SRK INSTITUTE OF TECHNOLOGY, ENIKEPADU, VIJAYAWADA -521108
Approved by AICTE, Affiliated to JNTUK, Kakinada
ISO 9001:2015 Certified Institution
Accredited with NAAC 'A' grade
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Tentative Lesson Plan

Course / Code: Electronic Devices and Circuits / R2021041

Year / Semester: II / I Section-I **Academic Year:** 2022-23

S.No	TOPIC	Date	Mode of Delivery
Unit – 1: Review of Semiconductor Physics and Junction Diode Characteristics **CO1**: Analyze the behavior of PN junction under deferent bias conditions and characteristics of diode **TB1:** Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition. **TB2:** Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.			
1	Energy band diagram of PN junction Diode	**From: 05-9-2022** **To: 30-9-2022**	Lecture Interspersed With discussions
2	basics		
3	Open circuited p-n junction Biased p-n diode		
4	V-I Characteristics		
5	Current components in PN junction Diode		
6	Diode equation		
7	Temperature dependence on VI characteristics		
8	Diode resistance, Diode capacitance		
9	Hall effect		
10	Continuity equation		
11	Fermi Dirac function		
12	Fermi level in intrinsic and extrinsic Semiconductors		
Unit – 2: Special Semiconductor Devices , Rectifiers and filters **CO2:** Classify different types of special diode and rectifiers, describe their operation **TB1:** Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition. **TB2:** Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition			
13	Breakdown mechanisms, Zener Diode, tunnel diode	**From: 1-10-2022**	Lecture interspersed
14	Zener diode applications		
15	LED		
16	Varactor Diode, Photodiode		
17	UJT		
18	SCR- Construction, operation and V-I characteristics.		
19	Basic Rectifier setup		
20	Half wave rectifier		
21	Full wave rectifier		
22	Bridge rectifier		

23	Filters: Inductor filter	To: 29-10-2022	with discussions
24	Capacitor filter		
25	LC filter, π- Filter		
26	Comparison of various filter circuits in terms of ripple factors.		

Unit – 3: Transistor Characteristics

CO3: Describe construction, working and VI characteristics of BJTs and JFETs

TB1: Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
TB2: Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition

27	Junction transistor, transistor current components	From: 01-11-2022 To: 03-12-2022	Lecture interspersed with discussions
28	Transistor equation		
29	transistor configurations		
30	transistor as an amplifier		
31	Characteristics of CE and CB configuration		
32	Characteristics of CC, Punch through		
33	Ebers-Moll model of a transistor, Typical transistor junction voltage values		
34	Comparison between CE, CB, CC configurations		
35	Problems, Photo transistor		
36	FET types		
37	Construction, Operation of JFET		
38	Characteristics of JFET		
39	μ, gm, rd parameters		
40	Depletion MOSFET-types, construction, operation, characteristics		
41	Enhancement MOSFET-types, construction, operation, characteristics		
42	Comparison between JFET and MOSFET		
43	Problems		

UNIT-IV: Transistor Biasing and Thermal Stabilization

CO4: Analyze various biasing, stabilization and compensation techniques for BJT and JFET

TB1: Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.

TB2: Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.

44	Need for biasing, operating point, load line analysis	From: 06-12-2022	Lecture
45	BJT biasing methods: fixed bias		
46	Collector to base bias		
47	Self bias		

48	Stabilization against variations in V_{BE} ,Ic, and β	To: 20-12-2022	interspersed with discussions
49	Bias compensation		
50	Thermal runaway, Thermal stability		
51	FET Biasing methods		
52	Stabilization		

UNIT-V: Small Signal Low Frequency Transistor Amplifier Models

CO5: Design transistor amplifiers using small signal model and compute various parameters related to amplifiers

TB1: Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
TB2: Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition

53	**BJT:** Two port network, Transistor hybrid model,	From: 23-12-2022	Lecture interspersed with discussions
54	determination of h-parameters,		
55	Conversion of h parameters		
56	generalized analysis of transistor amplifier model using h-parameters,		
57	Analysis of CB amplifier using exact and approximate analysis		
58	Analysis of CE amplifiers using exact and approximate analysis		
59	Analysis of CC amplifiers using exact and approximate analysis		
60	Comparison of transistor amplifiers	To: 31-12-2022	
61	**FET:** Generalized analysis of small signal model,		
62	Analysis of CG amplifier		
63	Analysis of CS amplifier		
64	Analysis of CD amplifier		
65	comparison of FET amplifiers		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Tentative Lesson Plan

Course / Code: Electronic Devices and Circuits / R2021041

Year / Semester: II / I sec - II **Academic Year:** 2022-23

Tools: Black Board

No. of Periods	TOPIC	Date	Mode of Delivery
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15	LED		
16	Varactor Diode, Photodiode		
17	UJT		

15	LED	From: 1-10-2022 To: 29-10-2022	Lecture interspersed with discussions
16	Varactor Diode, Photodiode		
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18	SCR- Construction, operation and V-I characteristics.		
19	Basic Rectifier setup		
20	Half wave rectifier		
21	Full wave rectifier		
22	Bridge rectifier		
23	Filters: Inductor filter		
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25	LC filter, π- Filter		
26	Comparison of various filter circuits in terms of ripple factors.		
Unit – 3: Transistor Characteristics **CO3:** Describe construction, working and VI characteristics of BJTs and JFETs **TB1:** Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition. **TB2:** Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition			
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29	transistor configurations		
30	transistor as an amplifier		
31	Characteristics of CE and CB configuration		
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33	Ebers-Moll model of a transistor, Typical transistor junction voltage values		
34	Comparison between CE, CB, CC configurations		
35	Problems, Photo transistor		
36	FET types		
37	Construction, Operation of JFET		
38	Characteristics of JFET		
39	μ, gm, rd parameters		
40	Depletion MOSFET-types, construction, operation, characteristics		
41	Enhancement MOSFET-types, construction, operation, characteristics		
42	Comparison between JFET and MOSFET		
43	Problems		
UNIT-IV: Transistor Biasing and Thermal Stabilization			

CO4: Analyze various biasing, stabilization and compensation techniques for BJT and JFET

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44	Need for biasing, operating point, load line analysis	**From: 06-12-2022**	Lecture interspersed with discussions
45	BJT biasing methods: fixed bias		
46	Collector to base bias		
47	Self bias		
48	Stabilization against variations in V_{BE} ,Ic, and β	**To: 20-12-2022**	
49	Bias compensation		

UNIT-V: Small Signal Low Frequency Transistor Amplifier Models

CO5: Design transistor amplifiers using small signal model and compute various parameters related to amplifiers

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TB2: Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition

50	Thermal runaway, Thermal stability	**From: 23-12-2022**	Lecture interspersed with discussions
51	FET Biasing methods		
52	Stabilization		
53	**BJT:** Two port network, Transistor hybrid model,		
54	determination of h-parameters,		
55	Conversion of h parameters		
56	generalized analysis of transistor amplifier model using h-parameters,		
57	Analysis of CB amplifier using exact and approximate analysis		
58	Analysis of CE amplifiers using exact and approximate analysis	**To: 31-12-2022**	
59	Analysis of CC amplifiers using exact and approximate analysis		
60	Comparison of transistor amplifiers		
61	**FET:** Generalized analysis of small signal model,		
62	Analysis of CG amplifier		
63	Analysis of CS amplifier		
64	Analysis of CD amplifier		
65	comparison of FET amplifiers		

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Date: 3/9/22

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Date: 3/9/22

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TENTATIVE LESSON PLAN

Course/Code: Switching Theory And Logic Design/ R2021042

Year / Semester : II/I **Section:** I **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I REVIEW OF NUMBER SYSTEMS & CODES AND BOOLEAN THEOREMS AND LOGIC OPERATIONS:			
CO1: An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.			
TB1: Digital Design, 5/e, M. Morris Mano, Michael D Ciletti, PEA.			
1	Review of Number Systems & Codes	From: 5-9-2022 To: 22-9-2022	Lecture interspersed with discussions
2	Representation of Numbers of Different Radix		
3	Conversion from One Radix to Another Radix		
4	R-1's Compliments		
5	R's Compliments of Signed Numbers		
6	Gray Code		
7	4 - Bit Codes		
8	BCD Codes and Arithmetic		
9	Excess – 3 Code and Arithmetic		
10	2421, 84-2-1 codes		
11	Error Detection Codes		
12	Error Correction Codes		
13	Parity Checking		
14	Even Parity		
15	Odd Parity		
16	Hamming code		
17	Boolean Theorems and Logic Operations		
18	Postulates of Boolean Algebra		
19	Principle of Complementation & Duality		
20	De-Morgan Theorems		
21	Basic Logic Operations -NOT, OR		
22	AND, Universal Logic operations		
23	EX-OR, EX-NOR Operations		

24	Standard SOP and POS Forms	From: 5-9-2022 To: 22-9-2022	Lecture interspersed with discussions
25	Standard POS Forms		
26	NAND-NAND And NOR-NOR Realizations		
27	Realization of three level logic circuits		
28	Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404.		
29	Study the pin diagram and obtain truth table for the following relevant ICs 7408,7432,7486.		
UNIT-II MINIMIZATION TECHNIQUES AND COMBINATIONAL LOGIC CIRCUITS DESIGN:			
CO2: An ability to understand the different switching algebra theorems and apply them for logic functions.			
TB1: Digital Design, 5/e, M. Morris Mano, Michael D Ciletti, PEA.			
30	Minimization and realization of switching functions using Boolean theorems	From: 27-9-2022 To: 22-10-2022	Lecture interspersed with discussions
31	Problems on Minimization		
32	K-Map (up to 6 variables)		
33	Tabular Method (Quine-McCluskey Method) With Only Four Variables		
34	Design of Half adder, full adder		
35	Design of half subtractor, full subtractor		
36	Applications of Full Adders		
37	4-bit adder-subtractor circuit, BCD adder circuit		
38	Excess 3 adder circuit and carry look-a-head adder circuit		
39	Design code converts using Karnaugh method and draw the complete circuit diagrams		
UNIT-III COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI AND INTRODUCTION OF PLD's:			
CO3: An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.			
TB2: Digital Logic and Computer Design, M. Morris Mano, PEA.			

40	Design of Encoder, Decoder	From: 25-10-2022 To: 10-11-2022	Lecture interspersed with discussions
41	Multiplexer and De-Multiplexers		
42	Implementation of higher order circuits using lower order circuits		
43	Realization of Boolean functions using decoders and multiplexers		
44	Realization of Boolean functions using decoders and multiplexers		
45	Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154		
46	PLDs: PROM, PAL, PLA -Basics structures		
47	Realization of Boolean functions		
48	Programming table.		
UNIT-IV SEQUENTIAL CIRCUITS I: **CO4:** Able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays. **TB2: Digital Logic and Computer Design, M. Morris Mano, PEA.**			
49	Classification of sequential circuits (synchronous and asynchronous)	From: 19-11-2022 To: 16-12-2022	Lecture interspersed with discussions
50	operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop		
51	JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals		
52	Conversion from one flip-flop to another flip-flop		
53	Design of 5ripple counters		
54	Design of synchronous counters, Johnson counter, ring counter		
55	Design of registers - Buffer register, control buffer register		
56	Shift register, Bi-Directional shift register		
57	Universal Shift Register		
58	Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121		
UNIT-V SEQUENTIAL CIRCUITS II: **CO5:** Able to design various sequential circuits starting from flip-flop to registers and counters. **TB2: Digital Logic and Computer Design, M. Morris Mano, PEA.**			
59	Finite State Machine; State Diagrams, State Tables		
60	Reduction of state tables		
61	Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa		

62	Realization of sequence generator	From: 17-12-2022 To: 31-12-2022	Lecture interspersed with discussions
63	Design of Clocked Sequential Circuit to detect the given sequence (with overlapping)		
64	Design of Clocked Sequential Circuit to detect the given sequence (without overlapping)		
65	State Diagrams & State Table		
66	Revision		
67	Revision		
68	Revision		
69	Revision		
70	Revision		
71	Revision		
72	Revision		
73	Revision		
74	Revision		
75	Revision		
76	Revision		
77	Revision		

TB1: Digital Design, 5/e, M. Morris Mano, Michael D Ciletti, PEA.
TB2: Digital Logic and Computer Design, M. Morris Mano, PEA.

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TENTATIVE LESSON PLAN

Course/Code: Switching Theory And Logic Design/ R2021042

Year / Semester : II/I **Section:** II **A.Y:** 2022-23

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CO1: An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.			
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TB1: Digital Design, 5/e, M. Morris Mano, Michael D Ciletti, PEA.
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A. Ramya
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TENTATIVE LESSON PLAN

Course/Code: Signals and Systems / R2021043

Year / Semester : II/I **Section:** I **A.Y:** 2022-23

S.NO.	TOPIC	Date	Mode of Delivery
UNIT-I INTRODUCTION **CO1: Analyze the characteristics of signals, systems and principles of vector space.** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
1	Introduction, Definition of Signals and Systems	**From: 05 /09/22 To: 21/09/22**	Lecture interspersed with discussions
2	Classification of Signals, problems on classification		
3	Basic Elementary Signals		
4	Operations on signals: on time and amplitude		
5	Problems on time scaling and amplitude scaling		
6	Problems on time scaling and amplitude scaling		
7	Orthogonal signal space ,signal approximation using orthogonal functions		
8	Mean Square Error , Closed or complete set of orthogonal functions		
9	Orthogonality in complex functions		
10	Related problems, Tutorial		
UNIT-II FOURIER SERIES AND FOURIER TRANSFORM **CO2: Examine the continues time signals and continues time systems using Fourier series and Fourier Transform.** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
11	Fourier Series Representation of CT signals, Dirichlet's conditions		
12	Trigonometric Fourier Series		

13	Exponential Fourier Series	From: 23/09/22 To 11/10/22	Lecture interspersed with discussions
14	Relation between TFS and EFS		
15	Complex Fourier Spectrum		
16	Properties of Fourier Series		
17	Related Problems		
18	Fourier Transform from Fourier Series		
19	Fourier Transform for standard signals		
20	Properties of Fourier Transforms		
21	Inverse Fourier Transform and related problems		
22	Fourier Transform for periodic signals		
23	Fourier Transform Involving impulse function and signum function		
24	Introduction to Hilbert Transform, Related problems		
UNIT-III SAMPLING THEOREM **CO3: Apply sampling theorem and evaluate the concept of Convolution, correlation Energy and Power density spectrum and their relationship** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
25	Unit.3 Introduction, linear systems, Impulse response of linear systems.	From: 12/10/22 To: 10/11/22	Lecture interspersed with discussions
26	LTI and LTV systems		
27	Concept of convolution in time and frequency domain		
28	Transfer function of LTI system, Related problem		
29	Filter Characteristics of Linear System		
30	Distortion less Transmission Through a System		
31	Signal bandwidth, System bandwidth, Ideal LPF,HPF,BPF &BRF characteristics		
32	Causality and poly-Winer criterion for physically realization		
33	Relationship between rise time and bandwidth		

	,problems		
34	Convolution by graphical method		
35	Problems		
36	Tutorials		
37	Problems		
UNIT-IV ANALYSIS OF LINEAR SYSTEMS **CO4: Determine relationship among the various representations of LTI systems.** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
38	Auto and Cross Correlation function	**From: 12/11/21 To: 02/12/22**	Lecture interspersed with discussions
39	Properties of Correlation function		
40	Problems		
41	Energy density Spectrum, Parsevals theorem		
42	Power density spectrum, relation between auto and cross		
43	Detection of periodic signals in noise		
44	Extraction of signals from noise by filtering		
45	Introduction to sampling theorem		
46	Effect of under sampling ,Band pass sampling		
47	Related problems		
UNIT-V LAPLACE TRANSFORMS AND Z – TRANSFORMS CO5: Apply Laplace Transform and z-transforms to analyze continues and discrete time signals . **TB1: Signals and Systems by A. Anand Kumar, PHI**			
48	Introduction to LT	**From: 3/12/22 To: 24/12/22**	Lecture interspersed with discussions
49	Region of convergence		
50	Properties of Laplace Transform		
51	Inverse Laplace Transform		
52	Relation between L.T and F.T		
53	L.T using wave form synthesis		
54	Concept of Z-transforms		
55	Region of convergence		
56	Relation between L.T and F.T		
57	L.T using wave form synthesis		
58	Concept of Z-transforms		
59	Inverse Z-transforms		
60	Properties of Z-transforms		
61	Distribution between L.T,Z.T and F.T		
62	Problems		

TB1: Signal and Systems by A. Anand Kumar, PHI

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TENTATIVE LESSON PLAN

Course/Code: Signals and Systems / R2021043

Year / Semester : II/I **Section:** II **A.Y:** 2022-23

S.NO.	TOPIC	Date	Mode of Delivery
UNIT-I INTRODUCTION **CO1: Analyze the characteristics of signals, systems and principles of vector space.** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
1	Introduction, Definition of Signals and Systems	**From: 05 /09/22 To: 20/09/22**	Lecture interspersed with discussions
2	Classification of Signals, problems on classification		
3	Basic Elementary Signals		
4	Operations on signals: on time and amplitude		
5	Problems on time scaling and amplitude scaling		
6	Problems on time scaling and amplitude scaling		
7	Orthogonal signal space ,signal approximation using orthogonal functions		
8	Mean Square Error , Closed or complete set of orthogonal functions		
9	Orthogonality in complex functions		
10	Related problems, Tutorial		
UNIT-II FOURIER SERIES AND FOURIER TRANSFORM **CO2: Examine the continues time signals and continues time systems using Fourier series and Fourier Transform.** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
11	Fourier Series Representation of CT signals, Dirichlet's conditions		
12	Trigonometric Fourier Series		

13	Exponential Fourier Series	From: 23/09/22 To 12/10/22	Lecture interspersed with discussions
14	Relation between TFS and EFS		
15	Complex Fourier Spectrum		
16	Properties of Fourier Series		
17	Related Problems		
18	Fourier Transform from Fourier Series		
19	Fourier Transform for standard signals		
20	Properties of Fourier Transforms		
21	Inverse Fourier Transform and related problems		
22	Fourier Transform for periodic signals		
23	Fourier Transform Involving impulse function and signum function		
24	Introduction to Hilbert Transform, Related problems		
UNIT-III SAMPLING THEOREM **CO3: Apply sampling theorem and evaluate the concept of Convolution, correlation Energy and Power density spectrum and their relationship** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
25	Unit.3 Introduction, linear systems, Impulse response of linear systems	From:12/10 /22 To:10/11/22	Lecture interspersed with discussions
26	LTI and LTV systems		
27	Concept of convolution in time and frequency domain		
28	Transfer function of LTI system, Related problem		
29	Filter Characteristics of Linear System		
30	Distortion less Transmission Through a System		
31	Signal bandwith, System bandwidth, Ideal LPF,HPF,BPF &BRF Charistrics		
32	Causality and poly-Winer criterianfor physically realization		
33	Relationship between rise time and bandwidth		

	,problems		
34	Convolution by graphical method		
35	Problems		
36	Tutorials		
37	Problems		
UNIT-IV ANALYSIS OF LINEAR SYSTEMS **CO4: Determine relationship among the various representations of LTI systems.** **TB1: Signals and Systems by A. Anand Kumar, PHI**			
38	Auto and Cross Correlation function	**From: 11/11/21 To: 02/12/22**	Lecture interspersed with discussions
39	Properties of Correlation function		
40	Problems		
41	Energy density Spectrum, Parsevals theorem		
42	Power density spectrum, relation between auto and cross		
43	Detection of periodic signals in noise		
44	Extraction of signals from noise by filtering		
45	Introduction to sampling theorem		
46	Effect of under sampling ,Bandpass sampling		
47	Related problems		
UNIT-V LAPLACE TRANSFORMS AND Z – TRANSFORMS CO5: Apply Laplace Transform and z-transforms to analyze continues and discrete time signals . **TB1: Signals and Systems by A. Anand Kumar, PHI**			
48	Introduction to LT	**From: 3/12/22 To: 23/12/22**	Lecture interspersed with discussions
49	Region of convergence		
50	Properties of Laplace Transform		
51	Inverse Laplace Transform		
52	Relation between L.T and F.T		
53	L.T using wave form synthesis		
54	Concept of Z-transforms		
55	Region of convergence		
56	Relation between L.T and F.T		
57	L.T using wave form synthesis		
58	Concept of Z-transforms		
59	Inverse Z-transforms		
60	Properties of Z-transforms		
61	Distribution between L.T,Z.T and F.T		
62	Problems		

TB1: Signal and Systems by A. Anand Kumar, PHI

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Random Variables and Stochastic Processes / R2021044

Year / Semester : II/I **Section:** I **A.Y:** 2022-23

S.No	TOPIC	Date	Mode of Delivery
UNIT –I THE RANDOM VARIABLE **CO1: Describe the concept of Random Variable, functions based on Random Variable like distribution and density functions.** **TB : Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4 th Edition, 2001.**			
1	Introduction, Definition of a Random Variable, Conditions for a Function to be a Random Variable.	**From: 05/09/2022 To: 29/09/2022**	Lecture interspersed with discussions
2	Discrete, Continuous and Mixed random variable		
3	Density Function, Properties		
4	Distribution function, Properties		
5	Binomial, Poisson density functions		
6	Uniform , Gaussian Density functions		
7	Exponential, Rayleigh Density functions		
8	Conditional distribution and properties, conditional density		
9	Related problems.		
10	Tutorial		
UNIT –II OPERATION ON ONE RANDOM VARIABLE- EXPECTATIONS **CO2: Determine the expected value, moments on one random variable and their transformations.** **TB : Probability, Random Variables & Random Signal Principles, Peyton Z.Peebles, TMH, 4 th Edition, 2001.**			
11	Introduction, Expected value of a Random Variable, Functions	**From: 29/09/2022 To: 26/10/2022**	Lecture interspersed with discussions
12	Moments about the origin, Central moments		
13	Central moments ,Variance and skew		
14	Characteristic function		
15	Moment generation function		
16	Chebychev's Inequality		
17	Transformations of a random variable: Monotonic transformations for a continuous random variable		
18	Non-monotonic transformations of continuous random variable, Problems		

UNIT –III MULTIPLE RANDOM VARIABLES

CO3: Illustrate the concepts of joint distribution and density functions on multiple random variables and their transformations.

TB: Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4 th Edition, 2001.

19	Vector Random Variables	**From: 27/10/2022 To: 30/11/2022**	Lecture interspersed with discussions
20	Joint Distribution Function, Properties of Joint Distribution		
21	Marginal distribution function		
22	Conditional distribution and density functions		
23	Statistical independence, sum of two random variables		
24	Central limit theorem: Unequal distribution, Equal distribution		
25	Problems		
26	Revision		
	OPERATIONS ON MULTIPLE RANDOM VARIABLES		
27	Joint moments about the origin		
28	joint central moments		
29	Joint characteristic function		
30	Jointly Gaussian Random Variables, N Random Variable		
31	Transformations of multiple random variables		
32	Problems on moments, Linear Transformations of Gaussian		
33	Jointly moment generating function		
34	Problems		
35	Tutorial		

UNIT –IV RANDOM PROCESSES – TEMPORAL CHARACTERISTICS

CO4: Analyse the statistical characteristics of stochastic processes like auto correlation and cross correlation functions.

TB : Probability, Random Variables & Random Signal Principles, Peyton Z.Peebles, TMH, 4 th Edition, 2001.

36	Random process concept	**From: 3/12/2022 To: 14/12/2022**	Lecture interspersed with discussions
37	Classification of process, Deterministic and Non- deterministic processes, Distribution and density functions		
38	Statistically independent process		
39	Stationary processes-First order, 2nd order, Wide-sense, strict-sense stationary		
40	Time averages, Ergodicity		
41	Autocorrelation Function and properties		
42	Cross-correlation function & properties, Covariance functions		
43	Gaussian random process, Poisson random process, problems		

UNIT – V RANDOM PROCESSES- SPECTRAL CHARACTERISTICS

CO5: Derive the Power Density Spectrum and Cross Power Density Spectrum of signals.

TB : : Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4 th Edition, 2001.

44	The power spectrum: properties, Relationship between Power Spectrum and Autocorrelation Function		
45	The Cross Power Density Spectrum		

	Relationship between Cross power spectrum and cross correlation function	**From: 15/12/2022** **To: 26/12/2022**	Lecture interspersed with discussions
46	Linear systems with Random inputs		
47	Random signal response of linear system		
48	Auto correlation and cross correlation		
49	Mean and mean- squared value of system response		
50	Cross power density spectra of input and output		
51	Narrow band processes, properties, Problems		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Random Variables and Stochastic Processes / R2021044

Year / Semester : II/I **Section:** II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I THE RANDOM VARIABLE **CO1: Describe the concept of Random Variable, functions based on Random Variable like distribution and density functions.** **TB : Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4 th Edition, 2001.**			
1	Introduction, Definition of a Random Variable, Conditions for a Function to be a Random Variable.	**From: 05/09/2022 To: 21/09/2022**	Lecture interspersed with discussions
2	Discrete, Continuous and Mixed random variable		
3	Density Function, Properties		
4	Distribution function, Properties		
5	Binomial, Poisson density functions		
6	Uniform , Gaussian Density functions		
7	Exponential, Rayleigh Density functions		
8	Conditional distribution and properties, conditional density		
9	Related problems.		
10	Tutorial		
UNIT –II OPERATION ON ONE RANDOM VARIABLE- EXPECTATIONS **CO2: Determine the expected value, moments on one random variable and their transformations.** **TB : Probability, Random Variables & Random Signal Principles, Peyton Z.Peebles, TMH, 4 th Edition, 2001.**			
11	Introduction, Expected value of a Random Variable, Functions	**From: 23/09/2022 To: 15/10/2022**	Lecture interspersed with discussions
12	Moments about the origin, Central moments		
13	Central moments ,Variance and skew		
14	Characteristic function		
15	Moment generation function		
16	Chebychev's Inequality		
17	Transformations of a random variable: Monotonic transformations for a continuous random variable		
18	Non-monotonic transformations of continuous random variable, Problems		

45	The Cross Power Density Spectrum Relationship between Cross power spectrum and cross correlation function	**From: 14/12/2022** **To: 26/12/2022**	Lecture interspersed with discussions
46	Linear systems with Random inputs		
47	Random signal response of linear system		
48	Auto correlation and cross correlation		
49	Mean and mean- squared value of system response		
50	Cross power density spectra of input and output		
51	Narrow band processes, properties, Problems		

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UNIT –III MULTIPLE RANDOM VARIABLES

CO3: Illustrate the concepts of joint distribution and density functions on multiple random variables and their transformations.

TB: Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4 th Edition, 2001.

19	Vector Random Variables	**From: 17/10/2022 To: 29/11/2022**	Lecture interspersed with discussions
20	Joint Distribution Function, Properties of Joint Distribution		
21	Marginal distribution function		
22	Conditional distribution and density functions		
23	Statistical independence, sum of two random variables		
24	Central limit theorem: Unequal distribution, Equal distribution		
25	Problems		
26	Revision		
	OPERATIONS ON MULTIPLE RANDOM VARIABLES		
27	Joint moments about the origin		
28	joint central moments		
29	Joint characteristic function		
30	Jointly Gaussian Random Variables, N Random Variable		
31	Transformations of multiple random variables		
32	Problems on moments, Linear Transformations of Gaussian		
33	Jointly moment generating function		
34	Problems		
35	Tutorial		

UNIT –IV RANDOM PROCESSES – TEMPORAL CHARACTERISTICS

CO4: Analyse the statistical characteristics of stochastic processes like auto correlation and cross correlation functions.

TB : Probability, Random Variables & Random Signal Principles, Peyton Z.Peebles, TMH, 4 th Edition, 2001.

36	Random process concept	**From: 3/12/2022 To: 13/12/2022**	Lecture interspersed with discussions
37	Classification of process, Deterministic and Non- deterministic processes, Distribution and density functions		
38	Statistically independent process		
39	Stationary processes-First order, 2nd order, Wide-sense, strict-sense stationary		
40	Time averages, Ergodicity		
41	Autocorrelation Function and properties		
42	Cross-correlation function and its properties, Covariance functions		
43	Gaussian random process, Poisson random process, Problems		

UNIT – V RANDOM PROCESSES- SPECTRAL CHARACTERISTICS

CO5: Derive the Power Density Spectrum and Cross Power Density Spectrum of signals.

TB : : Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4 th Edition, 2001.

44	The power spectrum: properties, Relationship between Power Spectrum and Autocorrelation Function		

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TENTATIVE LESSON PLAN

Course/Code: Constitution of India

Year / Semester: II/II **Section:** I **A.Y:** 2022-23

S.No	TOPIC	Date	Mode of Delivery
UNIT –I Introduction to Indian constitution CO1: To unable the student to understand the importance of Constitution TB : Durga das Basu, Introduction to the constitution of India, Prentice-Hall of India Pvt ltd..New Delhi			
1	Introduction to Indian Constitution	**From: 05/09/2022 To: 29/09/2022**	Lecture interspersed with discussions
2	Meaning and term of Indian Constitution		
3	Constitutional History		
4	Brief history of Dr.Br Ambedkar		
5	Sources of Constitution		
6	Citizenship and its features		
7	Preamble		
8	***Fundamental Rights***		
9	Fundamental Duties		
10	Directive Principles of State policy		
UNIT –II Union govt and its administration CO2: Understand the structure of Indian Govt TB :Subashkashyap, Indian Constitution National book trust			
11	Union Government and its Administration	**From: 29/09/2022 To: 26/10/2022**	Lecture interspersed with discussions
12	Structure of the Indian Union		
13	President Role and powers		
14	**Prime Minister Role and power**		
15	Council of ministers		
16	Cabinet and central secretariat		
17	Loksabha and its role		
18	**Rajyasabha and its role**		

UNIT –III **CO3: Understand the structure of State Govt** **TB: D.C Gupta, Indian govt and politics**			
19	**State government and its administration**	**From: 27/10/2022 To: 30/11/2022**	Lecture interspersed with discussions
20	Governor role and Position		
21	Role of CM		
22	Role of Council of Ministers		
23	State Secretariat Organization		
24	Structure and functions of State Secretariat		
UNIT –IV **CO4: Understand the local administration** **TB : J.Raj, Indian govt and Politics**			
25	District administration Head Role and Importance	**From: 3/12/2022 To: 14/12/2022**	Lecture interspersed with discussions
26	Role of Municipalities		
27	Role of Mayor		
28	Role of Elected Representative		
29	CEO of Municipal Corporation		
30	Panchayat raj its functions		
31	Role of Zila Panchayat		
32	Importance of grass root democracy		
UNIT – V **CO5: Know the role of Election Commission** **TB: J.C Johari , Indian Government & Politics**			
33	Role of Chief Election Commissioner	**From: 15/12/2022 To: 26/12/2022**	Lecture interspersed with discussions
34	Role of State Election Commission		
35	Functions of commissiononerate		
36	Functions of commissions of SC/ST/OBC		
37	Welfare of women		

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TENTATIVE LESSON PLAN

Course/Code: Constitution of India

Year / Semester: II/II **Section:** II **A.Y:** 2022-23

S.No	TOPIC	Date	Mode of Delivery
UNIT –I Introduction to Indian constitution **CO1: To unable the student to understand the importance of Constitution** **TB : Durga das Basu, Introduction to the constitution of India, Prentice-Hall of India Pvt ltd..New Delhi**			
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UNIT –II Union govt and its administration **CO2: Understand the structure of Indian Govt** **TB :Subashkashyap, Indian Constitution National book trust**			
11	Union Government and its Administration	**From: 29/09/2022** **To: 26/10/2022**	Lecture interspersed with discussions
12	Structure of the Indian Union		
13	President Role and powers		
14	**Prime Minister Role and power**		
15	Council of ministers		
16	Cabinet and central secretariat		
17	Loksabha and its role		
18	**Rajyasabha and its role**		

UNIT –III **CO3: Understand the structure of State Govt** **TB: D.C Gupta, Indian govt and politics**			
19	**State government and its administration**	**From: 27/10/2022 To: 30/11/2022**	Lecture interspersed with discussions
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21	Role of CM		
22	Role of Council of Ministers		
23	State Secretariat Organization		
24	Structure and functions of State Secretariat		
UNIT –IV **CO4: Understand the local administration** **TB : J.Raj, Indian govt and Politics**			
25	District administration Head Role and Importance	**From: 3/12/2022 To: 14/12/2022**	Lecture interspersed with discussions
26	Role of Municipalities		
27	Role of Mayor		
28	Role of Elected Representative		
29	CEO of Municipal Corporation		
30	Panchayat raj its functions		
31	Role of Zila Panchayat		
32	Importance of grass root democracy		
UNIT – V **CO5: Know the role of Election Commission** **TB: J.C Johari , Indian Government & Politics**			
33	Role of Chief Election Commissioner	**From: 15/12/2022 To: 26/12/2022**	Lecture interspersed with discussions
34	Role of State Election Commission		
35	Functions of commissiononerate		
36	Functions of commissions of SC/ST/OBC		
37	Welfare of women		

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TENTATIVE LESSON PLAN

Course/Code: Mathematics - III / R2021011

Year / Semester : II/I **Section:** I **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT – I: VECTOR CALCULUS **CO1: To Interpret the physical meaning of different operators such as gradient, curl and divergence. Estimate the work done against a field, circulation and flux using vector calculus.** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
1	**Vector Differentiation:** Introduction	From: 05/09/2022 To 22/09/2022	Lecture interspersed with discussions
2	Properties of vectors and scalars		
3	Derivative of vector – definition		
4	Vector differential operator		
5	Gradient of a vector		
6	Divergence of a vector		
7	Curl of a vector		
8	Properties of gradient		
9	Vector identities		
10	Vector identities		
11	Problems on application of gradient		
12	Problems on divergence and curl		
13	**Vector Integration**: Introduction		
14	Problems on line integral		
15	Problems on line integral		
16	Problems on surface integrals		
17	Problems on volume integrals		
18	Problems on Greens theorem		
19	Problems on Green theorem		
20	Problems on Gauss divergence theorem		
21	Problems on stokes theorem		
UNIT – II: LAPLACE TRANSFORMS **CO2: To apply the Laplace transform for solving differential equations** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
22	Laplace Transforms: Definitions, Existence		
23	Laplace Transform of standard functions		
24	Linearity property; Shifting properties Change of scale property		
25	Laplace Transforms of derivatives; Integrals		
26	$L(t^n f(t))$		

27	Laplace Transforms of division by t	From 23/09/2022 To 12/10/2022	Lecture interspersed with discussions
28	Evaluation of integrals		
29	Laplace Transforms of periodic functions; unit step functions; Unit impulse functions		
30	**Inverse Laplace Transforms:** Finding L^{-1} using partial fractions		
31	Properties of inverse transform		
32	Convolution theorem		
33	Solutions of Difference Equations		
UNIT – III: FOURIER SERIES AND FOURIER TRANSFORMS **CO3: Find or compute the Fourier series of periodic signals. Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms.** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
34	Introduction	From 13/10/2022 To 22/10/2022 & From 31/10/2022 To 12/11/2022	Lecture interspersed with discussions
35	Periodic functions		
36	Fourier series of periodic function		
37	Dirchlets conditions		
38	Even and odd functions		
39	Change of interval		
40	Half range sine and cosine series		
41	Fourier transforms		
42	Fourier integral theorem		
43	Fourier sine and cosine integrals		
44	Sine and cosine transforms		
45	Properties		
46	Inverse transforms		
47	Finite Fourier transforms		
UNIT – IV: PDE OF FIRST ORDER **CO4: To identify solution methods for partial differential equations that model physical process.** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
48	Introduction	From 14/11/2022 To 26/11/2022	Lecture interspersed with discussions
49	Formation of PDE by eliminating arbitrary constants		
50	Formation of PDE by eliminating arbitrary functions		
51	Solutions of PDE		
52	Method of grouping		
53	Method of multipliers		
54	Nonlinear PDE $f(p,q) = 0$		
55	Nonlinear PDE $f(p,q,z) = 0$		
56	Nonlinear PDE $f(p,x) = g(q,y)$		
57	Clairaut's equation		
58	PDE reducible to standard form		
59	$f(px^m, qy^n) = 0$		
60	$f(pz^m, qz^m) = 0$		

UNIT – V: SECOND ORDER PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS CO5: Identify solution methods for partial differential equations that model physical processes. TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications			
61	Introduction; Homogeneous Linear P.D.E with constant coefficients; finding CF Finding PI: RHS term of the type $e^{(ax+by)}$	From 28/11/2022 To 17/12/2022	Lecture interspersed with discussions
62	$\sin(ax+by)$; $\cos(ax+by)$		
63	$x^m y^n$		
64	Method of separation of variables		
65	Solution of one dimensional wave equation		
66	Heat equation		
67	Two dimensional Laplace equation		

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TENTATIVE LESSON PLAN

Course/Code: Mathematics - III / R2021011

Year / Semester : II/I **Section:** II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT – I: VECTOR CALCULUS **CO1: To Interpret the physical meaning of different operators such as gradient, curl and divergence. Estimate the work done against a field, circulation and flux using vector calculus.** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
1	**Vector Differentiation:** Introduction	From: 05/09/2022 To 22/09/2022	Lecture interspersed with discussions
2	Properties of vectors and scalars		
3	Derivative of vector – definition		
4	Vector differential operator		
5	Gradient of a vector		
6	Divergence of a vector		
7	Curl of a vector		
8	Properties of gradient		
9	Vector identities		
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13	**Vector Integration**: Introduction		
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15	Problems on line integral		
16	Problems on surface integrals		
17	Problems on volume integrals		
18	Problems on Greens theorem		
19	Problems on Green theorem		
20	Problems on Gauss divergence theorem		
21	Problems on stokes theorem		
UNIT – II: LAPLACE TRANSFORMS **CO2: To apply the Laplace transform for solving differential equations** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
22	Laplace Transforms: Definitions, Existence		
23	Laplace Transform of standard functions		
24	Linearity property; Shifting properties Change of scale property		
25	Laplace Transforms of derivatives; Integrals		
26	$L(t^n f(t))$		

27	Laplace Transforms of division by t	From 23/09/2022 To 12/10/2022	Lecture interspersed with discussions
28	Evaluation of integrals		
29	Laplace Transforms of periodic functions; unit step functions; Unit impulse functions		
30	**Inverse Laplace Transforms:** Finding L^{-1} using partial fractions		
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32	Convolution theorem		
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UNIT – III: FOURIER SERIES AND FOURIER TRANSFORMS **CO3: Find or compute the Fourier series of periodic signals. Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms.** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
34	Introduction	From 13/10/2022 To 22/10/2022 & From 31/10/2022 To 12/11/2022	Lecture interspersed with discussions
35	Periodic functions		
36	Fourier series of periodic function		
37	Dirchlets conditions		
38	Even and odd functions		
39	Change of interval		
40	Half range sine and cosine series		
41	Fourier transforms		
42	Fourier integral theorem		
43	Fourier sine and cosine integrals		
44	Sine and cosine transforms		
45	Properties		
46	Inverse transforms		
47	Finite Fourier transforms		
UNIT – IV: PDE OF FIRST ORDER **CO4: To identify solution methods for partial differential equations that model physical process.** **TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications**			
48	Introduction	From 14/11/2022 To 26/11/2022	Lecture interspersed with discussions
49	Formation of PDE by eliminating arbitrary constants		
50	Formation of PDE by eliminating arbitrary functions		
51	Solutions of PDE		
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57	Clairaut's equation		
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59	$f(px^m, qy^n) = 0$		
60	$f(pz^m, qz^m) = 0$		

UNIT – V: SECOND ORDER PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS CO5: Identify solution methods for partial differential equations that model physical processes. TB:" Engineering Mathematics", Dr. T.K.V.Iyengar; S.Chand publications			
61	Introduction; Homogeneous Linear P.D.E with constant coefficients; finding CF Finding PI: RHS term of the type $e^{(ax+by)}$	From 28/11/2022 To 17/12/2022	Lecture interspersed with discussions
62	$\sin(ax+by)$; $\cos(ax+by)$		
63	$x^m y^n$		
64	Method of separation of variables		
65	Solution of one dimensional wave equation		
66	Heat equation		
67	Two dimensional Laplace equation		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: ANALOG IC'S AND APPLICATIONS /R2031041

Year / Semester : III/I **Section:** I **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I	**Introduction To Operational Amplifier**		
CO 1: Student can Analyze various parameters of Differential amplifiers and Operational amplifiers.			
T1: OP-AMPS and Linear Integrated Circuits, Ramakanth A Gayakwad, PHI.			
T2: Linear Integrated Circuits, D. Roy Choudary, Sahil B jain, New Age International.			
1.	Introduction	From: 01-08-2022 To: 20-08-2022	Lecture interspersed with discussions
2.	Op amp block diagram Characteristics of Op-Amp		
3.	Ideal and Practical Op-Amp specifications		
4.	DC Characteristics- Input and Output Off-set voltages		
5.	DC Characteristics- Input Off-set voltages		
6.	DC Characteristics- Input Off-set currents		
7.	DC Characteristics- Output Off-set currents		
8.	AC Characteristics-Frequency Response, Stability		
9.	AC Characteristics-Frequency Response, Stability		
10.	AC Characteristics-Frequency Compensation		
11.	Tutorial		
12.	Measurements of Op-Amp Parameters		
13.	AC Characteristics		
14.	Slew Rate		
15.	CMRR		
16.	PSRR		
17.	current Booster		
18.	Three-Terminal Voltage Regulators 78xx& 79xx Series		
19.	Adjustable voltage Regulator		
20.	Dual Power Supply with 78xx &79xx		
21.	Problems		
UNIT –II	**OP–AMP APPLICATIONS**		
CO 2: Student can implement OPAMP in real time applications.			
T1: OP-AMPS and Linear Integrated Circuits, Ramakanth A Gayakwad, PHI.			
T2: Linear Integrated Circuits, D. Roy Choudary, Sahil B jain, New Age International.			
22.	Introduction	From: 22-08-2022 To: 10-09-2022	Lecture interspersed with discussions
23.	Basic Op-Amp Applications		
24.	Instrumentation amplifier		
25.	AC amplifier		
26.	V to I converter		
27.	I to V converter		
28.	Sample and Hold Circuit		

29.	Tutorial	From: 22-08-2022 To: 10-09-2022	Lecture interspersed with discussions
30.	Log Amplifiers		
31.	Anti log Amplifiers		
32.	Multiplier and Divider		
33.	Integrator		
34.	Differentiator		
35.	Comparators And Waveform Generators		
36.	Square Wave Generators- Comparator		
37.	Schmitt Trigger		
38.	Astable Multivibrator		
39.	Monostable Multivibrator		
40.	Triangular Wave Generator		
41.	Sine Wave Generators-RC Phase Shift Oscillator		
42.	Sine Wave Generators- Wein Bridge Oscillator		
43.	**Tutorial**		
UNIT - III ACTIVE FILTERS **CO3: Ability to use OP Amp as Filter.** **T1: OP-AMPS and Linear Integrated Circuits, Ramakanth A Gayakwad, PHI.** **T2: Linear Integrated Circuits, D. Roy Choudary, Sahil B jain, New Age International..**			
44.	Design & Analysis of active filters	From: 12-09-2022 To: 24-09-2022 From: 03-10-2022 To: 15-10-2022	Lecture interspersed with discussions
45.	1st order LPF		
46.	2nd order LPF		
47.	1st order HPF filters		
48.	2nd order HPF		
49.	Tutorial		
50.	Narrow Band Pass Filter		
51.	Wide Band Pass Filter		
52.	Narrow Band Reject Filter		
53.	Wide Band Reject Filter		
54.	All Pass filters		

No. of Periods	**TOPIC**	**DATE**	**Mode of Delivery**
UNIT - IV TIMERS AND PLL **CO 4: Able to use OP Amp in generation of different waveforms and as PLL, Timer.** **T2: Linear Integrated Circuits, D. Roy Choudary, Sahil B jain, New Age International.**			
55.	Introduction to 555 timer	From: 17-10-2022 To: 05-11-2022	Lecture interspersed with discussions
56.	Functional Diagram		
57.	Monostable operation		
58.	Applications of Monostable multivibrator		
59.	Ramp generator		
60.	Frequency divider and multiplier		
61.	Astable operation		
62.	Applications of Astable mode		
63.	PLL - Introduction, block schematic		
64.	Principles and description of individual blocks		

65.	565 PLL	From: 17-10-2022 To: 05-11-2022	Lecture interspersed with discussions
66.	Applications of PLL – frequency multiplication		
67.	Frequency translation		
68.	AM and FM demodulators		
69.	Tutorial		
70.	FSK demodulators		
71.	Applications of VCO (566)		
72.	Tutorial		
UNIT – V DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS **CO 5: Able to use OPAMP in analog to digital and digital to analog converter.** **T1: OP-AMPS and Linear Integrated Circuits, Ramakanth A Gayakwad, PHI.**			
73.	Introduction	From: 07-11-2022 To: 26-11-2022	Lecture interspersed with discussions
74.	Basic DAC techniques - Weighted resistor DAC		
75.	Weighted resistor DAC		
76.	Tutorial		
77.	R-2R ladder DAC		
78.	Inverted R-2R DAC		
79.	Tutorial		
80.	DAC Specifications		
81.	ADCs – Parallel Comparator ADC		
82.	Counter type ADC		
83.	Successive Approximation ADC		
84.	Dual slope ADC		
85.	ADC Specifications		
86.	Problems		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: ANALOG IC'S AND APPLICATIONS /R2031041

Year / Semester : III/I **Section:** II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I Introduction To Operational Amplifier **CO 1: Student can Analyze various parameters of Differential amplifiers and Operational amplifiers.** **T1: OP-AMPS and Linear Integrated Circuits, Ramakanth A Gayakwad, PHI.** **T2: Linear Integrated Circuits, D. Roy Choudary, Sahil B jain, New Age International.**			
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22.	Introduction	From: 22-08-2022 To: 10-09-2022	Lecture interspersed with discussions
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38.	Astable Multivibrator		
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40.	Triangular Wave Generator		
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50.	Narrow Band Pass Filter		
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UNIT - IV TIMERS AND PLL **CO 4: Able to use OP Amp in generation of different waveforms and as PLL, Timer.** **T2: Linear Integrated Circuits, D. Roy Choudary, Sahil B jain, New Age International.**			
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56.	Functional Diagram		
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60.	Frequency divider and multiplier		
61.	Astable operation		
62.	Applications of Astable mode		
63.	PLL - Introduction, block schematic		
64.	Principles and description of individual blocks		

65.	565 PLL	From: 17-10-2022 To: 05-11-2022	Lecture interspersed with discussions
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78.	Inverted R-2R DAC		
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81.	ADCs – Parallel Comparator ADC		
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83.	Successive Approximation ADC		
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Electro Magnetic Waves and Transmission Lines / R2031042

Year / Semester : III/I **Section:** I **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I TRANSMISSION LINES-I **CO1 : Demonstrate and compute various parameters for transmission lines using either a smith chart or classical theory.** **TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.**			
1	Types, Parameters	**From: 18.07.2022** **To: 03.08.2022**	On Black Board
2	T & π equivalent circuits		
3	Transmission Line Equations		
4	Primary & Secondary Constants		
5	Expression for Characteristic Impedance		
6	Propagation Constant		
7	Phase & group Velocities		
8	Infinite Line Concepts		
9	Lossless lines/Low Loss Characterization		
10	Distortion – Condition for Distortion less lines and Minimum Attenuation		
11	Loading - Types of Loading		
12	Illustrative Problems		
UNIT-II TRANSMISSION LINES-II **CO2: Differentiate matching networks for loaded transmission lines for OC and SC.** **TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.**			
13	Input Impedance Relations, SC and OC Lines	**From: 10.08.2022**	On Black Board
14	Reflection Coefficient, VSWR		
15	Low loss radio frequency lines		
16	UHF Transmission lines		
17	$\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations		
18	Smith Chart – Construction and Applications		
19	Smith Chart – Construction and Applications		

20	Quarter wave transformer	**To: 03.09.2022**	
21	Single and Double Stub Matching		
22	Illustrative Problems		
UNIT-III ELECTROSTATICS **CO3: Determine E using various laws and applications of electro static fields.** **TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001**			
23	Review of Coordinate System	**From: 05.09.2022** **To: 20.10.2022**	On Black Board
24	Coulomb's Law		
25	Electric Field Intensity, Electric Flux Density		
26	Gauss Law and Applications		
27	Electric Potential, Maxwell's Two Equations for ESF		
28	Energy Density, Illustrative Problems		
29	Convection and Conduction Currents		
30	Dielectric Constant, Continuity Equation, Relaxation Time		
31	Poisson's and Laplace's Equations		
32	Capacitance: Parallel Plate, Coaxial capacitors		
33	Illustrative Problems		
34	Illustrative Problems		
UNIT-IV MAGNETOSTATICS & MAXWELL EQUATIONS (TIME VARYING FIELD) **CO4: Determine H using various laws and applications of magneto static fields & Derive Maxwell Equations in Time Varying Fields.** **TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.**			
35	Biot-Savart Law, Ampere's Circuital Law and Applications	**From: 21/10/22** **To:10/11/22**	On Black Board
36	Magnetic Flux Density, Maxwell Equations for MSF		
37	Magnetic Scalar and Vector Potentials		
38	Forces due to Magnetic Fields		
39	Ampere's Force Law, Inductances, Magnetic Energy		
40	Illustrative Problems		
41	Faraday's Law and Transformer emf		
42	Inconsistency of Ampere's Law		
43	Displacement Current Density		
44	Maxwell's Equations in Different Final Forms		
45	Conditions at Boundary Surface: Dielectric-Dielectric Interfaces		
46	Dielectric-Conductor Interfaces		

UNIT-V EM WAVE CHARACTERISTICS

CO5: Demonstrate the reflection and refraction of waves at boundaries & interpret the effects of lossy and low loss dielectrics and conductors upon the propagation of electromagnetic waves, and predict this process in specific applications.

TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.

47	Wave Equations for Conducting and Dielectric Media	**From: 10/11/22** **To: 25/11/22**	On Black Board
48	Wave Equations Dielectric Media		
49	Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations		
50	Wave Propagation in Lossy and Lossless Dielectrics		
51	Wave Propagation in free space		
52	Wave Propagation in good conductors		
53	Skin depth, Polarization & Types		
54	Illustrative Problems		
55	Reflection and Refraction of Plane Waves		
56	Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics		
57	Brewster Angle, Critical Angle, Total Reflection		
58	Surface Impedance		
59	Poynting Vector , Poynting Theorem – Applications		
60	Power Loss in a Plane Conductor		
61	Illustrative Problems		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Electro Magnetic Waves and Transmission Lines / R2031042

Year / Semester : III/I **Section:** II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I TRANSMISSION LINES-I **CO1 : Demonstrate and compute various parameters for transmission lines using either a smith chart or classical theory.** **TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.**			
1	Types, Parameters	**From: 18.07.2022** **To: 10.08.2022**	On Black Board
2	T & π equivalent circuits		
3	Transmission Line Equations		
4	Primary & Secondary Constants		
5	Expression for Characteristic Impedance		
6	Propagation Constant		
7	Phase & group Velocities		
8	Infinite Line Concepts		
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UNIT-II TRANSMISSION LINES-II **CO2: Differentiate matching networks for loaded transmission lines for OC and SC.** **TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.**			
13	Input Impedance Relations, SC and OC Lines	**From: 11.08.2022**	On Black Board
14	Reflection Coefficient, VSWR		
15	Low loss radio frequency lines		
16	UHF Transmission lines		
17	λ/4, λ /2, λ/8 Lines – Impedance Transformations		
18	Smith Chart – Construction and Applications		
19	Smith Chart – Construction and Applications		

20	Quarter wave transformer	**To: 02.09.2022**	
21	Single and Double Stub Matching		
22	Illustrative Problems		
UNIT-III ELECTROSTATICS **CO3: Determine E using various laws and applications of electro static fields.** **TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001**			
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25	Electric Field Intensity, Electric Flux Density		
26	Gauss Law and Applications		
27	Electric Potential, Maxwell's Two Equations for ESF		
28	Energy Density, Illustrative Problems	**From: 05.09.2022**	
29	Convection and Conduction Currents		On Black Board
30	Dielectric Constant, Continuity Equation, Relaxation Time	**To: 17.10.2022**	
31	Poisson's and Laplace's Equations		
32	Capacitance: Parallel Plate, Coaxial capacitors		
33	Illustrative Problems		
34	Illustrative Problems		
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37	Magnetic Scalar and Vector Potentials		
38	Forces due to Magnetic Fields		
39	Ampere's Force Law, Inductances, Magnetic Energy	**From: 18/10/22**	
40	Illustrative Problems		On Black Board
41	Faraday's Law and Transformer emf	**To: 08/11/22**	
42	Inconsistency of Ampere's Law		
43	Displacement Current Density		
44	Maxwell's Equations in Different Final Forms		
45	Conditions at Boundary Surface: Dielectric-Dielectric Interfaces		
46	Dielectric-Conductor Interfaces		

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TB: " Elements of Electromagnetics", Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.

47	Wave Equations for Conducting and Dielectric Media	**From: 14/11/22**	On Black Board
48	Wave Equations Dielectric Media		
49	Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations		
50	Wave Propagation in Lossy and Lossless Dielectrics		
51	Wave Propagation in free space		
52	Wave Propagation in good conductors		
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54	Illustrative Problems		
55	Reflection and Refraction of Plane Waves	**To: 25/11/22**	
56	Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics		
57	Brewster Angle, Critical Angle, Total Reflection		
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Digital Communications / R2031043

Year / Semester: III/I **Section:** I **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I Pulse Digital Modulation **CO1: Explain the working of pulse digital modulation systems such as PCM, DPCM and DM. Communication Systems.** **TB: 1. Communication Systems - Simon Haykin, John Wiley, 3/e.** **2. Digital communications - Simon Haykin, John Wiley, 2005**			
1.	Elements of digital communication systems	**From: 18/07/2022 To 30/07/2022**	Lecture interspersed with discussions
2.	Advantages of digital communication systems		
3.	Elements of PCM: Sampling		
4.	Quantization and coding		
5.	Quantization error		
6.	Companding in PCM systems		
7.	Differential PCM		
8.	Delta Modulation and its drawbacks		
9.	Adaptive Delta Modulation		
10.	Adaptive Delta Modulation		
11.	Comparison of PCM and DM systems		
12.	Noise in PCM and DM systems		
UNIT –II Digital Modulation Techniques **CO2 Learn various digital passband modulations techniques such as ASK, FSK, PSK, QPSK, DPSK and M-ary modulation techniques.** **TB: 1. Communication Systems - Simon Haykin, John Wiley, 3/e.** **2. Digital communications - Simon Haykin, John Wiley, 2005.** **3. Communication Systems-Analog & Digital – Singh & Sapre, TMH, 2004.**			
13.	Introduction		
14.	Introduction		
15.	ASK		
16.	FSK		
17.	PSK		
18.	DPSK		
19.	DEPSK		
20.	QPSK		
21.	M-ary PSK		

22.	M-ary ASK	From: 01/08/22 To 11/08/22	Lecture interspersed with discussions
23.	M-ary FSK		
24.	Similarity of BFSK and BPSK		
UNIT - III Data Transmission **CO3: Analyze the performance of various Digital Modulation systems in terms of probability of error.** **TB : 1. Communication Systems - Simon Haykin, John Wiley, 3/e.** **2. Digital communications - Simon Haykin, John Wiley, 2005**			
25.	Baseband signal receiver	From: 24/08/22 To 09/09/22	Lecture interspersed with discussions
26.	Probability of error		
27.	The optimum filter		
28.	Matched filter		
29.	Matched filter		
30.	Probability of error using Matched filter		
31.	Coherent reception		
32.	Non-coherent detection of FSK		
33.	Calculation of error probability of ASK		
34.	Calculation of error probability of BPSK		
35.	Calculation of error probability of BFSK		
36.	Calculation of error probability of QPSK		
UNIT –IV Information Theory **CO4: Understand the concepts of Information Theory and the need for source coding.** **TB :1. Communication Systems - Simon Haykin, John Wiley, 3/e.**			
37.	Discrete messages	From: 14/10/2022 To 22/10/2022	Lecture interspersed with discussions
38.	Concept of amount of information and its properties		
39.	Average Information		
40.	Average Information		
41.	Entropy and its properties		
42.	Information rate		
43.	Mutual Information and its properties		
44.	Mutual Information and its properties		
UNIT –V Source Coding **CO5: Learn the theorems governing the transmission of information over a noisy channel and perform the efficiency calculations.** **TB: 1. Communication Systems - Simon Haykin, John Wiley, 3/e.**			
45.	Introduction, Advantages		

46.	Shannon's Theorem	From: 30/10/2022 To 22/11/2022	Lecture interspersed with discussions
47.	Shannon-Fano Coding		
48.	Huffman Coding		
49.	Efficiency calculations		
50.	Channel capacity of discrete and analog channels		
51.	Capacity of a Gaussian channel		
52.	Bandwidth-S/N trade-off		
53.	Introduction to Linear Block Codes		
54.	Matrix description of linear block codes		
55.	Error detection and correction capabilities of LBC		
56.	Hamming codes		
57.	Revision		
58.	Binary cyclic codes		
59.	Classification cyclic codes		
60.	Algebraic structure		
61.	Encoding		
62.	Syndrome Calculation		
63.	BCH codes		
64.	Introduction to Convolution Codes		
65.	Encoding of convolution codes		
66.	Time-domain approach		
67.	Tutorial		
68.	Transform-domain approach		
69.	Graphical approach: State diagram		
70.	Graphical approach: State diagram		
71.	Tree and Trellis decoding using Viterbi Algorithm		
72.	Tutorial		

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TENTATIVE LESSON PLAN

Course/Code: Digital Communications / R2031043

Year / Semester : III/I **Section:** II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I Pulse Digital Modulation **CO1: Explain the working of pulse digital modulation systems such as PCM, DPCM and DM.** **Communication Systems.** **TB: 1. Communication Systems - Simon Haykin, John Wiley, 3/e.** **2. Digital communications - Simon Haykin, John Wiley, 2005**			
1.	Elements of digital communication systems	**From: 18/07/2022 To 30/07/2022**	Lecture interspersed with discussions
2.	Advantages of digital communication systems		
3.	Elements of PCM: Sampling		
4.	Quantization and coding		
5.	Quantization error		
6.	Companding in PCM systems		
7.	Differential PCM		
8.	Delta Modulation and its drawbacks		
9.	Adaptive Delta Modulation		
10.	Adaptive Delta Modulation		
11.	Comparison of PCM and DM systems		
12.	Noise in PCM and DM systems		
UNIT –II Digital Modulation Techniques **CO2 Learn various digital passband modulations techniques such as ASK, FSK, PSK, QPSK, DPSK and M-ary modulation techniques.** **TB: 1. Communication Systems - Simon Haykin, John Wiley, 3/e.** **2. Digital communications - Simon Haykin, John Wiley, 2005.** **3. Communication Systems-Analog & Digital – Singh & Sapre, TMH, 2004.**			
13.	Introduction	**From: 01/08/22 To 11/08/22**	Lecture interspersed with discussions
14.	Introduction		
15.	ASK		
16.	FSK		
17.	PSK		
18.	DPSK		
19.	DEPSK		
20.	QPSK		

21.	M-ary PSK		
22.	M-ary ASK		
23.	M-ary FSK		
24.	Similarity of BFSK and BPSK		
UNIT - III Data Transmission **CO3: Analyze the performance of various Digital Modulation systems in terms of probability of error.** **TB : 1. Communication Systems - Simon Haykin, John Wiley, 3/e.** **2. Digital communications - Simon Haykin, John Wiley, 2005**			
25.	Baseband signal receiver	**From: 24/08/22 To 09/09/22**	Lecture interspersed with discussions
26.	Probability of error		
27.	The optimum filter		
28.	Matched filter		
29.	Matched filter		
30.	Probability of error using Matched filter		
31.	Coherent reception		
32.	Non-coherent detection of FSK		
33.	Calculation of error probability of ASK		
34.	Calculation of error probability of BPSK		
35.	Calculation of error probability of BFSK		
36.	Calculation of error probability of QPSK		
UNIT –IV Information Theory **CO4: Understand the concepts of Information Theory and the need for source coding.** **TB :1. Communication Systems - Simon Haykin, John Wiley, 3/e.**			
37.	Discrete messages	**From: 14/10/2022 To 22/10/2022**	Lecture interspersed with discussions
38.	Concept of amount of information and its properties		
39.	Average Information		
40.	Average Information		
41.	Entropy and its properties		
42.	Information rate		
43.	Mutual Information and its properties		
44.	Mutual Information and its properties		
UNIT –V Source Coding **CO5: Learn the theorems governing the transmission of information over a noisy channel and perform the efficiency calculations.** **TB: 1. Communication Systems - Simon Haykin, John Wiley, 3/e.**			
45.	Introduction, Advantages		

46.	Shannon's Theorem	From: 30/10/2022 To 22/11/2022	Lecture interspersed with discussions
47.	Huffman Coding		
48.	Efficiency calculations		
49.	Channel capacity of discrete and analog channels		
50.	Capacity of a Gaussian channel		
51.	Bandwidth-S/N trade-off		
52.	Introduction to Linear Block Codes		
53.	Matrix description of linear block codes		
54.	Error detection and correction capabilities of LBC		
55.	Hamming codes		
56.	Binary cyclic codes		
57.	Classification cyclic codes		
58.	Algebraic structure		
59.	Encoding		
60.	Syndrome Calculation		
61.	BCH codes		
62.	Introduction to Convolution Codes		
63.	Encoding of convolution codes		
64.	Time-domain approach		
65.	Transform-domain approach		
66.	Graphical approach: State diagram		
67.	Tree diagram and Trellis decoding using Viterbi Algorithm		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Electronic Measurements and Instrumentation /R203104B

Year / Semester : III/I **Section:** I **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I **CO1:: Learn and understand functioning of various measuring system and metrics for performance analysis.** **TB: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.**			
1.	Performance characteristics of instruments	**From: 01-08-2022 To: 12-08-2022**	Lecture interspersed with discussions
2.	Static characteristics Accuracy, Resolution, Precision		
3.	Expected value, Error, Sensitivity		
4.	Dynamic Characteristics-speed of response		
5.	Fidelity, Lag and Dynamic error.		
6.	Types of errors in measurements and their analysis.		
7.	DC Voltmeters- Multi-range		
8.	Range extension/Solid state and differential voltmeters		
9.	AC voltmeters- multi range, range extension		
10.	Thermo couple type RF Ammeter		
11.	Aryton shunt		
12.	Ohmmeters series type, shunt type using D'arsonval movement.		
13.	Multimeter for Voltage, Current and resistance elements		
14.	True rms meter.		
15.	**Tutorial**		
UNIT – II **CO2:: Acquire knowledge of principle of operation, working of different electronic Instruments viz. signal generators, signal analyzers** **TB: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.**			
16.	Signal Generator- fixed and variable	**From: 16-08-2022 To: 03-09-2022**	Lecture interspersed with discussions
17.	AF oscillators, AF sine wave signal generators		
18.	AF square wave signal generators		
19.	Function Generators Square pulse, Random noise		
20.	Sweep generator		
21.	Arbitrary waveform generator		
22.	Wave Analyzers		
23.	Harmonic Distortion Analyzers		
24.	Spectrum Analyzers		
25.	Digital Fourier Analyzers		
26.	**Tutorial**		

UNIT – III

CO3:: Understand the design of oscilloscopes for different applications

TB: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.

27.	Oscilloscopes CRT features ,vertical amplifiers	**From: 05-09-2022 To: 24-09-2022**	Lecture interspersed with discussions
28.	Horizontal deflection system		
29.	Sweep, trigger pulse, delay line		
30.	Simple CRO		
31.	Triggered sweep CRO		
32.	Dual beam CRO ,Dual trace oscilloscope		
33.	Lissajous method of frequency measurement		
34.	Probes for CRO- Active & Passive, attenuator type		
35.	Sampling oscilloscope		
36.	Analog storage oscilloscope		
37.	Digital storage oscilloscope		
38.	**Tutorial**		

UNIT –IV

CO4:: To Compare various measuring bridges and their balancing conditions

TB1:: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
TB2:: Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

39.	Bridge circuits- Wheat stone bridge	**From: 10-10-2022 To: 29-10-2022**	Lecture interspersed with discussions
40.	Measurement of very low resistance		
41.	AC Bridges Measurement of inductance- Maxwell's bridge.		
42.	Anderson bridge.		
43.	Measurement of capacitance -Shearing Bridge		
44.	Wien's Bridge		
45.	Errors and precautions in using bridges		
46.	Q-meter principle of operation		
47.	Measurement methods and sources of errors.		
48.	Counters : principle of operation		
49.	Modes of operation- totalizing mode,		
50.	Frequency mode and time period mode- sources of errors.		
51.	**Tutorial**		

UNIT – V

CO5 :: Learn and understand the use of various measuring techniques for measurement of different physical parameters using different classes oftransducers.

TB1:: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
TB2:: Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

No. of Periods	TOPIC	DATE	Mode of Delivery
52.	active & passive transducers	**From: 29-10-2022**	Lecture interspersed with discussions
53.	Resistance, Capacitance,		
54.	Inductance		
55.	Strain gauges		
56.	LVDT		
57.	Piezo Electric transducers		
58.	Measurement of physical parameters, temperature		

59	Measurement of pressure	To: 26-11-2022	
60	Measurement of velocity		
61	Measurement of displacement		
62	Measurement of force		
63	Measurement of acceleration		
64	**Tutorial**		

30/11/22

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Electronic Measurements and Instrumentation /R203104B

Year / Semester : III/I **Section:** II **A.Y:** 2022-23

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I **CO1:: Learn and understand functioning of various measuring system and metrics for performance analysis.** **TB: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.**			
1.	Performance characteristics of instruments	**From: 01-08-2022 To: 11-08-2022**	Lecture interspersed with discussions
2.	Static characteristics Accuracy, Resolution, Precision		
3.	Expected value, Error, Sensitivity		
4.	Dynamic Characteristics-speed of response		
5.	Fidelity, Lag and Dynamic error.		
6.	Types of errors in measurements and their analysis.		
7.	DC Voltmeters- Multi-range		
8.	Range extension/Solid state and differential voltmeters		
9.	AC voltmeters- multi range, range extension		
10.	Thermo couple type RF Ammeter		
11.	Aryton shunt		
12.	Ohmmeters series type, shunt type using D'arsonval movement.		
13.	Multimeter for Voltage, Current and resistance elements		
14.	True rms meter.		
15.	**Tutorial**		
UNIT – II **CO2:: Acquire knowledge of principle of operation, working of different electronic Instruments viz. signal generators, signal analyzers** **TB: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.**			
16.	Signal Generator- fixed and variable	**From: 16-08-2022 To: 03-09-2022**	Lecture interspersed with discussions
17.	AF oscillators, AF sine wave signal generators		
18.	AF square wave signal generators		
19.	Function Generators Square pulse, Random noise		
20.	Sweep generator		
21.	Arbitrary waveform generator		
22.	Wave Analyzers		
23.	Harmonic Distortion Analyzers		
24.	Spectrum Analyzers		
25.	Digital Fourier Analyzers		
26.	**Tutorial**		

UNIT – III

CO3:: Understand the design of oscilloscopes for different applications

TB: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.

27.	Oscilloscopes CRT features ,vertical amplifiers	**From: 05-09-2022 To: 24-09-2022**	Lecture interspersed with discussions
28.	Horizontal deflection system		
29.	Sweep, trigger pulse, delay line		
30.	Simple CRO		
31.	Triggered sweep CRO		
32.	Dual beam CRO ,Dual trace oscilloscope		
33.	Lissajous method of frequency measurement		
34.	Probes for CRO- Active & Passive, attenuator type		
35.	Sampling oscilloscope		
36.	Analog storage oscilloscope		
37.	Digital storage oscilloscope		
38.	**Tutorial**		

UNIT –IV

CO4:: To Compare various measuring bridges and their balancing conditions

TB1:: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
TB2:: Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

39.	Bridge circuits- Wheat stone bridge	**From: 10-10-2022 To: 29-10-2022**	Lecture interspersed with discussions
40.	Measurement of very low resistance		
41.	AC Bridges Measurement of inductance- Maxwell's bridge.		
42.	Anderson bridge.		
43.	Measurement of capacitance -Shearing Bridge		
44.	Wien's Bridge		
45.	Errors and precautions in using bridges		
46.	Q-meter principle of operation		
47.	Measurement methods and sources of errors.		
48.	Counters : principle of operation		
49.	Modes of operation- totalizing mode,		
50.	Frequency mode and time period mode- sources of errors.		
51.	**Tutorial**		

UNIT – V

CO5 :: Learn and understand the use of various measuring techniques for measurement of different physical parameters using different classes oftransducers.

TB1:: Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
TB2:: Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

No. of Periods	TOPIC	DATE	Mode of Delivery
52.	Transducers	**From: 31-10-2022**	Lecture interspersed with discussions
53.	active & passive transducers		
54.	Resistance, Capacitance,		
55.	Inductance		
56.	Strain gauges		
57.	LVDT		
58.	Piezo Electric transducers		
59.	Measurement of physical parameters, temperature		

60.	Measurement of pressure	To: 26-11-2022	
61.	Measurement of velocity		
62.	Measurement of displacement		
63.	Measurement of force		
64.	Measurement of acceleration		
65.	**Tutorial**		

30-1/22

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Computer Organization & Architecture / R203105K

Year / Semester : III/I **Section:** I **A.Y:** 2022-23

Mode of Delivery: Onboard

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I NUMBER SYSTEM AND DATA REPRESENTATION, BOOLEAN ALGEBRA AND LOGIC GATES **CO1: Demonstrate an understanding of the different number systems, codes and Relate Postulates of Boolean algebra and minimize combinational functions** **TB: Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.**			
1	Introduction	**From: 01.08.2022** **To: 20.08.2022**	Lecture interspersed with discussions
2	Numbering Systems		
3	Decimal to Binary Conversion		
4	Binary Coded Decimal Numbers		
5	Error Detecting Codes		
6	Error Correcting Codes		
7	Hamming Code for Error Correction		
8	Karnaugh map representation		
9	minimization of Boolean functions using K-maps up to 4-variable		
10	Don't care conditions		
11	Digital Logic gates		
12	Two-level realizations using gates		
13	AND-OR, OR-AND, NAND-NAND and NOR-NOR		
14	**Tutorial**		
UNIT-II COMBINATIONAL LOGIC CIRCUITS-I, SEQUENTIAL CIRCUITS I **CO2: Evaluate and learn different combinational circuits, sequential circuits and able to design them.** **TB: Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.**			
15	Design of Half adder	**From: 22.08.2022** **To: 1.09.2022**	Lecture interspersed with discussions
16	Full adder		
17	Half subtractor		
18	Full subtractor		
19	Design of decoder		
20	De-multiplexer		

No. of Periods	TOPIC	Date	Mode of Delivery
21	Encoder	From: 22.08.2022 To: 1.09.2022	Lecture interspersed with discussions
22	Multiplexer		
23	Classification of sequential circuits (synchronous and asynchronous)		
24	Basic flip-flops		
25	Truth tables		
26	Excitation tables (NAND RS latch, NOR RS latch, RS flip-flop. JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals)		
27	**Tutorial**		
UNIT-III BASIC STRUCTURE OF COMPUTERS, REGISTER TRANSFER LANGUAGE AND MICRO-OPERATIONS **CO3: Organize, Determine and learns basic structure of components register through language, micro operations and able to write micro programs.** **TB: Computer Organization, 5th ed.,Hamacher, Vranesicand Zaky,TMH,2002.**			
28	Computer Types	From: 3.09.2022 To: 13.10.2022	Lecture interspersed with discussions
29	Functional unit		
30	Basic Operational concepts		
31	Bus structures		
32	Software		
33	Performance		
34	Multiprocessors and multi computers		
35	Register Transfer language		
36	Register Transfer Bus and memory transfers		
37	Arithmetic Micro-operations		
38	Logic micro operations		
39	Shift micro operations		
40	Instruction codes		
41	Computer registers		
42	Computer instructions		
43	Instruction cycle		
44	**Tutorial**		
UNIT-IV MICRO PROGRAMMED CONTROL, CENTRAL PROCESSING UNIT **CO4: Determine and able to write data transfer and manipulators program and students able to learn micro programme control and central processing unit.** **TB: Computer System Architecture, 3/e, MorisMano,Pearson/PHI.**			
45	Control memory	From: 15.10.2022 To: 3.11.2022	Lecture interspersed with discussions
46	Address sequencing		
47	micro program example		
48	design of control unit		
49	General Register Organization		

No. of Periods	TOPIC	Date	Mode of Delivery
50	Instruction Formats	From: 15.10.2022 To: 3.11.2022	Lecture interspersed with discussions
51	Addressing modes		
52	Data Transfer and Manipulation		
53	Program Control		
54	**Tutorial**		
UNIT-V MEMORY ORGANIZATION, INPUT –OUTPUT ORGANIZATION **CO5: Able to learns the internal organization of computers and able to evaluate performance of them.** **TB: Computer System Architecture, 3/e, MorisMano,Pearson/PHI.**			
55	Memory Hierarchy	From: 4.11.2022 To: 26.11.2022	Lecture interspersed with discussions
56	Main Memory		
57	Auxiliary memory		
58	Associate Memory		
59	Cache Memory		
60	Virtual memories		
61	Introduction to Shift registers and RAID		
62	Input-Output Interface		
63	Asynchronous data transfer		
64	Modes of Transfer		
65	Priority Interrupts		
66	DMA		
67	Input Output Processor		
68	Serial Communication		
69	**Tutorial**		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Computer Organization & Architecture / R203105K

Year / Semester : III/I **Section:** II **A.Y:** 2022-23

Mode of Delivery: Onboard

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT –I NUMBER SYSTEM AND DATA REPRESENTATION, BOOLEAN ALGEBRA AND LOGIC GATES **CO1: Demonstrate an understanding of the different number systems, codes and Relate Postulates of Boolean algebra and minimize combinational functions** **TB: Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.**			
1	Introduction	**From: 01.08.2022** **To: 17.08.2022**	Lecture interspersed with discussions
2	Numbering Systems		
3	Decimal to Binary Conversion		
4	Binary Coded Decimal Numbers		
5	Error Detecting Codes		
6	Error Correcting Codes		
7	Hamming Code for Error Correction		
8	Karnaugh map representation		
9	minimization of Boolean functions using K-maps up to 4-variable		
10	Don't care conditions		
11	Digital Logic gates		
12	Two-level realizations using gates		
13	AND-OR, OR-AND, NAND-NAND and NOR-NOR		
14	**Tutorial**		
UNIT-II COMBINATIONAL LOGIC CIRCUITS-I, SEQUENTIAL CIRCUITS I **CO2: Evaluate and learn different combinational circuits, sequential circuits and able to design them.** **TB: Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.**			
15	Design of Half adder	**From: 18.08.2022** **To: 30.08.2022**	Lecture interspersed with discussions
16	Full adder		
17	Half subtractor		
18	Full subtractor		
19	Design of decoder		
20	De-multiplexer		

No. of Periods	TOPIC	Date	Mode of Delivery
21	Encoder		
22	Multiplexer		
23	Classification of sequential circuits (synchronous and asynchronous)		
24	Basic flip-flops		Lecture interspersed with discussions
25	Truth tables		
26	Excitation tables (NAND RS latch, NOR RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals)		
27	**Tutorial**		
UNIT-III BASIC STRUCTURE OF COMPUTERS, REGISTER TRANSFER LANGUAGE AND MICRO-OPERATIONS **CO3: Organize, Determine and learns basic structure of components register through language, micro operations and able to write micro programs.** **TB: Computer Organization, 5th ed.,Hamacher, Vranesicand Zaky,TMH,2002.**			
28	Computer Types	**From: 2.09.2022** **To: 24.9.2022**	Lecture interspersed with discussions
29	Functional unit		
30	Basic Operational concepts		
31	Bus structures		
32	Software		
33	Performance		
34	Multiprocessors and multi computers		
35	Register Transfer language		
36	Register Transfer Bus and memory transfers		
37	Arithmetic Micro-operations		
38	Logic micro operations		
39	Shift micro operations		
40	Instruction codes		
41	Computer registers		
42	Computer instructions		
43	Instruction cycle		
44	**Tutorial**		
UNIT-IV MICRO PROGRAMMED CONTROL, CENTRAL PROCESSING UNIT **CO4: Determine and able to write data transfer and manipulators program and students able to learn micro programme control and central processing unit.** **TB: Computer System Architecture, 3/e, MorisMano,Pearson/PHI.**			
45	Control memory	**From: 10.10.2022** **To: 26.10.2022**	Lecture interspersed with discussions
46	Address sequencing		
47	micro program example		
48	design of control unit		
49	General Register Organization		

No. of Periods	TOPIC	Date	Mode of Delivery
50	Instruction Formats		Lecture interspersed with discussions
51	Addressing modes		
52	Data Transfer and Manipulation		
53	Program Control		
54	**Tutorial**		
UNIT-V MEMORY ORGANIZATION, INPUT –OUTPUT ORGANIZATION **CO5: Able to learns the internal organization of computers and able to evaluate performance of them.** **TB: Computer System Architecture, 3/e, MorisMano,Pearson/PHI.**			
55	Memory Hierarchy	**From: 27.10.2022** **To: 26.11.2022**	Lecture interspersed with discussions
56	Main Memory		
57	Auxiliary memory		
58	Associate Memory		
59	Cache Memory		
60	Virtual memories		
61	Introduction to Shift registers and RAID		
62	Input-Output Interface		
63	Asynchronous data transfer		
64	Modes of Transfer		
65	Priority Interrupts		
66	DMA		
67	Input Output Processor		
68	Serial Communication		
69	**Tutorial**		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Microwave and Optical Communication Engineering: R1941041
Year/ Semester: IV/I **Section: II** **A.Y: 2022-23**

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I Microwave Tubes **CO1:**Design different modes in waveguide structures **TB1:** Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.			
1	Cavities, Re-entrant Cavities	**From: 04/07/2022** **To: 18/07/2022**	Lecture interspersed with discussions
2	Two Cavity Klystrons-Structure		
3	Velocity Modulation and Bunching process		
4	Reflex Klystrons Structure, principle of working		
5	HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures		
6	Structure of TWT		
7	M-TYPE TUBES Introduction		
8	Cross-field effects		
9	Magnetrons – 8-Cavity Cylindrical Travelling Wave Magnetron		
10	MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications		
11	TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, LSA Mode of operation		
12	Tutorial		
UNIT-II Waveguide Components And Applications **CO2:**Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction **TB1:** Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.			
13	Waveguide Components And Applications Introduction	**From: 19/07/2022** **To: 01/08/2022**	Lecture interspersed with discussions
14	Waveguide Attenuators – Resistive Card		
15	Rotary Vane types		
16	Scattering matrix parameters: Definition, Properties, Salient Features, S- parameters of Magic TEE		
17	S- parameters of two port Network		
18	S- parameters of two port Network		

19	S- parameters of two port Network, Bethe Hole types		
20	Bethe Hole types		
21	Tutorial		
UNIT-III Over view of Optical Fiber Communication And Optical Fiber Connectors **CO3**: Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices. **TB2:** Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.			
22	Introduction about optical fiber	**From: 01/08/2022** **To: 19/09/2022**	Lecture interspersed with discussions
23	Over view of Generation of optical fiber communication		
24	Total Internal Reflection, Numerical Aperture		
25	Quarter wave Monopole and Half wave Dipole		
26	Graded index fibers, Multi Mode Graded index fibers		
27	OPTICAL FIBER CONNECTORS-introduction		
28	Connector types		
29	Single mode fiber connectors,Types		
30	Mechanical Splicing &their types, single mode fiber joints		
31	Fusion splicing, Mechanical splicing		
32	Multimode fiber joints		
33	Couplers & Types		
34	Mixer & Star coupler		
35	Tutorial		
UNIT-IV Optical Sources And Detectors **CO3**:Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices. **TB2:** Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.			
36	OPTICAL SOURCES and Detectors Introduction, Surface emitting LED	**From: 20/09/2022 To: 12/10/2022**	Lecture interspersed with discussions
37	LASER diode		
38	Working of LASER,PN diode		
39	P-I-N detector		
40	Quantum efficiency for optical source ,detector		
41	Comparison of optical sources ,detectors		
42	Point to point links – Component Choice and considerations,Link power budget analysis		

43	Problems solving		
44	Tutorial		
45	Line coding		
46	Characteristics of Line coding		
47	Components of optical communication		
48	WDM, Principle of fiber cable		
49	EYE pattern ,Semiconductor material		
UNIT-V Microwave And Optical Measurements **CO4**: Measure various microwave parameters using a Microwave testbench **TB2:** Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.			
50	Description Of Microwave Bench-Different Blocks	**From: 13/10/2022** **To: 21/10/2022**	Lecture interspersed with discussions
51	Microwave Power Measurement-Bolometer Method, Attenuation measurement		
52	VSWR measurement		
53	Impedance Measurement, LOS and Radio Horizon		
54	OTDR, Attenuation		
55	Detector Characteristics		
56	Tutorial		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Microwave and Optical Communication Engineering: R1941041
Year/ Semester: IV /I **Section: I** **A.Y: 2022-23**

No. of Periods	TOPIC	Date	Mode of Delivery
UNIT-I Microwave Tubes **CO1:**Design different modes in waveguide structures **TB1:** Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.			
1	Cavities, Re-entrant Cavities	**From: 04/07/2022** **To: 21/07/2022**	Lecture interspersed with discussions
2	Two Cavity Klystrons-Structure		
3	Velocity Modulation and Bunching process		
4	Reflex Klystrons Structure, principle of working		
5	HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures		
6	Structure of TWT		
7	M-TYPE TUBES Introduction		
8	Cross-field effects		
9	Magnetrons – 8-Cavity Cylindrical Travelling Wave Magnetron		
10	MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications		
11	TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, LSA Mode of operation		
12	Tutorial		
UNIT-II Waveguide Components And Applications **CO2:**Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction **TB1:** Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.			
13	Waveguide Components And Applications Introduction	**From: 22/07/2022** **To: 30/07/2022**	Lecture interspersed with discussions
14	Waveguide Attenuators – Resistive Card		
15	Rotary Vane types		
16	Scattering matrix parameters: Definition, Properties, Salient Features, S- parameters of Magic TEE		
17	S- parameters of two port Network		

18	S- parameters of two port Network, Bethe Hole types		
19	Bethe Hole types		
20	Tutorial		
UNIT-III Over view of Optical Fiber Communication And Optical Fiber Connectors **CO3**:Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices. **TB2:** Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.			
21	Introduction about optical fiber	**From: 02/08/2022** **To: 20/09/2022**	Lecture interspersed with discussions
22	Over view of Generation of optical fiber communication		
23	Total Internal Reflection		
24	Numerical Aperture		
25	Quarter wave Monopole and Half wave Dipole		
26	Graded index fibers, Multi Mode Graded index fibers		
27	OPTICAL FIBER CONNECTORS-introduction		
28	Connector types		
29	Single mode fiber connectors, Types		
30	Mechanical Splicing &their types		
31	single mode fiber joints		
32	Multimode fiber joints		
33	Couplers & Types		
34	Mixer & Star coupler		
35	Tutorial		
UNIT-IV Optical Sources And Detectors **CO3**:Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices. **TB2:** Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.			
36	OPTICAL SOURCES and Detectors Introduction, Surface emitting LED	**From: 20/09/2022** **To:13/10/2022**	Lecture interspersed with discussions
37	LASER diode		
38	Working of LASER,PN diode		
39	P-I-N detector		
40	Quantum efficiency for optical source ,detector		
41	Comparison of optical sources ,detectors		
42	Point to point links – Component Choice and considerations,Link power budget analysis		
43	Problems solving		

44	Tutorial		
45	Line coding		
46	Characteristics of Line coding		
47	Components of optical communication		
48	WDM, Principle of fiber cable		
49	EYE pattern ,Semiconductor material		
UNIT-V Microwave And Optical Measurements **CO4**: Measure various microwave parameters using a Microwave testbench **TB2:** Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.			
50	Description Of Microwave Bench-Different Blocks	**From: 13/10/2022** **To: 21/10/2022**	Lecture interspersed with discussions
51	Microwave Power Measurement-Bolometer Method, Attenuation measurement		
52	VSWR measurement		
53	Impedance Measurement, LOS and Radio Horizon		
54	OTDR, Attenuation		
55	Detector Characteristics		
56	Tutorial		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Digital Image and Video Processing/ R1941043

Year / Semester: IV/I **Section:** I **A.Y:** 2022-23

S.NO.	TOPIC	Date	Mode of Delivery
UNIT-I FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS **CO1**: Defining the digital image representation applications in image processing and various image transforms. **TB1:** Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009.			
1	Introduction	From: 04.07.2022 To: 23.07.2022	Lectureinterspersed with discussions
2	Image sampling, Quantization, Resolution		
3	Image file formats		
4	Elements of image processing system		
5	Applications of Digital image processing		
6	Introduction, Need for transform		
7	Fourier transform 2 D Discrete Fourier transform and its transforms		
8	Importance of phase		
9	Walsh transform		
10	Hadamard transform		
11	Haar transform		
12	slant transform		
13	Discrete cosine transform		
14	KL transform		
15	singular value decomposition		
16	comparison of different image transforms		
	Tutorial class		
UNIT-II IMAGE ENHANCEMENT: SPATIAL DOMAIN METHODS **CO2:** Discuss how an image can be enhanced by using histogram techniques. Analyze restoration techniques by estimating Image degradation. **TB1:** Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009.			
17	point processing techniques	From: 25.07.2022 To: 23.08.2022	Lecture interspersed withdiscussions
18	Histogram processing		
19	Fundamentals of Spatial filtering		
20	smoothing spatial filters		
21	sharpening spatial filters		
22	**Frequency domain methods: basics of filtering in frequency domain**		
23	image smoothing		

24	image sharpening		
25	Selective filtering		
26	**IMAGE RESTORATION:**		
27	Introduction to Image restoration		
28	Image degradation		
29	Types of image blur		
30	Classification of image restoration techniques		
31	Image restoration model		
32	Linear and Nonlinear image restoration techniques		
33	Blind de-convolution		
	Tutorial		
UNIT-III IMAGE SEGMENTATION **CO3:**Detection of point, line and edges in images. Differentiate various image compression techniques by the redundancy in images. **TB1:** Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.			
34	Point, Line and Edge Detection	From: 23.08.2022 To: 27.08.2022	Lecture interspersed withdiscussions
35	Region based segmentation		
36	Classification of segmentation techniques		
37	Region approach to image segmentation		
38	clustering techniques		
39	Image segmentation based on thresholding		
40	Edge based segmentation, Edge detection and linking		
41	Hough transform		
42	**IMAGE COMPRESSION: INTRODUCTION, NEED FOR IMAGE COMPRESSION**		
43	Redundancy in images, Classification of redundancy in image		
44	image compression scheme, Classification of image compression schemes		
45	Fundamentals of information theory		
46	Run length coding		
47	Shannon – Fano coding		
48	Huffman coding		
49	Arithmetic coding	From: 05.09.2022 To: 27.09.2022	
50	Predictive coding		
51	Transformed based compression		
52	Image compression standard		
53	Wavelet-based image compression		
54	JPEG Standards		
	Tutorial		
UNIT IV: BASIC STEPS OF VIDEO PROCESSING **CO4:** Differentiate analog colour TV system and to digital video system and explain filtering operations in video processing. **TB2:** Video Processing and Communication – Yao Wang, JoemOstermann and Ya-quin Zhang.1st Ed., PH Int,2017.			

TB3:Digital Video Processing – M. Tekalp, Prentice Hall International.2ndEd.2015.			
55	Analog Video	From: 28.09.2022 To: 15.10.2022	Lecture Interspersed withdiscussions
56	Digital Video		
57	Time-Varying Image Formation models		
58	Three-Dimensional Motion Models		
59	Geometric Image Formation		
60	Photometric Image Formation		
61	Sampling of Video signals		
62	filtering operations		
	Tutorial		
UNIT-V MOTION ESTIMATION **CO5:**Analyze the general methodologies for 2D motion estimation. **TB2:** Video Processing and Communication – Yao Wang, JoemOstermann and Ya-quin Zhang.1st Ed., PH Int,2017.			
63	Optical flow	From: 17.10.2022 To: 29.10.2022	Lecture interspersed withdiscussions
64	General Methodologies		
65	Pixel Based Motion Estimation		
66	Block-Matching Algorithm		
67	Mesh based Motion Estimation		
68	Global Motion Estimation		
69	Region based Motion Estimation		
70	Multi resolution motion estimation		
71	Waveform based coding		
72	Block based transform coding		
73	Predictive coding		
74	Application of motion estimation in Video coding.		
	Tutorial class		

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TENTATIVE LESSON PLAN

Course/Code: Digital Image and Video Processing / R1941043

Year / Semester: IV/I **Section:** II **A.Y:** 2022-23

S.NO.	TOPIC	Date	Mode of Delivery
UNIT-I FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS **CO1**: Defining the digital image representation applications in image processing and analyze various Image Transforms. **TB1:** Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009.			
1	Introduction	From: 04.07.2022 To: 23.07.2022	Lectureinterspersed with discussions
2	Image sampling, Quantization, Resolution		
3	Image file formats		
4	Elements of image processing system		
5	Applications of Digital image processing		
6	Introduction, Need for transform		
7	Fourier transform 2 D Discrete Fourier transform and its transforms		
8	Importance of phase		
9	Walsh transform		
10	Hadamard transform		
11	Haar transform		
12	slant transform		
13	Discrete cosine transform		
14	KL transform		
15	singular value decomposition		
16	comparison of different image transforms		
	Tutorial class		
UNIT-II IMAGE ENHANCEMENT: SPATIAL DOMAIN METHODS **CO2:** Detection of point, line and edges in images.Differentiate various image compression techniques by the redundancy in images. **TB1:** Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009.			
17	point processing techniques		
18	Histogram processing		
19	Fundamentals of Spatial filtering		
20	smoothing spatial filters		
21	sharpening spatial filters		
22	**FREQUENCY DOMAIN METHODS: BASICS OF FILTERING IN FREQUENCY DOMAIN**		

23	image smoothing	From: 25.07.2022 To: 13.08.2022	Lecture interspersed withdiscussions
24	image sharpening		
25	Selective filtering		
26	**IMAGE RESTORATION:**		
27	Introduction to Image restoration		
28	Image degradation		
29	Types of image blur		
30	Classification of image restoration techniques		
31	Image restoration model		
32	Linear and Nonlinear image restoration techniques		
33	Blind de-convolution		
	Tutorial		

UNIT-III IMAGE SEGMENTATION

CO3: Detection of point, line and edges in images. Differentiate various image compression techniques by the redundancy in images.

TB1: Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009.

34	Point, Line and Edge Detection	From: 23.08.2022 To: 27.08.2022	Lecture interspersed withdiscussions
35	Region based segmentation		
36	Classification of segmentation techniques		
37	Region approach to image segmentation		
38	clustering techniques		
39	Image segmentation based on thresholding		
40	Edge based segmentation, Edge detection and linking		
41	Hough transform		
42	**IMAGE COMPRESSION: INTRODUCTION, NEED FOR IMAGE COMPRESSION**		
43	Redundancy in images, Classification of redundancy in image		
44	image compression scheme, Classification of image compression schemes		
45	Fundamentals of information theory		
46	Run length coding		
47	Shannon – Fano coding		
48	Huffman coding		
49	Arithmetic coding		
50	Predictive coding		
51	Transformed based compression	From: 05.09.2022 To: 27.09.2022	
52	Image compression standard		
53	Wavelet-based image compression		
54	JPEG Standards		
	Tutorial		

UNIT IV: BASIC STEPS OF VIDEO PROCESSING

CO4: Differentiate analog colour TV systemand to digital video system and explain filtering operations in video processing.

TB2: Video Processing and Communication – Yao Wang, Joem Ostermann and Ya-quin Zhang.1st Ed., PH Int,2017.

TB3: Digital Video Processing – M. Tekalp, Prentice Hall International.2ndEd.2015.			
55	Analog Video	From: 28.09.2022 To: 15.10.202	Lecture Interspersed Withdiscussions
56	Digital Video		
57	Time-Varying Image Formation models		
58	Three-Dimensional Motion Models		
59	Geometric Image Formation		
60	Photometric Image Formation		
61	Sampling of Video signals		
62	filtering operations		
	Tutorial		
UNIT-V MOTION ESTIMATION **CO5:** Analyze the general methodologies for 2D motion estimation. **TB2:** Video Processing and Communication – Yao Wang, Joem Ostermann and Ya-quin Zhang.1st Ed., PH Int,2017.			
63	Optical flow	From: 15.10.2022 To: 29.10.2022	Lecture interspersed withdiscussions
64	General Methodologies		
65	Pixel Based Motion Estimation		
66	Block-Matching Algorithm		
67	Mesh based Motion Estimation		
68	Global Motion Estimation		
69	Region based Motion Estimation		
70	Multi resolution motion estimation		
71	Waveform based coding		
72	Block based transform coding		
73	Predictive coding		
74	Application of motion estimation in Video coding.		
	Tutorial class		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Communication Standards & Protocols / (R194104A)

Year / Semester : IV/I **Section:** I **Academic Year:** 2022-2023

S.No.	TOPIC	Date	Mode of Delivery
UNIT –I INTRODUCTION TO COMMUNICATION AND NETWORKING **CO1::Acquire knowledge on the basic concepts of how digital data is transferred across computer networks and identify the different types of network topologies.** **TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.** **TB :: 2.Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.**			
1	Introduction, Communications	**From: 04.07.2022 To: 23.07.2022**	PPT, Onboard Lecture interspersed with discussions
2	Signal Types and its characteristics (Analog/Digital)		
3	Data Transmission Types (Serial/Parallel),		
4	Communication Techniques (Asynchronous, Synchronous)		
5	Data Transmission Modes (Simplex, Half/Full Duplex)		
6	Network Topologies (Star, Ring, Mesh, Point to Point, Tree, Bus, Daisy chain, Multi drop) and its applications		
7	Modulation need and types		
8	Tutorial		
UNIT –II OSI LAYERS **CO2::Comprehend the concept of layered approach of computer networks organization and familiarize with transmission media, flow control and analyze various error detection and correction techniques.** **TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.** **TB :: 2. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.**			
9	Communication Layers and its applications	**From: 25.07.2022 To: 13.08.2022**	Onboard Lecture interspersed with discussions
10	Communication media (Twisted Pair)		
11	Co-axial		
12	Fiber Optics		
13	Introduction to Errors (Error types)		
14	Error detection		
15	Error correction		

16	Flow Control and its applications		
17	Tutorial		

UNIT - III WIRED COMMUNICATION PROTOCOLS

CO3:: Illustrate the fundamental concepts of addressing, reliable transmission and working of wired communication protocols.

TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.

TB :: 2. System Design- A Unified Hardware and Software Introduction – Frank Vahid/Tony Girvargis-3rd edition,2009,John Wiley&Sons.

18	Ethernet (Types, Socket)	From: 16.08.2022 To: 24.09.2022	PPT, Onboard Lecture interspersed with discussions
19	MAC		
20	IP		
21	ARP		
22	ICMP		
23	TCP		
24	UDP		
25	DHCP		
26	CAN		
27	Mod-bus(RTU, ASCII)		
28	UART (RS485,RS232)		
29	OFC and Advantages, Disadvantages and its applications		
30	Introduction to Dial up Modems		
31	Leased line modems		
32	Tutorial		

UNIT –IV WIRELESS COMMUNICATION PROTOCOLS

CO4: Interpret the transferring of data using various wireless communication technologies and protocols.

TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.

TB :: 2. System Design- A Unified Hardware and Software Introduction – Frank Vahid/Tony Girvargis-3rd edition,2009,John Wiley&Sons.

33	Zigbee	From: 25.09.2022 To: 12.10.2022	PPT, Onboard Lecture interspersed with discussions
34	Bluetooth		
35	Wi-Fi		
36	GPRS,		
37	GSM		
38	NFC		
39	IR		
40	Satellite Communication, Advantages, Disadvantages and its applications		
41	Tutorial		

UNIT –V NETWORK TYPES

CO5: Analyze various network routing algorithms, congestion prevention policies and obtain an overview of the Internet and network security.

TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.

TB :: 2. Hoc Wireless Networks: Architectures and Protocols - C. Siva RamMurthy and B.S.Manoj, 2004, PHI.			
42	Introduction to LAN,WAN,PAN	From: 13.10.2022 To: 26.10.2022	PPT, Onboard Lecture interspersed with discussions
43	Internet and Intranet		
44	sensor networks (wired/wireless) and its applications		
45	**Network Security** :Introduction to NAT, PAT		
46	DNS		
47	Network Routing algorithms		
48	Introduction to Switch, Hub, Bridges and its working		
49	Network Security		
50	Introduction to Firewall and its applications		
51	Tutorial		

12/7/22

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TENTATIVE LESSON PLAN

Course/Code: Communication Standards & Protocols / (R194104A)

Year / Semester : IV/I **Section:** II **Academic Year:** 2022-2023

S.No.	TOPIC	Date	Mode of Delivery
UNIT –I INTRODUCTION TO COMMUNICATION AND NETWORKING **CO1::Acquire knowledge on the basic concepts of how digital data is transferred across computer networks and identify the different types of network topologies.** **TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.** **TB :: 2.Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.**			
1	Introduction, Communications	**From: 04.07.2022 To: 23.07.2022**	PPT, Onboard Lecture interspersed with discussions
2	Signal Types and its characteristics (Analog/Digital)		
3	Data Transmission Types (Serial/Parallel),		
4	Communication Techniques (Asynchronous, Synchronous)		
5	Data Transmission Modes (Simplex, Half/Full Duplex)		
6	Network Topologies (Star, Ring, Mesh, Point to Point, Tree, Bus, Daisy chain, Multi drop) and its applications		
7	Modulation need and types		
8	Tutorial		
UNIT –II OSI LAYERS **CO2::Comprehend the concept of layered approach of computer networks organization and familiarize with transmission media, flow control and analyze various error detection and correction techniques.** **TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.** **TB :: 2. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.**			
9	Communication Layers and its applications	**From: 25.07.2022 To: 13.08.2022**	Onboard Lecture interspersed with discussions
10	Communication media (Twisted Pair)		
11	Co-axial		
12	Fiber Optics		
13	Introduction to Errors (Error types)		
14	Error detection		
15	Error correction		

16	Flow Control and its applications		
17	Tutorial		
UNIT - III WIRED COMMUNICATION PROTOCOLS **CO3:: Illustrate the fundamental concepts of addressing, reliable transmission and working of wired communication protocols.** **TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.** **TB :: 2. System Design- A Unified Hardware and Software Introduction – Frank Vahid/Tony Girvargis-3rd edition,2009,John Wiley&Sons.**			
18	Ethernet (Types, Socket)	**From: 16.08.2022** **To: 24.09.2022**	PPT, Onboard Lecture interspersed with discussions
19	MAC		
20	IP		
21	ARP		
22	ICMP		
23	TCP		
24	UDP		
25	DHCP		
26	CAN		
27	Mod-bus(RTU, ASCII)		
28	UART (RS485,RS232)		
29	OFC and Advantages, Disadvantages and its applications		
30	Introduction to Dial up Modems		
31	Leased line modems		
32	Tutorial		
UNIT –IV WIRELESS COMMUNICATION PROTOCOLS **CO4: Interpret the transferring of data using various wireless communication technologies and protocols.** **TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.** **TB :: 2. System Design- A Unified Hardware and Software Introduction – Frank Vahid/Tony Girvargis-3rd edition,2009,John Wiley&Sons.**			
33	Zigbee	**From: 25.09.2022** **To: 12.10.2022**	PPT, Onboard Lecture interspersed with discussions
34	Bluetooth		
35	Wi-Fi		
36	GPRS,		
37	GSM		
38	NFC		
39	IR		
40	Satellite Communication, Advantages, Disadvantages and its applications		
41	Tutorial		

UNIT –V NETWORK TYPES

CO5: Analyze various network routing algorithms, congestion prevention policies and obtain an overview of the Internet and network security.

TB :: 1. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.

TB :: 2. Hoc Wireless Networks: Architectures and Protocols - C. Siva RamMurthy and B.S.Manoj, 2004, PHI.

42	Introduction to LAN,WAN,PAN	**From: 13.10.2022 To: 26.10.2022**	PPT, Onboard Lecture interspersed with discussions
43	Internet and Intranet		
44	sensor networks (wired/wireless) and its applications		
45	**Network Security :**Introduction to NAT, PAT		
46	DNS		
47	Network Routing algorithms		
48	Introduction to Switch, Hub, Bridges and its working		
49	Network Security		
50	Introduction to Firewall and its applications		
51	Tutorial		

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TENTATIVE LESSON PLAN

Course/Code: Embedded Systems / R194104D

Year / Semester : IV/I **Section:** I **A.Y:** 2022-23

S.No	TOPIC	Date	Mode of Delivery
UNIT –I INTRODUCTION **CO1:** Understand the building blocks of typical embedded systems and different memory technology and memory types. **TB : Embedded Systems by Shibu k.v.**			
1	Embedded System-Definition	**From: 12-07-2022 To: 26-07-2022**	Lecture interspersed with discussions
2	History of Embedded systems		
3	Classification of Embedded systems		
4	Major application areas of embedded systems purpose of embedded systems		
5	The typical embedded system		
6	Core of the embedded system , Memory		
7	Sensors and Actuators		
8	Communication Interface		
9	Embedded firmware ,PCB and passive components		
10	Characteristics of an embedded system		
11	Quality attributes of embedded systems		
12	Application -specific embedded system-		
13	Domain-Specific examples of Embedded system		
14	Tutorial		
UNIT –II EMBEDDED HARDWARE DESIGN **CO2:** Student can understand the principles and the implementation of various communication devices. **TB: EMBEDDED SYSTEMS BY RAJ KAMAL SECOND EDITION.**			
15	Analog and digital electronic components	**From: 27-07-2022 To: 20-08-2022**	Lecture interspersed with discussions
16	I/O types and examples		
17	Serial communication devices		
18	Parallel device ports		
19	Wireless devices, Timer and counting devices		
20	Real time clock, Watchdog timer		
21	Tutorial		

UNIT –III EMBEDDED FIRMWARE DESIGN

CO3: Student can understand the firmware design approaches, ISR concept and interrupt sources.

TB : EMBEDDED SYSTEMS BY RAJ KAMAL SECOND EDITION.

22	Embedded Firmware design approaches	**From: 22-08-2022 To: 12-09-2022**	Lecture interspersed with discussions
23	Embedded Firmware development languages		
24	ISR concept Interrupt sources Interrupt servicing mechanism		
25	Multiple interrupts, DMA		
26	Device driver programming		
27	Concepts of C versus Embedded C Compiler Vs Cross compiler		
28	**Tutorial**		

UNIT –IV REAL TIME OPERATIONG SYSTEM AND HARDWARE SOFTWARE CO DESIGN

CO4: Student can understand the OS basics and RTOS and also the design of hardware and software interfaces

TB1: Embedded systems by Shibu k.v.

TB2: Embedded systems by Rajkamal second edition.

29	Operating system basics	**From: 13-09-2022 To: 10-10-2022**	Lecture interspersed with discussions
30	Types of operating systems		
31	Task, Process and Threads		
32	Multiprocessing and Multitasking		
33	Task Scheduling, Threads processes scheduling		
34	Task communication		
35	Task synchronization		
36	Device Drivers, How to choose an RTOS		
37	**HARDWARE SOFTWARE CO-DESIGN**		
38	Fundamental Issues in hardware software co-design		
39	Computational models in embedded design		
40	Hardware software trade-offs		
41	Integration of hardware and firmware, ICE		
42	Tutorial		

UNIT –V EMBEDDED SYSTEM DEVELOPMENT AND TESTING

CO5: Student can understand the concept of IDE and Hardware debugging, debugging tools and testing tools

TB : EMBEDDED SYSTEMS ARCHITECTURE BY TAMMY NEORGAARD.

43	The integrated development environment	**From: 15/12/2022**	Lecture interspersed
44	Types of files generated on cross-compilation		
45	Simulators, Emulators and Debugging		
46	Target hardware debugging, Boundary Scan		
47	Embedded Software development process and tools		
48	The main software utility tool		

49	CAD and the hardware ,Translation tools-pre processor	To: 26/12/2022	with discussions
50	Interpreters, Compilers and Linkers, Debugging tools		
51	Quality assurance and testing of the design, Testing		
52	Simulators ,Laboratory Tools, Tutorial		

Signature of Faculty

Signature of HoD

SRK INSTITUTE OF TECHNOLOGY, ENIKEPADU, VIJAYAWADA -521108
Approved by AICTE, Affiliated to JNTUK, Kakinada
ISO 9001:2015 Certified Institution
Accredited with NAAC 'A' grade
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

TENTATIVE LESSON PLAN

Course/Code: Embedded Systems / R194104D

Year / Semester : IV/I **Section:** II **A.Y:** 2022-23

S.No	TOPIC	Date	Mode of Delivery
UNIT –I INTRODUCTION **CO1:** Understand the building blocks of typical embedded systems and different memory technology and memory types. **TB : Embedded Systems by Shibu k.v.**			
1	Embedded System-Definition	**From: 12-07-2022 To: 26-07-2022**	Lecture interspersed with discussions
2	History of Embedded systems		
3	Classification of Embedded systems		
4	Major application areas of embedded systems purpose of embedded systems		
5	The typical embedded system		
6	Core of the embedded system , Memory		
7	Sensors and Actuators		
8	Communication Interface		
9	Embedded firmware ,PCB and passive components		
10	Characteristics of an embedded system		
11	Quality attributes of embedded systems		
12	Application -specific embedded system-		
13	Domain-Specific examples of Embedded system		
14	Tutorial		
UNIT –II EMBEDDED HARDWARE DESIGN **CO2:** Student can understand the principles and the implementation of various communication devices. **TB: EMBEDDED SYSTEMS BY RAJ KAMAL SECOND EDITION.**			
15	Analog and digital electronic components	**From: 27-07-2022 To: 20-08-2022**	Lecture interspersed with discussions
16	I/O types and examples		
17	Serial communication devices		
18	Parallel device ports		
19	Wireless devices, Timer and counting devices		
20	Real time clock, Watchdog timer		
21	Tutorial		

UNIT –III EMBEDDED FIRMWARE DESIGN

CO3: Student can understand the firmware design approaches, ISR concept and interrupt sources.

TB : EMBEDDED SYSTEMS BY RAJ KAMAL SECOND EDITION.

22	Embedded Firmware design approaches	**From: 22-08-2022 To: 12-09-2022**	Lecture interspersed with discussions
23	Embedded Firmware development languages		
24	ISR concept Interrupt sources Interrupt servicing mechanism		
25	Multiple interrupts, DMA		
26	Device driver programming		
27	Concepts of C versus Embedded C Compiler Vs Cross compiler		
28	**Tutorial**		

UNIT –IV REAL TIME OPERATIONG SYSTEM AND HARDWARE SOFTWARE CO DESIGN

CO4: Student can understand the OS basics and RTOS and also the design of hardware and software interfaces

TB1: Embedded systems by Shibu k.v.

TB2: Embedded systems by Rajkamal second edition.

29	Operating system basics	**From: 13-09-2022 To: 10-10-2022**	Lecture interspersed with discussions
30	Types of operating systems		
31	Task, Process and Threads		
32	Multiprocessing and Multitasking		
33	Task Scheduling, Threads processes scheduling		
34	Task communication		
35	Task synchronization		
36	Device Drivers, How to choose an RTOS		
37	**HARDWARE SOFTWARE CO-DESIGN**		
38	Fundamental Issues in hardware software co-design		
39	Computational models in embedded design		
40	Hardware software trade-offs		
41	Integration of hardware and firmware, ICE		
42	Tutorial		

UNIT –V EMBEDDED SYSTEM DEVELOPMENT AND TESTING

CO5: Student can understand the concept of IDE and Hardware debugging, debugging tools and testing tools

TB : EMBEDDED SYSTEMS ARCHITECTURE BY TAMMY NEORGAARD.

43	The integrated development environment	**From: 15/12/2022 To: 26/12/2022**	Lecture interspersed with discussions
44	Types of files generated on cross-compilation		
45	Simulators, Emulators and Debugging		
46	Target hardware debugging, Boundary Scan		
47	Embedded Software development process and tools		
48	The main software utility tool		

49	CAD and the hardware ,Translation tools-pre processor		
50	Interpreters, Compilers and Linkers, Debugging tools		
51	Quality assurance and testing of the design, Testing		
52	Simulators ,Laboratory Tools, Tutorial		

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