IDEAL INSTITUTE OF ENGINEERING
KALYANI

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WBUT SYLLABUS

Subject: **SIGNALS AND SYSTEMS**
Code: **EC 303**
Semester / Branch: 3RD Semester/ ECE
Credit: **3**

Module No 1
Introduction to signal and systems: **8L**
Continuous and discrete time signals: Classification of Signals – Periodic aperiodic even– odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity –unit impulse – unit step – Transformation of independent variable of signals: time scaling, time shifting. System properties: Linearity, Causality, time invariance and stability. Dirichlet's conditions, Determination of Fourier series coefficients of signal.

Module No 2
Signal Transformation: **8L**
Fourier transformation of continuous and discrete time signals and their properties. Laplace transformation-analysis with examples and properties. Parseval's theorem; Convolution in time (both discrete and continuous) and frequency domains with magnitude and phase response of LTI systems.

Module No 3
Laplace Transform: **2L**
Recapitulation, Analysis and characterization of LTI systems using Laplace transform: Computation of impulse response and transfer function using Laplace transform.

Module No 4
Sampling Theorem: **4L**

Representation of continuous time signals by its sample –Types of sampling, Sampling theorem. Reconstruction of a Signal from its samples, aliasing –sampling of band pass signals.

Module No 5 **6L**

Z-Transforms: Basic principles of z-transform - z-transform definition –, Relationship between z-transform and Fourier transform, region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion

Module No 6 **4L**

Random Signals & Systems: Definitions, distribution & density functions, mean values & moments, function of two random variables, concepts of correlation, random processes, spectral densities, response of LTI systems to random inputs.

Total: 32 hrs

TEXT BOOKS:

3. A.V.Oppenheim, A.S.Willsky and S.H.Nawab -Signals & Systems, Pearson
4. S.Haykin & B.V.Veen, Signals and Systems- John Wiley
5. A.Nagoor Kani- Signals and Systems- McGraw Hill

REFERENCES:

1. J.G.Proakis & D.G.Manolakis- Digital Signal Processing Principles, Algorithms and Applications, PHI.
2. C-T Chen- Signals and Systems- Oxford
3. E WKamen &BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab- Pearson
4. B.P.Lathi- Signal Processing & Linear Systems- Oxford
5. P.Ramesh Babu & R.Anandanatarajan- Signals and Systems 4/e- Scitech
6. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH
7. S Ghosh- Signals and Systems- Pearson
8. M.H.Hays- Digital Signal Processing ", Schaum's outlines, TMH
9. Ashok Ambardar, -Analog and Digital Signal Processing- Thomson.
10. Phillip, Parr & Riskin- Signal, Systems and Transforms- Pearson

COURSE PLAN

Name of the Faculty: SOUMIK SEN
Subject with code: **SIGNALS AND SYSTEMS** ***(Code: EC 303)***
Semester / Branch: 3RD SEMESTER/ ECE

Detailed Plan for Lectures:

LECTURE NO	CONTENT	NO OF LECTURE	NAME OF BOOK	E-LEARNING REFERENCES
MODULE 1[8L]				
INTRODUCTION TO SIGNAL AND SYSTEMS				
1.	Continuous and discrete time signals: Continuous, Discrete and Digital Signal and idea of Sampling and Quantization in brief	1	T1,R5	-
2	Classification of Signals – Periodic aperiodic even– odd – energy and power signals – Deterministic and random signals	1	T1,R5	-
3	complex exponential and sinusoidal signals – periodicity –unit impulse – unit step	1	T1,R5	-
4	Transformation of independent variable of signals: time scaling, time shifting	1	T1,R5	-
5	System properties: Linearity, Causality, time invariance and stability.	1	T1,R5	-
6	Dirichlet's conditions, Determination of Fourier series coefficients of signal (Exponential form).	1	T1,R5	-
7	Determination of Fourier series coefficients of signal (Trigonometric form).	1	T1,R5	-
8	Mathematical Problems & Wbut Questions	1	R5	-
MODULE 2[8L]				
SIGNAL TRANSFORMATION				
9	Fourier transformation of continuous time signals and their properties	1	T1,R5	-
10	Fourier transformation of discrete time signals and their properties	1	T1,R5	-
11	Mathematical Problems from Fourier Transform	1	T1,R5	-
12	Laplace transformation- analysis with examples and properties, Parseval's theorem	1	T1,R5	-
13	Mathematical Problems from Laplace Transform.	1	R5	-
14	Convolution in time (both discrete and continuous) domain with magnitude and phase response of LTI systems	1	T1,R5	-
15	Convolution in frequency domain with magnitude and phase response of LTI systems	1	T1,R5	-
16	Mathematical Problems on Convolution	1	R5	-
MODULE 3[2L]				
LAPLACE TRANSFORM				
17	Recapitulation, Computation of impulse response using Laplace transform	1	T1,R5	-
18	Computation of transfer function using Laplace transform	1	TI, R5	-
MODULE 4[4L]				
SAMPLING THEOREM				

19	Types of sampling	1	T1, R5	-
20	Sampling theorem,Reconstruction of a Signal from its samples	1	T1, R5	-
21	Aliasing, sampling of band pass signals	1	T1, R5	-
22	Mathematical Problems	1	R5	
MODULE 5[6L]				
Z-TRANSFORMS				
23	Z-transform definition –, Relationship between z-transform and Fourier transform	1	T1,R5	-
24	region of convergence – properties of ROC	1	T1,R5	-
25	Properties of z-transform – Poles and Zeros	1	T1,R5	-
26	Mathematical Problems on Z-transform	1	R5	-
27	inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion	1	T1,R5	-
28	Mathematical Problems on inverse Z-transform	1	R5	-
MODULE 6[4L]				
RANDOM SIGNALS & SYSTEMS				
29	Definitions, distribution & density functions	1	R5	-
30	mean values & moments, function of two random variables	1	R5	-
31	concepts of correlation, random processes, , spectral densities	1	R5	-
32	response of LTI systems to random inputs	1	R5	-

IDEAL INSTITUTE OF ENGINEERING

KALYANI

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WBUT SYLLABUS

Subject: DIGITAL ELECTRONICS CIRCUITS
Code: EC (EE)-302
Semester / Branch: 3RDSemester/ EE
Credit: 3

MODULE 1-DATA AND NUMBER SYSTEM

UNIT1/I Binary, Octal and Hexadecimal representation andtheir conversion, BCD, ASCII, EBDIC,
UNIT1/II Gray codes and their conversion, Signed binary numbers representation with 1's and 2's complement methods, Binary arithmetic.

MODULE-2 BOOLEAN ALGEBRA:

UNIT 2/I Various logic gates and their truth tables and circuits,Representation in SOP and POS forms,
UNIT2/ II Minimization of logic expressions by algebraic method, K-map method

MODULE-3 COMBINATIONAL CIRCUITS:

UNIT3/ I Adder and sub tractor circuit,
UNIT3/ II Circuit of Encoder,Decoder, Comparator,
UNIT3/ II Multiplexer, De-Multiplexer and parity Generator.

MODULE-4 MEMORY SYSTEMS:

UNIT4/IRAM, ROM, EPROM, EEROM

MODULE-5 SEQUENTIAL CIRCUITS:

UNIT5/ I Basic memory elements, S-R, J-K,
UNIT5/ IID, and T Flipflop, various types of Registers,
UNIT5/ III Counters & their design, Irregular counter
UNIT5/ IV State table& State transition diagram, Sequential circuit design methodology.

MODULE-6 DIFFERENT TYPES OF A/D AND D/A CONVERSION TECHNIQUES.

UNIT6/ I Different types of A/D conversion
UNIT6/ II Different types of D/A conversion

MODULE-7 LOGIC FAMILIES:

UNIT7/ I TTL, ECL,
UNIT7/ IIMOS & CMOS, their operation and specification.

COURSE PLAN

Name of the Faculty: SUDESHNA DEY
Subject with code: DIGITAL ELECTRONICS CIRCUITSEC(EE)302
Semester / Branch: 3rd SEMESTER/ EE
Credit: 3

1. Textbook:

1. Digital Principles & Application, 5th Edition, Leach &Malvino, McGraw Hill Company
2. Digital Logic Design, Morries Mano, PHI.
3. Digital Electronics – Kharate – Oxford

2. References:

R1:Fundamental of Digital Circuits, A. Anand Kumar, PHI.
R2:Microelectronics Engineering - Sedra& Smith-Oxford.

Detailed Plan for Lectures:

LECTURE NO	CONTENT	NAME OF BOOK	REFERENCES
MODULE 1- DATA AND NUMBER SYSTEM			
UNIT 1/I,II			
1.	Binary, Octal and Hexadecimal representation andtheir conversion, BCD, ASCII, EBDIC, Gray codes and their conversion, Signed binary numbers representation with 1's and 2's complement methods, Binary arithmetic.	3	1,2
MODULE-2 BOOLEAN ALGEBRA			
UNIT 2/I			
2	Various logic gates and their truth tables and circuits, Representation in SOP and POS forms	3	1
UNIT 2/II			
3	Minimization of logic expressions by algebraic method, K-map method	3,1	1
MODULE-3 COMBINATIONAL CIRCUITS			
UNIT 3/I			
4,5	Adder and sub tractor circuit	3	2
UNIT 3/II			
6,7	Circuit of Encoder,Decoder, Comparator,	3	2
UNIT 3/III			
8,9	Multiplexer, De-Multiplexer	3	2
10	parity Generator.	3	2
MODULE-5SEQUENTIAL CIRCUITS			
UNIT 5/I			
11	Basic memory elements, S-Rfliplop	3,1	2
UNIT 5/II			
12	J-K, D, and T Flipflop,	3,1	2
UNIT 5/III			
13,14	Registers Design(SISO,SIPO,PIPO,PISO)	3	2
UNIT 5/III,IV			
15,16	Counters & their design	3	2
MODULE-4MEMORY SYSTEMS			
UNIT 4/I			
17	RAM, ROM, EPROM, EEROM	3	2
MODULE-6DIFFERENT TYPES OF A/D AND D/A CONVERSION TECHNIQUES			
UNIT 6/I			
18	Different types of A/D conversion	3	2
UNIT 6/II			
19	Different types of D/A conversion	3	2

MODULE-7 LOGIC FAMILIES			
UNIT 7/I			
20	TTL, ECL	3	2
UNIT 7/II			
	MOS & CMOS, their operation and specification	3	2

IDEAL INSTITUTE OF ENGINEERING
KALYANI
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WBUT SYLLABUS

Subject: ANALOG & DIGITAL ELECTRONICS
Code: CS 301
Semester / Branch: 3RDSemester/CSE
Credit: 3

Module -1 ANALOG ELECTRONICS

UNIT1/I Different Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency

UNIT1/II Recapitulation of basic concepts of Feedback and Oscillation ,Phase Shift, Wein Bridge oscillators

UNIT1/III Astable&MonostableMultivibrators ,Schimtt Trigger circuits [1L], 555 Timer

Module -2 DIGITAL ELECTRONICS

DATA AND NUMBER SYSTEM

UNIT1/I Binary, Octal and Hexadecimal representation andtheir conversion, BCD, ASCII, EBDIC,
UNIT1/II Gray codes and their conversion, Signed binary numbers representation with 1's and 2's complement methods, Binary arithmetic.

BOOLEAN ALGEBRA:

UNIT 2/I Various logic gates and their truth tables and circuits,Representation in SOP and POS forms,
UNIT2/ II Minimization of logic expressions by algebraic method, K-map method

COMBINATIONAL CIRCUITS:

UNIT3/ I Adder and sub tractor circuit,
UNIT3/ II Circuit of Encoder,Decoder, Comparator,
UNIT3/ II Multiplexer, De-Multiplexer and parity Generator.

SEQUENTIAL CIRCUITS:

UNIT4/ I Basic memory elements, S-R, J-K,
UNIT54 IID T Flipflop, various types of Registers,

UNIT4/ III Counters & their design, Irregular counter

DIFFERENT TYPES OF A/D AND D/A CONVERSION TECHNIQUES.

UNIT5/ I Different types of A/D conversion
UNIT5/ II Different types of D/A conversion

LOGIC FAMILIES:

UNIT6/ I TTL, ECL,
UNIT6/ IIMOS & CMOS, their operation and specification.

COURSE PLAN

Name of the Faculty: SUDESHNA DEY
Subject with code: ANALOG &DIGITAL ELECTRONICS [CS 301]
Semester / Branch: 3rd SEMESTER/ CSE
Credit: 3

3. Textbook:

4. Digital Principles & Application, 5th Edition, Leach &Malvino, McGraw Hill Company
5. Digital Logic Design, Morries Mano, PHI.
6. Digital Electronics – Kharate – Oxford
7. Electronic Devices & Circuit Theory – Boyelstad&Nashelsky

4. References:

R1:Fundamental of Digital Circuits, A. Anand Kumar, PHI.
R2:Microelectronics Engineering - Sedra& Smith-Oxford.
R3:Morries Mano- Digital Logic Design- PHI

Detailed Plan for Lectures:

LECTURE NO	CONTENT	NAME OF BOOK	REFERENCES
	Module -2DIGITAL ELECTRONICS		
	DATA AND NUMBER SYSTEM		
	UNIT 1/I,II		
1.	Binary, Octal and Hexadecimal representation andtheir conversion, BCD, ASCII, EBDIC, Gray codes and their conversion, Signed binary numbers representation with 1's and 2's complement methods, Binary arithmetic.	3	1,2
	BOOLEAN ALGEBRA		
	UNIT 2/I		
2,3	Various logic gates and their truth tables and circuits, Representation in SOP and POS forms	3	1
	UNIT 2/II		
4	Minimization of logic expressions by algebraic method, K-map method	3,1	1
	COMBINATIONAL CIRCUITS		
	UNIT 3/I		
5	Adder and sub tractor circuit	3	2
	UNIT 3/II		
6,7	Circuit of Encoder,Decoder, Comparator,	3	2
	UNIT 3/III		
8,9	Multiplexer, De-Multiplexer	3	2
10	parity Generator.	3	2
	SEQUENTIAL CIRCUITS		
	UNIT 4/I		
11	Basic memory elements, S-Rfliplop	3,1	2
	UNIT 4/II		
12	J-K, D, and T Flipflop,	3,1	2
	UNIT 4/III		
13	Registers Design(SISO,SIPO,PIPO,PISO)	3	2
	UNIT 4/III,IV		
14,15	Counters & their design(Ring counter, Johnson counter , Basic concept of Synchronous and Asynchronous counters , Design of Mod N Counter)	3	2
	DIFFERENT TYPES OF A/D AND D/A CONVERSION TECHNIQUES		
	UNIT 5/I		
16	Different types of A/D conversion	3	2
	UNIT 5/II		
17	Different types of D/A conversion	3	2
	LOGIC FAMILIES		
	UNIT 6/I		
18	TTL, ECL	3	2
	UNIT 6/II		

19	MOS & CMOS, their operation and specification	3	2
Module -1 ANALOG ELECTRONICS			
UNIT 1/I			
20,21	Different Classes of Amplifiers - (Class-A, B, AB and C - basic concepts, power, efficiency	4	NONE
UNIT 1/II			
22,23	Recapitulation of basic concepts of Feedback and Oscillation, Phase Shift, Wein Bridge oscillators	4	NONE
UNIT 1/III			
24,25	Astable&MonostableMultivibrators ,Schimtt Trigger circuits , 555 Timer	4	NONE

IDEAL INSTITUTE OF ENGINEERING
KALYANI

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WBUT SYLLABUS

Subject: Analog Communication
Code: EC 501
Semester / Branch: 5th Semester/ ECE
Credit: 4

MODULE 1- INTRODUCTION TO ANALOG COMMUNICATION [9L]

UNIT1/I – INTRODUCTION [1L]
Elements of communication system - Transmitters, Transmission channels & receivers Concept of modulation, its needs

UNIT1/ II -CONTINUOUS WAVE LINEAR MODULATION [5L]
Amplitude modulation(AM-DSB/TC): Time domain representation of AM signal (expression derived using a single tone message), modulation index , frequency domain (spectral) representations, illustration of the carrier and side band components; transmission bandwidth for AM; Phasor diagram of an AM signal; Calculation of Transmitted power & sideband power & Efficiency ; concept of under, over and critical modulation of AM-DSB-TC.

UNIT 1/III- OTHER AMPLITUDE MODULATIONS [3L]
Double side band suppressed carrier (DSBSC) modulation: time and frequency
domain expressions, bandwidth and transmission power for DSB. Single side band modulation (SSB) both TC & SC and only the basic concept of VSB, Spectra and band-width.

MODULE-2 GENERATION & DETECTION OF AMPLITUDE MODULATION [9L]

UNIT 2/I -GENERATION OF AM [4L]
Concept of i) Gated and ii) Square law modulators, Balanced Modulator. Generation of SSB: Filter method, Phase shift method

UNIT2/ II- DEMODULATION FOR LINEAR MODULATION [3L]
Demodulation of AM signals: Detection of AM by envelope detector , Synchronous detection for AM-SC, Effects of Frequency & Phase mismatch, Corrections.

UNIT2/ III- PRINCIPLE OF SUPER HETERODYNE RECEIVERS [2L]
Super heterodyning principle, intermediate frequency, Local oscillator frequency, image frequency.

MODULE-3 ANGLE MODULATION [8L]

UNIT3/ I FREQUENCY MODULATION (FM) AND PHASE MODULATION (PM) [3L]
Time and Frequency domain representations, Spectral representation of FM and PM for a single tone message, Bessel's functions and Fourier series. Phasor diagram

UNIT3/ II GENERATION OF FM & PM [3L]
Narrow and Wide-band angle modulation, Basic block diagram representation of generation of FM & PM, Concept of VCO & Reactance modulator

UNIT3/ III- DEMODULATION OF FM AND PM [2L]
Concept of frequency discriminators , Phase Locked Loop

MODULE - 4 MULTIPLEXING [10L]

UNIT 4/I- FDM &TDM [3L]
Frequency Division Multiplexing, Time Division Multiplexing, (FDM) , Stereo – AM and FM: Basic concepts with block diagrams

UNIT 4/II- RANDOM SIGNALS AND NOISE IN COMMUNICATION SYSTEM [2L]
Noise in Communication systems – Internal & External noise, Noise Temperature, Signal-to-Noise ratio, White noise, thermal noise, Figure of Merit.

UNIT4/ III NOISE PERFORMANCE IN ANALOG COMMUNICATION SYSTEMS [5L]
SNR calculation for DSB/TC, DSB-SC, SSB-TC, SSBSC & FM.

COURSE PLAN

Name of the Faculty: SOURISH CHATTERJEE
Subject with code: ANALOG COMMUNICATION (Code: EC 501)
Semester / Branch: 5^{TH} SEMESTER/ ECE
Credit: 4
Alloted Hrs: 42 L (42×50 min= 35 Hours)

1. **Textbook:**
   T1: Simon Haykin "An Introduction to Analog and Digital Communication", Wiley Publication
   Or
   B.P.Lathi –"Modern Analog & Digital Communication"- Oxford Publications

2. **References:**
   R1: Taub and Schilling , "Principles of Communication Systems", TMG
   R2: Singh & Sapre—"Communication Systems": 2/e, TMH
   R3: Leon W. Couch-" Digital and Analog Communication Systems" Pearson
   R4: S Sharma, "Analog Communication Systems"- Katson Books
   R5: V.Chandrasekhar " Communication System"- Oxford
   R6: R.K. Kanodia & Ashish Murolia " GATE Electronics & Communication Volume 2" Nodia & Company (For Numerical Problems)

3. **E-Learning Courses for Reference (From NPTEL):**
   W1
   www.learnerstv.com/Free-Engineering-Video-lectures-ltv179-Page1.htm
   (Prof.Surendra Prasad, Department of Electrical Engineering, IIT Delhi)

Detailed Plan for Lectures:

LECTURE NO	CONTENT	NO OF LECTURE	NAME OF BOOK	E-LEARNING REFERENCES
MODULE 1- INTRODUCTION TO ANALOG COMMUNICATION [9L]				
UNIT 1/I – INTRODUCTION [1L]				
1.	Elements of communication system - Transmitters, Transmission channels & receivers Concept of modulation, its needs	1	T1, R5	W1 Module 1
UNIT1/ II -CONTINUOUS WAVE LINEAR MODULATION [6L]				
2	Recaptulation of signal and systems including fourier transform	1	T1,R3	W1 Module 3
3	Amplitude modulation(AM-DSB/TC): Time domain representation of AM signal (expression derived using a single tone message), modulation index	1	T1,R2	NONE
4	Modulation Theorem, Frequency domain (spectral) representations, illustration of the carrier and side band components;	1	T1,R1	NONE
5	Multitone Modulation ,Power Relation and Efficiency Calculation	1	R4	NONE
6	Concept of under, over and critical modulation of AM-DSB-TC and,Numerical Problems on Efficiency and Power relation	1	T1,R4	NONE
UNIT 1/ III- OTHER AMPLITUDE MODULATIONS [3L]				
7	Double side band suppressed carrier (DSBSC) modulation: time and frequency domain expressions, bandwidth and transmission power for DSB	1	T1,R1	NONE
8	Hilbert Transform, Properties of Hilbert Transform	1	T1,R3	W1 Module 4
9	Single Sideband Suppressed Carrier Modulation,Time Domain Description of SSBSC Signal	1	T1,R1	NONE
10	Basic concept of VSB, Spectra and band-width. Comparison between different types of Amplitude Modulation	1	T1,R1	W1 Module 12
MODULE-2 GENERATION & DETECTION OF AMPLITUDE MODULATION [10L]				

UNIT 2/I -GENERATION OF AM [3L]				
11	Square Law Modulator	1	T1	
12	Balanced Modulator, Ring Modulator	1	T1,R4	NONE
13	Filter Method of SSB Generation, Phase Shift Method of SSB Generation	1	T1,R4	W1 Module 11
UNIT 2/II- DEMODULATION FOR LINEAR MODULATION [3L]				
14	Demodulation of AM signals: Detection of AM by envelope detector	1	T1,R5	NONE
15	Square Law Detector, Synchronous detection for AM-SSBSC.	1	T1	NONE
16	Effects of Frequency & Phase mismatch, Corrections	1	T1,R5	NONE
UNIT 2/III- PRINCIPLE OF SUPER HETERODYNE RECEIVERS & ASSIGNMENTS[4L]				
17	Frequency Translation of Bandpass Signal, Mixing, Receiver Characteristics: Selectivity,Sensitivity,Fidelity	1	T1,R2	W1 Module 12 &13
18	Intermediate frequency, Local oscillator frequency, image frequency, Block Diagram of Superheterodyne Receiver	1	T1,R2	W1 Module 12 & 13
19	Class Assignment I	1	R4	NONE
20	Class Assignment II (GATE)	1	R6	NONE
MODULE-3 ANGLE MODULATION [9L]				
UNIT I FREQUENCY MODULATION (FM) AND PHASE MODULATION (PM) [3L]				
21	Angle Modulation: Basic Concepts (Sinusoidal and Square Modulation)	1	T1,R2	W1 Module 15
22	Single Tone Frequency Modulation,Spectrum Analysis.	1	T1	NONE
23	Wide band and Narrow Band FM, Transmission Bandwidth	1	T1	NONE
UNIT II GENERATION OF FM & PM [3L]				
24	Narrow and Wide-band angle modulation, Basic block diagram representation of generation of FM & PM	1	T1,R5	NONE
25	Direct Method of Generating FM	1	T1,R5	W1 Module 17
26	Concept of VCO & Reactance modulator, Comparison Between AM and FM	1	T1,R5	NONE
UNIT 3/III- DEMODULATION OF FM & NUMERICAL PROBLEM ON FM [3L]				
27	Demodulation of FM, Balanced Frequency Discriminator,PLL	1	T1,R4, R5	W1 Module 22
28	Solution of Numerical Problems on FM	1	R4	NONE

29	Solution of Numerical Problems on FM (GATE)	1	R6	NONE
MODULE - 4 MULTIPLEXING [10L]				
UNIT 4/I- FDM &TDM [2L]				
30	Time division multiplexing, Frequency Division Multiplexing	1	T1,R3, R1	NONE
31	Stereo – AM and FM: Basic concepts with block diagrams	1	R2,R4, R5	NONE
UNIT 4/II- RANDOM SIGNALS AND NOISE IN COMMUNICATION SYSTEM [3L]				
32	Noise in Communication systems – Internal & External noise, Thermal and Shot Noise	1	T1,R2	W1 Module 2
33	I/P and O/P SNR, Noise Figure,	1	T1,R2	NONE
34	Equivalent Noise Temperature, Cascade Connections of Noisy Networks	1	T1,R2	NONE
UNIT 4/III NOISE PERFORMANCE IN ANALOG COMMUNICATION SYSTEMS [5L]				
35	Signal to Noise Ratio for Coherent Reception (DSBSC)	1	T1,R1, R4	W1 Module 34 to 37
36	Noise in SSBSC System	1	T1,R1, R4	
37	Noise in AM Receiver Using Envelope Detection, Threshold Effect	1	T1,R1, R4	
38	Noise in FM Reception	1	T1,R1, R4	
39	Solution of Numerical Problems	1	R4,R6	NONE
40	Solution of Numerical Problems (GATE)	1	R6	NONE
CONCLUDING SESSIONS [2L]				
41	Overall Discussion And WBUT (previous years) question answer session	1	-	-
42	WBUT question answer session continues	1	-	-

IDEAL INSTITUTE OF ENGINEERING
KALYANI

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WBUT SYLLABUS

Subject: Digital Communication
Code: EE 705C
Semester / Branch: 7th Semester/ EE
Credit: 3

MODULE 1- PROBABILITY THEORY AND RANDOM PROCESS [6L]

Conditional probability, communication example, joint probability, statistical independence, random variable-continuous and discrete, cumulative distribution function, probability density function – Gaussian, Rayleigh and Rician mean, variance, random process, stationary and ergodic processes, correlation coefficient, covariance, auto correlation function and its properties, random binary wave, power spectral density

MODULE-2 SIGNAL VECTOR REPRESENTATION [6L]

Analogy between signal and vector, distinguishibility of signal, orthogonality and orthonormality, basis function, orthogonal signal space, message point , signal constellation, geometric interpretation of signals, likelihood functions, Schwartz inequality, Gram-Schmidt orthogonalization procedure, response of the noisy signal at the receiver, maximum likelihood decision rule, decision boundary, optimum correlation receiver; probability of error , error function, complementary error function, Type-I and Type-II errors.

MODULE-3 DIGITAL DATA TRANSMISSION [10L]

UNIT3/ I

Concept of sampling, Pulse Amplitude Modulation (PAM), interlacing and multiplexing of samples, Pulse Code Modulation (PCM), quantization, uniform and non-uniform quantization, quantization noise, binary encoding, A-Law and μ -law companding, differential PCM, delta modulation and adaptive delta modulation.

UNIT3/ II

Digital transmission components, source, multiplexer, line coder, regenerative repeater, concept of line coding – polar/unipolar/bipolar NRZ and RZ, Manchester, differential encoding and their PSDs, pulse shaping, Inter Symbol Interference (ISI), Eye pattern, Nyquist criterion for zero ISI, equalizer, zero forcing equalizer, timing extraction.

MODULE - 4 DIGITAL MODULATION TECHNIQUES [14L]

Types of Digital Modulation, coherent and non-coherent Binary Modulation Techniques, basic digital carrier modulation techniques: ASK, FSK and PSK,
Coherent Binary Phase Shift Keying (BPSK), geometrical representation of BPSK signal; error probability of BPSK, generation and detection of BPSK Signal, power spectrum of BPSK.
Concept of M-ary Communication, M-ary phase shift keying, the average probability of symbol error for coherent M-ary PSK, power spectra of MPSK,
Quadrature Phase Shift Keying (QPSK), error probability of QPSK signal, generation and detection of QPSK signals, power spectra of QPSK signals, Offset Quadrature Phase shift Queuing (OQPSK),
Coherent Frequency Shift Keying (FSK), Binary FSK, error probability of BFSK signals, generation and detection of Coherent Binary FSK signals, power spectra of BFSK signal,
Minimum Shift Keying (MSK), signal constellation of MSK waveforms, error probability of MSK signal, Gaussian Minimum Shift Keying: GMSK, basic concept of OFDM, constellation diagram,
Some performance issues for different digital modulation techniques - Error Vector Magnitude (EVM), Eye Pattern and Relative Constellation Error (RCE),
Conceptual idea for Vector Signal Analyzer (VSA)

COURSE PLAN

Name of the Faculty: SOURISH CHATTERJEE
Subject with code: DIGITAL COMMUNICATION (Code: EE 705C)
Semester / Branch: 7^{TH} SEMESTER/ EE
Credit: 3
Alloted Hrs: 45 L (45×50min= 37 Hours Approx)

1. **Textbook:**
   T1: B.P.Lathi –"Modern Analog & Digital Communication"- Oxford Publications

2. **References:**
   R1: Simon Haykin "Digital Communication", Wiley Publication
   R2: Taub and Schilling , "Principles of Communication Systems", TMG
   R3 R.N. Mutagi- " Digital Communication"- Oxford
   R4: NPTEL Study Material
   R5: : Leon W. Couch-" Digital and Analog Communication Systems" Pearson
   R6: S Sharma, "Analog and Digital Communication Systems"- Katson Books

PRE-REQUISITE FOR THE COURSE

Basic Concept of different signals and systems, Fourier Transformation of signals, Concept on Analog Communication System, Importance of Modulation, Amplitude and Frequency Modulation Technique, Modulation Index, Noise, AWGN, SNR, Noise Figure

Detailed Plan for Lectures:

LECTURE NO	CONTENT	NO OF LECTURE	NAME OF BOOK	
MODULE 1- PROBABILITY THEORY AND RANDOM PROCESS [9L]				
UNIT 1/I – PROBABILITY BASICS AND RANDOM VARIABLE [5L]				
1.	Introduction, Advantage of Digital Communication, Probability Terminology (Outcome, Experiment, Event etc)	1	T1, R4	
2	Probability of an Event, Conditional Probability	1	T1, R4	
3	Random Variables, Distribution Function, PDF	1	T1, R4	
4	Joint Distribution Function, Statistical Independence, Marginal Density Function	1	T1, R4	
5	Moment Generating Function, Mean, Variance	1	T1, R4	
UNIT1/ II –RANDOM PROCESS [4L]				
6	Autocorrelation Function, Energy and Power Spectral Density	1	R1	
7	Random Variable to Random Process, Importance of Ensemble Statistics	1	T1,R1	
8	Characterization of Random Process, Simplified Assumption (Concept on stationarity), Gross Characterization	1	T1,R1	
9	Wide sense stationary Process, Ergodic Process	1	T1,R1	
MODULE-2 SIGNAL VECTOR REPRESENTATION [8L]				
UNIT 2/I –BASICS OF SIGNAL SPACE [4L]				
11	Vector Space : Subspace, Inner Product, Norm, Basis	1	T1	
12	Analogy between Signal and Vector, Signal Space: Inner Product, Norm	1	T1,R3	
13	Concept on Orthogonality, Orthonormal Basis, Cauchy Schwartz Inequality, Problems	1	T1,R3	
14	Gram Schmidt Procedure, Pictorial Representation of Gram Schmidt Method, Importance of the method in Digital Communication (Overview)			
UNIT 2/II- SIGNAL VECTOR REPRESENTATION FOR DIGITAL COMMUNICATION [3L]				
14	Geometric Interpretation of Signals, Signal Constellation and Message Point, Observation Vector	1	T1,R3	
15	Maximum Likelihood Detection	1	T1	
16	Optimum Receiver, Matched Filter	1	T1,R3	
17	Rayleigh Energy Theorem, Maximization of Output SNR	1	T1,R3	

MODULE-3 DIGITAL DATA TRANSMISSION [14L]				
UNIT 3/I PAM, PCM, DPCM, DM, ADM [8L]				
18	Concept of Sampling, Nyquist Theorem, Pulse Amplitude Modulation	1	T11,R5	
19	Time division Multiplexing and Frequency Division Multiplexing	1	T1,R2	
20	Pulse Code Modulation, Uniform Quantization, Encoding, Regenerative Repeater	1	T1,R6	
21	Quantization Noise and SNR Calculation	1	T1,R4	
22	Non uniform Quantization, Companding (μ law &A law)	1	T1,R6	
23	Differential Pulse Code Modulation, SNR Improvement over PCM	1	T1,R1	
24	Delta Modulation, Granular and Slope overload Noise in DM	1	T1,R1	
25	SNR calculation for DM, Adaptive Delta Modulation Technique, Prediction Filter	1	T1,R4	
UNIT 3/II DIGITAL DATA TRANSMISSION [6L]				
26	Line Coding, Different Line Coding Technique	1	T1,R6	
27	Inter-symbolic Interference, Nyquist Criterion for Zero ISI	1	T1,R1	
28	Eye Pattern, Importance of Eye Diagram	1	T1,R1	
29	Controlled ISI, Partial Response Signalling, Scrambling	1	T1,R1	
30	Equalizers, Zero Forcing Equalizers, Timing Extraction	1	T1	
31	Numerical Problems	1	R6	
MODULE - 4 DIGITAL MODULATION TECHNIQUES [12L]				
32	Digital Modulation Formats, Amplitude Shift Keying	1	R1,R4	
33	Coherent Binary PSK, Signal space Diagram, BPSK Transmitter and Receiver	1	R1,R4	
34	Response of Bank of Correlators	1	R1,R4	
35	Error Probability of BPSK	1	R1,R4	
36	Coherent Binary FSK, Signal Space Diagram, FSK transmitter and Receiver	1	R1,R4	
37	Error Probability of FSK	1	R1,R4	
38	Coherent QPSK techniques, Signal Space diagram,	1	R1,R4	
39	Transmitter and Receiver for QPSK	1	R1,R4	
40	Basic Concept of M-ary PSK, Minimum Shift Keying	1	R1,R4	
41	Basic Idea of DPSK and OQPSK	1	R1,R4	
42	Basic Concept of OFDM	1	R1,R4	
43	Vector Signal Analyzer	1	R1,R4	
CONCLUDING SESSIONS [2L]				
44	Overall Discussion And WBUT (previous years) question answer session	1	-	
45	WBUT question answer session continues	1	-	

IDEAL INSTITUTE OF ENGINEERING
KALYANI
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WBUT SYLLABUS

Subject: Microelectronics & VLSI Designs
Code: EC-702
Semester / Branch: 3RDSemester/ EE
Credit: 3

Module 1: Introduction to VLSI Design

UNIT1/IVLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI – basic idea only),

UNIT1/II Types of VLSI Chips (Analog &DigitalVLSI chips, General purpose, ASIC, PLA, FPGA

UNIT1/ III Design principles (Digital VLSI –Concept of Regularity, Granularity etc), Design Domains

Module 2: Micro-electronic Processes for VLSI Fabrication

Silicon Semiconductor Technology- An Overview, Wafer processig, Oxidation, Epitaxial deposition, Ion-implantation & Diffusion ,Cleaning, Etching , Photo-lithography – Positive & Negative photo-resist, Basic CMOS Technology – (Steps in fabricating CMOS , Basic n-well CMOS process, p-well CMOS process, Twin tubprocess , Silicon on insulator,Layout Design Rule: Stick diagram with examples , Layout rules .

Module – 3: CMOS for Digital VLSI Circuits

UNIT3/ I Recapitulation of MOS , CMOS, CMOS inverter

UNIT3/ IICMOS logic circuits, NAND & NOR Gates, Complex logic circuits

UNIT3/ III CMOS Full Adder, CMOS Transmission GATE, Advanced CMOS Logic circuits

UNIT3/ IV Sequential CMOS logic circuits, SR Latch circuit, clocked JK Latch/ Master-Slave JK , CMOS D-latch & Edge triggered flip-flop

Module – 4: Analog VLSI Circuits

UNIT5/ I Analog VLSI design steps ,Basic building blocks of Analog VLSI chips

UNIT5/ IIMOS switch , Active load / resistors; Voltagedividers (,CMOS Current source & sink;

UNIT5/ IIICMOS Voltage references/voltage dividers

UNIT5/ IV CMOS Differential amplifier; Output amplifiers ,CMOS OPAMP ,Switched capacitor filter

COURSE PLAN

Name of the Faculty: SUDESHNA DEY, Dr.DEB KUMAR PAL
Subject with code:Microelectronics & VLSI Designs [EC-702]
Semester / Branch: 7TH SEMESTER/ ECE
Credit: 3

5. Textbook:

1. CMOS Digital Integrated Circuit, S.M.Kang&Y.Leblebici, TMH.
2. VLSI Design & EDA Tools , A.Sarkar De,Sarkar, SCITECH
3. Modern VLSI Design: system on silicon, Wayne Wolf; Addison Wesley Longman Publisher

6. References:

1. Digital Integrated Circuits, Demassa&Ciccone, John Willey &Sons .
2. Digital Integrated Circuit, J.M.Rabaey, Chandrasan, Nicolic, Pearson Education.

Detailed Plan for Lectures:

LECTURE NO	CONTENT	NAME OF BOOK	REFERENCES
Module 1: Introduction to VLSI Design			
UNIT 1/I,II,III			
1.	VLSI Design Concepts, Moor's Law, Scale of Integration (SSI, MSI, LSI, VLSI, ULSI)	1	2
2	Types of VLSI Chips (Analog &DigitalVLSI chips, General purpose, ASIC, PLA, FPGA	1	2
3	Design principles (Digital VLSI –Concept of Regularity, Granularity etc), Design Domains	1	2
Module – 3: CMOS for Digital VLSI Circuits			
UNIT 3/I			
4,	Recapitulation of MOS , CMOS, CMOS inverter	1,2	2
UNIT 3/II			
5,6	CMOS logic circuits, NAND & NOR Gates, Complex logic circuits	1,2	2
UNIT 3/III			
7,8	CMOS Full Adder, CMOS Transmission GATE, Advanced CMOS Logic circuits	1,2	2
UNIT 3/IV			
9,10	Sequential CMOS logic circuits, SR Latch circuit, clocked JK Latch/ Master-Slave JK , CMOS D-latch & Edge triggered flip-flop	1,2	2
Module – 4: Analog VLSI Circuits			
UNIT 4/I			
11	Analog VLSI design steps ,Basic building blocks of Analog VLSI chips	2	2
UNIT 4/II			
12	MOS switch , Active load / resistors; Voltage dividers (,CMOS Current source & sink	2	2
UNIT 4/III			
13,14	CMOS Voltage references/voltage dividers [Basic circuits only	2	2
UNIT 4/IV			
15,16	CMOS Differential amplifier; Output amplifiers ,CMOS OPAMP ,Switched capacitor filter	2	2

IDEAL INSTITUTE OF ENGINEERING
KALYANI

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WBUT SYLLABUS

Subject: **WIRELESS COMMUNICATION AND NETWORKS**
Code: EC 701
Semester / Branch: 7th Semester/ ECE
Credit: 3

MODULE – I:
Cellular Mobile Wireless Networks: Systems and Design Fundamentals: **6L**
Brief introduction to mobile wireless communication and systems, Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering, Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring, Co-channel and Adjacent channel interferences, Channel assignment schemes – Fixed channel, Dynamic channel and Hybrid channel, mobility management – location management and handoff management, handoff process, different types of handoff.

Characteristics of wireless channel and propagation path loss models: **6L**
Different Multi-path propagation mechanisms, Multi-path effects on mobile communication, Fading, different types of fading, small and large scale fading, slow and fast fading, narrowband and wideband fading, Inter symbol interference, fast fading model, Doppler effect due to velocity of mobiles, Rayleigh envelop, free space propagation model, two ray ground reflection model, log distance path loss model, log normal shadowing model, macro and micro cell propagation models, types of base stations and mobile station antennas.

MODULE – II:
Modern Mobile Wireless Communication **Systems** **2L**
Evolution strategies – First Generation (1G) to Fourth Generation (4G), Personal Area Networks :PAN,

Low Tier Wireless System: Cordless Telephone, Second Generation (CT2), Digital European Cordless Telecommunications (DECT), Public wide-area Wireless Networks: 1 G to 3G cellular networks

Multiple Access Technologies in cellular communication 3L

Time division multiple access (TDMA), narrowband and wideband TDMA, synchronous and asynchronous TDMA, Frequency division multiple access (FDMA), Code Division Multiple Access (CDMA), Direct-sequence CDMA, spread spectrum technique, spectral efficiency of different wireless access technologies: Spectral Efficiency in FDMA system, Spectral Efficiency in TDMA system, Spectral Efficiency for DS-CDMA system

Cellular Communication Networks and Systems

Second generation (2G) Network: 3L

Global system for mobile communication (GSM): Architecture and Protocols Air Interface, GSM spectrum, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multi-frame, Control (Signaling) Channel Multi-frame, Frames, Multi-frames, Superframes And Hyper-frames, GSM Call Set up Procedure, Location Update Procedure, Routing of a call to a Mobile Subscriber

The concept of packet data services 3L

The 2.5 G General Packet Radio Services: GPRS Networks Architecture, GPRS Interfaces and Reference Points, GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures, Session Management and PDP Context, Data Transfer through GPRS Network and Routing, The IP Internetworking Model

Overview of CDMA systems: 3L

IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS) CDMA based IS-95 Systems, forward link and reverse link for IS-95, handoff process in CDMA based IS-95 network. UMTS Network Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution UMTS Release 4 and 5, UMTS FDD and TDD, UMTS Channels, Logical Channels, UMTS Time Slots

MODULE – III:

Wireless Local Area Networks (WLAN): IEEE 802.11 Standards and Protocols 4L

IEEE 802.11 standards, WLAN family, WLAN transmission technology, WLAN system architecture, Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA), Frequency Hopping Spread Spectra, 802.11 PHY and MAC layers, IEEE 802.11 Distributed Coordination function (DCF) and Point coordination function (PCF), Back off algorithm, Virtual carrier sense, MAC frame format. Security and QoS issues, WLAN applications

Wireless Broadband Networks and Access 3L

Evolution of broadband wireless, IEEE 802.16 standards : **WiMAX** , Spectrum Allocation, IEEE 802.16 Standard Architecture, Overview of WiMAX PHY, IEEE 802.16 MAC Layer, IEEE 802.16 Scheduling Services, Unsolicited Grant Service (UGS), Real-time Polling Service (rtPS), Non-realtime Polling Service (nrtPS), Best Effort (BE) Overview of 3G Long Term Evolution (3G LTE) for broadband wireless communication, Orthogonal Frequency Division Multiple Access (OFDMA)

MODULE – IV:

Mobile Internet Protocol 3L

Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Configuring PDP Addresses on Mobile Station, Mobility Classification, Seamless Terminal Mobility Management, Limitations of current TCP/IP networks for mobility support, Mobility solution, Accessing External PDN through GPRS/UMTS PS Domain, Transparent Access, Use of Mobile IP for Non-transparent access, Dynamically 4accesses IP address from External Network.

Alloted Hrs: 36 L

TEXT BOOKS:

1. Wireless Communications: Principles and Practice,
T.S.Rappaport, PHI Learning.

2. Wireless Communication and Networks : 3G and Beyond,
I. Saha Misra, TMH Education.
3. Wireless Networks: Applications and Protocols,
T. S. Rappaport, Pearson Education
4. Wireless Communications,
A. Goldsmith, Cambridge University Press.

REFERENCE BOOKS:

1. Lee's Essentials of Wireless Communications,
MH Prof. Med/Tech
2. Wireless Digital Communications: Modulations and Spread Spectrum Applications,
K. Feher, Prentice Hall.
3. Wireless Communications and Networking,
J.W.Mark and W. Zhuang, PHI.

COURSE PLAN

Name of the Faculty: SOUMIK SEN
Subject with code: WIRELESS COMMUNICATION (Code: EC 701)
Semester / Branch: 7^{TH} SEMESTER/ ECE

Detailed Plan for Lectures:

LECTURE NO	CONTENT	NO OF LECTURE	NAME OF BOOK	E-LEARNING REFERENCES
MODULE 1[12L]				
UNIT 1/I – CELLULAR MOBILE WIRELESS NETWORKS: SYSTEMS AND DESIGN FUNDAMENTALS[6L]				
1.	Brief introduction to mobile wireless communication and systems, Description of cellular system, Cellular Structure	1	T1,T2	-
2	Frequency Reuse, Cell clustering	1	T1,T2	-
3	Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring	1	T1,T2	-
4	Co-channel and Adjacent channel interferences, Channel assignment schemes – Fixed channel, Dynamic channel and Hybrid channel	1	T1,T2	-
5	mobility management –location management and handoff management, handoff process, different types of handoff.	1	T2	-
6	Mathematical Deductions & Probleems	1	T2	-
UNIT 1/ II- CHARACTERISTICS OF WIRELESS CHANNEL AND PROPAGATION PATH LOSS MODELS [6L]				
7	Different Multi-path propagation mechanisms, Multi-path effects on mobile communication	1	T2	-
8	Fading, different types of fading, small and large scale fading, slow and fast fading, narrowband and wideband fading	1	T2	-
9	Inter symbol interference, fast fading model, Doppler effect due to velocity of mobiles	1	T2	-
10	Rayleigh envelop, free space propagation model	1	T2	-
11	two ray ground reflection model, log distance path loss model, log normal shadowing model, Mathematical problem	1	T2	-
12	macro and micro cell propagation models, types of base stations and mobile station antennas.	1	T2	-
MODULE 2[14L]				
UNIT 2/I- *MODERN MOBILE WIRELESS COMMUNICATION* SYSTEMS [2L]				
13	Evolution strategies – First Generation (1G) to Fourth	1	T1,T2	-

	Generation (4G), Personal Area Networks :PAN, Low Tier Wireless System: Cordless Telephone,			
14	Second Generation (CT2), Digital European Cordless Telecommunications (DECT), Public wide-area Wireless Networks: 1 G to 3G cellular networks	1	T1,T2	-
UNIT 2/II- MULTIPLE ACCESS TECHNOLOGIES IN CELLULAR COMMUNICATION[3L]				
15	Time division multiple access (TDMA), narrowband and wideband TDMA, synchronous and asynchronous TDMA, Frequency division multiple access (FDMA),	1	T1,T2	-
16	Code Division Multiple Access(CDMA), Direct-sequence CDMA, spread spectrum technique	1	T1,T2	-
17	spectral efficiency of different wireless access technologies: Spectral Efficiency in FDMA system, Spectral Efficiency in TDMA system, Spectral Efficiency for DS-CDMA system	1	T1,T2	-
UNIT 2/III/I- 2G NETWORK [3L]				
18	Global system for mobile communication (GSM): Architecture and Protocols Air Interface, GSM spectrum, GSM Multiple Access Scheme	1	T1,T2	-
19	GSM Channel Organization, Traffic Channel multi-frame, Control (Signaling) Channel Multi-frame, Frames, Multi-frames, Superframes And Hyper-frames	1	T1,T2	-
20	GSM Call Set up Procedure, Location Update Procedure, Routing of a call to a Mobile Subscriber	1	T1,T2	-
UNIT 2/III/II THE CONCEPT OF PACKET DATA SERVICES [3L]				
21	The 2.5 G General Packet Radio Services: GPRS Networks Architecture, GPRS Interfaces and Reference Points	1	T1,T2	-
22	GPRS Mobility Management Procedures, GPRS Attachment and Detachment Procedures, Session Management and PDP Context	1	T1,T2	-
23	Data Transfer through GPRS Network and Routing, The IP Internetworking Model	1	T1,T2	-
UNIT 2/III/III- OVERVIEW OF CDMA SYSTEMS [3L]				
24	IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS) CDMA based IS-95 Systems, forward link and reverse link for IS-95	1	T1,T2	-
25	handoff process in CDMA based IS-95 network. UMTS Network Architecture – Release 99, UMTS Interfaces, UMTS Network Evolution UMTS Release 4 and 5	1	T2	-
26	UMTS FDD and TDD, UMTS Channels, Logical Channels, UMTS Time Slots	1	T2	-
MODULE - 3 [7L]				
UNIT 3/I- WIRELESS LOCAL AREA NETWORKS (WLAN): IEEE 802.11 STANDARDS AND				

PROTOCOLS [4L]				
27	IEEE 802.11 standards, WLAN family, WLAN transmission technology, WLAN system architecture	1	T2	-
28	Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance(CSMA/CA), Frequency Hopping Spread Spectra	1	T2	-
29	802.11 PHY and MAC layers, IEEE 802.11 Distributed Coordination function (DCF) and Point coordination function (PCF), Back off algorithm	1	T2	-
30	Virtual carrier sense, MAC frame format. Security and QoS issues, WLAN applications	1		-
UNIT 3/II WIRELESS BROADBAND NETWORK AND ACCESS [3L]				
31	Evolution of broadband wireless, IEEE 802.16 standards : WiMAX , Spectrum Allocation, IEEE 802.16 Standard Architecture, Overview of WiMAX PHY, IEEE 802.16 MAC Layer	1	T2	-
32	IEEE 802.16 Scheduling Services, Unsolicited Grant Service (UGS), Real-time Polling Service (rtPS), Non-realtime Polling Service (nrtPS),	1	T2	-
33	Best Effort (BE) Overview of 3G Long Term Evolution (3G LTE) for broadband wireless communication, Orthogonal Frequency Division Multiple Access (OFDMA)	1	-	www.cse.wustl.edu/~jain/cse574-08/ftp/**lte.pdf** santos.ee.ntu.edu.tw/mobile2011/13.**pdf-**
MOBILE INTERNET PROTOCOL [3L]				
34	Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling	1	-	ccis2k.org/iajit/**PDF**/vol.4,no.2/10-Fayza.**pdf**
35	MIPv4 Triangular Routing, Configuring PDP Addresses on Mobile Station, Mobility Classification, Seamless Terminal Mobility Management, Limitations of current TCP/IP networks for mobility support, Mobility solution	1	-	www.cs.rice.edu/~dbj/pubs/cluster-optim.**pdf** www.free.net/NTL/IP6/presentation/mipv6english.**pdf**
36	Accessing External PDN through GPRS/UMTS PS Domain, Transparent Access, Use of Mobile IP for Non-transparent access, Dynamically 4accesses IP address from External Network.	1	-	doc.utwente.nl/65994/1/tr-ctit-99-21.**pdf**