Robotics", Oxford, New Delhi, 2006

Useful Links

1	https://nptel.ac.in/courses/112/101/112101098/
2	https://nptel.ac.in/courses/112/105/112105249/

Course Code	Course Outcomes	CL	Class Sessions
BEC4703.1	**Compute** the currents and voltages of each element in electrical network by using loop (mesh) as well as node analysis.	3	9
BEC4703.2	**Determine** current, voltage & power of electrical circuit's with the help of various theorems for the analysis.	3	9
BEC4703.3	**Attribute** the Solution of First and Second order networks and transient and steady-state response of electrical circuits	4	9
BEC4703.4	**Discriminate** the integro-differential equation using Laplace and inverse Laplace transformation to analyze the behavior of electric circuit	4	9
BEC4703.5	**Solve** the two port network in respect of the various approaches developed to analyze their behavior.	3	9

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B. Tech Fourth Year (Semester-VII) Electronics and Communication Engineering

BEC4704:   Machine Learning

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		**CT-1**	15 Marks
Tutorial	-		**CT-2**	15 Marks
Total Credit	3		**CA**	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE:03 Hrs 00 Min.	

Course Contents

Unit I	**Introduction to Probability :**Probabilities of events, random variables, joint distribution & densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.
Unit II	**Overview of Machine learning concepts : Introduction** to Bayes Theorem, Linear Regression- model assumptions, regularization. Over fitting and train/test splits, Types of Machine learning - Supervised, Unsupervised, Reinforced learning.
Unit III	**Classification and Regression Algorithms :**Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest and their classification Errors.
Unit IV	**Clustering :**Sequential clustering, hierarchical clustering, probabilistic clustering, partitional clustering, clustering for region segmentation, Introduction to Neural Networks, back-propagation algorithm, Overview of Deep Learning.
Unit V	**Case Studies of Machine Learning Application :**Weather forecasting, Stock market prediction, Object Detection and recognition, Real Time Applications.

Text Books

T.1	Aurélien Géron, "Hands-On Machine Learning with Scikit - Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
T.2	Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
T.3	Learning by Subramanian Chandramouli, Saikat Dutt, Amit Kumar Das.

Reference Books
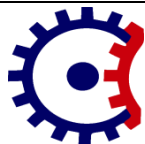
R.1	Ian Good fellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press http://www.deeplearningbook.org.
R.2	Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.

R.3	Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.	

Useful Links

1	https://nptel.ac.in/courses/106106139
2	https://www.youtube.com/watch?v=fC7V8QsPBec
3	https://www.digimat.in/nptel/courses/video/106105152/L01.html

Course Code	Course Outcomes	CL	Class Sessions
BEC4704.1	Understand the scope and examples of machine learning.	2	9
BEC4704.2	Explain fundamentals of machine learning principles and algorithm.	3	9
BEC4704.3	Prepare clean data for machine learning.	4	9
BEC4704.4	Analysis supervised and unsupervised learning models to solve problems.	2	9
BEC4704.5	Prepare clean data for machine learning.	3	9

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B. Tech Fourth Year (Semester-VII) Electronics and Communication Engineering

BEC4705 : Satellite Communication

Teaching Scheme			Examination Scheme	
Lectures	3 Hrs/week		**CT-1**	15 Marks
Tutorial	-		**CT-2**	15 Marks
Total Credit	3		**CA**	10 Marks
			ESE	60 Marks
			Total	100 Marks
			Duration of ESE: 03 Hrs 00 Min.	

Course Contents

Unit I	**INTRODUCTION AND ORBITAL ASPECTS OF SATELLITE COMMUNICATIONS :** A brief history of satellite communications, Orbital mechanics, Keplers laws of planetary motion, Locating the satellite in the orbit, Locating the Satellite with respect to the earth, Orbital elements, Look angle determination, Orbital perturbations, launches and launch vehicles, Orbital effects in communication System performance.
Unit II	**SATELLITE SUB SYSTEMS:** Introduction, attitude and orbit control system, Telemetry, tracking, command and monitoring, Power Systems, Communication Subsystems, Satellite antennas.
Unit III	**SATELLITE LINK DESIGN:** Introduction, Basic transmission theory, System noise temperature and G / T ratio. Design of uplink and down link models, Design of satellite links for specified C / N ratio. **EARTH STATIONS:** Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power, test methods.
Unit IV	**LOW EARTH ORBIT AND NON-GEO STATIONARY SATELLITE SYSTEMS :** Introduction, Orbit consideration, coverage and frequency considerations, Delay and Throughput considerations, System considerations, Operational NGSO constellation Designs
Unit V	**SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM :** Introduction, Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS

Text Books

T.1	T Pratt and W Bostiain - Satellite Communications, 2nd Edition, John Wiley, 2003.
T.2	Wilbur L. Pritchard, Henri G.Suyderhoud and Robert A Nelson - Satellite Communication Systems Engineering, 2nd Edition, Pearson Publications, 2003.
T.3	Satellite Communications SystemsSystems, Techniques and Technology By Gerard Maral, Michel Bousquet, Zhili Sun · 2020

Reference Books

R.1	Dennis Roddy, Satellite communications, McGraw Hill, 4 th Edition,2009.
R.2	. DC Agarwal, Satellite Communications, Khanna Publishers, 2003 Robert M Gagliard, Satellite

		Communications		
R.3		Satellite Communications Systems Systems, Techniques and Technology By Gerard Maral, Michel Bousquet, Zhili Sun · 2020		
Useful Links				
1		http://nptel.iitm.ac.in/courses/		
2		https://archive.nptel.ac.in/courses/117/105/117105131/		
3		https://encryptedtbn2.gstatic.com/faviconV2?url=https://www.digimat.in&client=ABOUT_THIS_RESULT&size=32&type=FAVICON&fallback_opts=TYPE,SIZE,URL		

Course Code	Course Outcomes	CL	Class Sessions
BEC4705.1	**Determine** orbital mechanics, Kepler's laws, locating, elements, launches, and communication effects in satellite systems.	2	9
BEC4705.2	**Examine** satellite subsystems and multiple access techniques for comprehensive understanding and application	3	9
BEC4705.3	**Analyze** satellite link & earth station design principles for effective communication.	4	9
BEC4705.4	**Examine** essential concepts of Slow Earth Orbit & Non-Geo Satellite Systems, covering orbits, coverage, delays, throughput, system designs.	5	9
BEC4705.5	**Examine** proficiency in Satellite Navigation & GPS principles, covering signals, receivers, accuracy, and Differential GPS.	3	9

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B. Tech Fourth Year (Semester-VI) Electronics and Communication Engineering

BEC4706: Computer Communication Network Lab

Teaching Scheme		Examination Scheme	
Practical	2 Hrs/week	**CA**	25 Marks
Total Credit	1	**ESE**	25 Marks
		TOTAL	50 Marks
		Duration of ESE: 02 Hrs 00 Min.	

Sr. No.	List of Experiment	CO
1	Study network simulator & get familiar with NS2	CO1
2	create network Topology in NS2.	CO 1
3	demonstrate data transmission using Ping protocol, tracert, IP configuration & hub.	CO2
4	Study the fundamental of socket programming.	CO2
5	Interpret IP address of the system, dhcp, network addresses translation.	CO2
6	To understand the domain name server.	CO3
7	To Study Protocol analyzer.	CO3
8	To Study of FTP, HTFT protocol.	CO4
9	To perform PC to PC communication using RS-232 port.	CO4
10	To demonstrate Network security cryptography	CO5

Text Books

T.1	Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn.
T.2	Wireless Communication and Networking – William Stallings

Reference Books

R.1	Wireless Digital Communications – KamiloFeher
R.2	Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy

Useful Links

1	https://nptel.ac.in/courses/103/106/103106118/
2	https://nptel.ac.in/courses/117/105/117105147/

Course Code	Course Outcomes	CL	Lab Sessions
BEC3610.1	**Interpret** OSI/TCP reference model for data transfer in a network	2	2
BEC3610.2	**Determine** principle of computer communication including multiplexing, flow control and error control.	3	2
BEC3610.3	**Analyze** wide area, local area and metropolitan area network.	4	2
BEC3610.4	**Understand** IEEE standards such as 802.11, 802.16, IP addressing, etc	2	2
BEC3610.5	**Implement** security of a network using cryptography technique such as public key, secret key.	3	2

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Program: B. Tech Electronics & Communication Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
VI	BEC4707	CMOS VLSI DESIGN	-	-	2	1

Sr. No.	List of Experiment	CO
1	Design of CMOS Inverter using DSCH2 Tool.	CO1
2	Gate Level Analysis of 2-Input NAND & NOR Gate.	CO1
3	Implement the Following Function using Compound Gates. F(A,B,C,D)=(ABC+CD)'	CO2
4	Design Half Adder using NAND Gates.	CO2
5	Design Full Adder using NAND Gates.	CO3
6	Design 2:1 Multiplexer using NAND Gates.	CO3
7	Design of 4 bit binary Adder	CO4
8	Draw Layout of CMOS Inverter Microwind/Cadence Tools	CO4
9	Draw Layout of 2-Input NAND Gate using Microwind /Cadence Tools	CO5
10	Draw Layout of Multiplexer	CO5

Text Books

T.1	Principle of CMOS VLSI Design by Neil H. E. WesteHarris4th Edition, 2013
T.2	Introduction to VLSI Circuits and Systems by John P. UyemuraFirst Edition

Reference Books

R.1	CMOS VLSI Design by Pucknell , K. Eshraghian3rd Edition, 2005
R.2	CMOS Digital Integrated circuits Analysis and Design by Sung-Mo Kang, Yusuf leblebiciThird edition, 2008

Useful Links

1	nptel.ac.in/noc21_ee09/preview
2	nptel.ac.in/courses/108/107/108107129/

	Course Outcomes
EC2308.1	Describe and interpret the basic concepts of MOS transistors
EC2308.2	Construct the ability to design a system, component or process as per needs and specifications.

EC2308.3	Analyze inverter design, characteristics and applications and performance parameters of CMOS Circuits.
EC2308.4	Evaluate circuits using CMOS styles
EC2308.5	Analyze performance of the complex logic structures