Amrita Sai Institute of Science and Technology
(Autonomous)
Approved by AICTE, New Delhi; Permanently Affiliated to JNTUK, Kakinada
Recognized by UGC under 2(f) & 12(B) of 1956 Act
ISO 9001:2015 Certified Institution, Accredited by NAAC with 'A' grade
Amrita Sai Nagar, Paritala, Krishna District, Andhra Pradesh – 521 180
www.amritasai.edu.in, **0866 2428399**

AR20

COURSE STRUCTURE & SYLLABUS B.Tech
Electronics and Communication Engineering
Programme

(Applicable for batches admitted from 2020-2021)

AMRITA SAI INSTITUTE OF SCIENCE & TECHNOLOGY
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE FOR AR20 REGULATION

I YEAR I SEMESTER:

S.NO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20BS1T1	ENGINEERING PHYSICS	BSC	3	0	0	3
2	20BS1T2	ORDINARY DIFFERENTIAL EQUATIONS AND CALCULUS	BSC	3	0	0	3
3	20ES1T3	ELECTRICAL CIRCUIT ANALYSIS	ESC	3	0	0	3
4	20ES1T4	C PROGRAMMING	ESC	3	0	0	3
5	20ES1T5	ENGINEERING GRAPHICS AND DESIGN	ESC	1	0	4	3
6	20BS1L1	ENGINEERING/APPLIED PHYSICS LAB	BSC	0	0	3	1.5
7	20ES1L2	C PROGRAMMING LAB	ESC	0	0	3	1.5
8	20ES1L3	ENGINEERING WORKSHOP & ITWS LAB	ESC	0	0	3	1.5
9	20MC1T6	ENVIRONMENTAL STUDIES	MC	**2**	**0**	**0**	**0**
		TOTAL CREDITS					**19.5**

I YEAR II SEMESTER:

S.NO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20HS2T1	COMMUNICATIVE ENGLISH-I	HSMC	3	0	0	3
2	20BS2T2	LINEAR ALGEBRA AND TRANSFORMATIONS	BSC	3	0	0	3
3	20BS2T3	ENGINEERING CHEMISTRY	BSC	3	0	0	3
4	20ES2T4	PYTHON PROGRAMMIG	ESC	3	0	0	3
5	20ES2T5	ENGINEERING MECHANICS	ESC	3	0	0	3
6	20HS2L1	COMMUNICATIVE ENGLISH LAB	HSMC	0	0	3	1.5
7	20BS2L2	ENGINEERING CHEMISTRY LAB	BSC	0	0	3	1.5
8	20ES2L3	PYTHON LAB	ESC	0	0	3	1.5
		TOTAL CREDITS					**19.5**

Prepared

Chairman

Member(s)

II YEAR I SEMESTER:

SNO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20BS3T1	Numerical Methods and Complex Variables	BSC	3	0	0	3
2	20EC3T2	Electronic Devices and Circuits	PCC	3	0	0	3
3	20EC3T3	Signals and Systems	PCC	3	1	0	4
4	20EC3T4	Switching Theory and Logic Design	PCC	2	0	0	2
5	20EC3T5	Network Theory	PCC	3	0	0	3
6	20EC3L1	Electronic Devices and Circuits Lab	PCC(LAB)	0	0	3	1.5
7	20EC3L2	Network Theory Lab	PCC(LAB)	0	0	3	1.5
8	20EC3L3	Switching Theory and Logic Design Lab	PCC(LAB)	0	0	3	1.5
9	20EC3S3	*PCB Design *GIT	SOC*	**1**	**0**	**2**	**2**
10	20EC3M3	Constitution of India	Mandatory course	2	0	0	0
		TOTAL CREDITS					**21.5**

II YEAR II SEMESTER:

S.NO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20BS4T1	Probability and Statistics	BSC /PCC	3	0	0	3
2	20EC4T2	Computer Architecture and Organization	ESC	3	0	0	3
3	20EC4T3	Electronic Circuit Analysis	PCC	3	0	0	3
4	20EC4T4	Analog and Digital Communications	PCC	3	0	0	3
5	20HS4T1	Communicative English -II	HSS	3	0	0	3
6	20EC4L1	MATLAB and Arduino Programming Lab	ESC/PCC (Interdisciplinary) (LAB)	0	0	3	1.5
7	20EC4L2	Electronic Circuits Analysis Lab	PCC (LAB)	0	0	3	1.5
8	20EC4L3	Analog and Digital Communications Lab	PCC(LAB)	0	0	3	1.5
9	20EC4S4	*Mini projects on PCB *eSim	SOC*	**1**	**0**	**2**	**2**
		TOTAL CREDITS					**21.5**
Internship 2 Months (Mandatory) during summer vacation, MOOCs-NPTEL/edx				**3**	**0**	**2**	**4**

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III YEAR I SEMESTER:

SNO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20EC5T1	Pulse and Digital Circuits	PCC	2	0	0	2
2	20EC5T2	Electromagnetic waves and Transmission lines	PCC	3	0	0	3
3	20EC5T3	Linear and Digital Integrated Circuit Applications	PCC	3	1	0	4
4	20EC5T4A 20EC5T4B 20EC5T4C 20EC5T4D 20EC5T4E	1. Introduction to MEMS 2. Bio-Medical Engineering 3. CMOS-Design 4. Nano electronics 5. Scientific computing	OEC/JOE	3	0	0	3
5	20EC5T5	Random Variables and Stochastic Processes	PEC	3	0	0	3
6	20EC5L1	Pulse and Digital Circuits Lab	PCC Lab	0	0	3	1.5
7	20EC5L2	Linear and Digital Integrated Circuit Applications Lab	PCC Lab	0	0	3	1.5
8	20EC5S1	*Mini projects *R	SAC/ SSC*	**1**	**0**	**2**	**2**
9	20MC5T1	Professional Ethics & Human Values	Mandatory course	2	0	0	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester				0	0	0	1.5
TOTAL CREDITS							**21.5**
Internship 2 Months (Mandatory) during summer vacation, MOOCs-NPTEL/edx				**3**	**0**	**2**	**4**

III YEAR II SEMESTER:

S.NO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20EC6T1	Control Systems	PCC	3	0	0	3
2	20EC6T2	Digital Signal Processing	PCC	3	0	0	3
3	20EC6T3	Micro Processors & Micro Controllers	PCC	3	0	0	3
4	20EC6T4	VLSI Design	PEC	3	0	0	3
5	20EC6T5A 20EC6T5B 20EC6T5C 20EC6T5D 20EC6T5E	1. OOPs through Java 2. Data Mining 3. Industrial Robotics 4. Power Electronics 5.Artificial Neural Networks	OEC/JOE	2	0	2	3
6	20EC6L1	MPMC Lab	PCC Lab	0	0	3	1.5
7	20EC6L2	Digital Signal Processing Lab	PCC Lab	0	0	3	1.5
8	20EC6L3	VLSI Lab	PCC Lab	0	0	3	1.5
9	20EC6S1	*Mini projects * Latex	SAC/ SSC*	**1**	**0**	**2**	**2**
TOTAL CREDITS							**21.5**
Honors/Minor courses			MOOCs/EDX	**3**	**0**	**2**	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation							

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IV YEAR I SEMESTER:

S.NO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20EC7T1	Digital Image & Video Processing	PEC	3	0	0	3
2	20EC7T2	Fiber Optic Communication	PEC	3	0	0	3
3	20EC7T3	Computer Networks	PEC	3	0	0	3
4	20EC7T4A 20EC7T4B 20EC7T4C 20EC7T4D	1.Satellite Communication 2.Wireless Sensor Networks 3.Mobile Communication and Networks 4.Microwave Theory and Techniques	OEC/ JOE	2	0	2	3
5	20EC7T5A 20EC7T5B 20EC7T5C 20EC7T5D	1.Embedded systems 2.Error correcting codes 3.High Speed Electronics 4.Adaptive Signal Processing	OEC/ JOE	2	0	2	3
6	20EC7T6	Personality Development	*HSS Elective	**3**	**0**	**0**	**3**
7	20EC7S1	*Mini projects *RDBMS	SAC/SSC*	1	0	2	2
Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester				0	0	3	3
TOTAL CREDITS							**23**
Honors/Minor courses			MOOCs/EDX	**3**	**0**	**2**	**4**

IV YEAR II SEMESTER:

S.NO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20EC8 PROJ	Project, Project work, seminar and internship in industry	Major Project	0	0	0	12
TOTAL CREDITS							**12**

Total Credits:- 21.5+21.5+21.5+21.5+23+12=121 (3rd sem to 8th sem)

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B.Tech III, IV Semester Course Structure
Electronics and Communication Engineering
(Applicable for batches admitted from 2020-2021)

II YEAR I SEMESTER:

SNO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20BS3T1	Numerical Methods and Complex Variables	BSC	3	0	0	3
2	20EC3T2	Electronic Devices and Circuits	PCC	3	0	0	3
3	20EC3T3	Signals and Systems	PCC	3	1	0	4
4	20EC3T4	Switching Theory and Logic Design	PCC	2	0	0	2
5	20EC3T5	Network Theory	PCC	3	0	0	3
6	20EC3L1	Electronic Devices and Circuits Lab	PCC(LAB)	0	0	3	1.5
7	20EC3L2	Network Theory Lab	PCC(LAB)	0	0	3	1.5
8	20EC3L3	Switching Theory and Logic Design Lab	PCC(LAB)	0	0	3	1.5
9	20EC3S3	*PCB Design *GIT	SOC*	1	0	2	2
10	20EC3M3	Constitution of India	Mandatory course (AICTE suggested)	2	0	0	0
TOTAL CREDITS							**21.5**

II YEAR II SEMESTER:

S.NO	SUB CODE	COURSE TITLE	CATEGORY	L	T	P	CREDITS
1	20BS4T1	Probability and Statistics	BSC /PCC	3	0	0	3
2	20EC4T2	Computer Architecture and Organization	ESC	3	0	0	3
3	20EC4T3	Electronic Circuit Analysis	PCC	3	0	0	3
4	20EC4T4	Analog and Digital Communications	PCC	3	0	0	3
5	20HS4T1	Communicative English -II	HSS	3	0	0	3
6	20EC4L1	MATLAB and Arduino Programming Lab	ESC/PCC (Interdisciplinary) (LAB)	0	0	3	1.5
7	20EC4L2	Electronic Circuits Analysis Lab	PCC (LAB)	0	0	3	1.5
8	20EC4L3	Analog and Digital Communications Lab	PCC(LAB)	0	0	3	1.5
9	20EC4S4	*Mini projects on PCB *eSim	SOC*	1	0	2	2
TOTAL CREDITS							**21.5**
Internship 2 Months (Mandatory) during summer vacation, MOOCs-NPTEL/edx				**3**	**0**	**2**	**4**

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S) (DR.B.R.NAIK)

(DHABIBULLA KHAN)

Course Code	Numerical Methods and Complex Variables	L	T	P	C
20BS3T1	Maximum expected contact hours : 48	3	0	0	3
	Prerequisites : Basics Of Mathematics				

PURPOSE: This fundamental course will enable the students to learn numerical techniques and complex integration

INSTRUCTIONAL COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

COURSE OUTCOMES	
1	Calculate a root of algebraic and transcendental equations.
2	Compute interpolating polynomial for the given data. Explain relation between the finite difference operators.
3	Solve ordinary differential equations numerically using Euler's and RK method.
4	Verify analyticity of functions.
5	Calculate Taylor and Laurent series for functions Use line and contour integration to evaluate integrals.
6	Use residues to evaluate integrals.

UNIT I Solution of Algebraic and Transcendental Equations:

Introduction- Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method.

UNIT II Interpolation:

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton"s formulae for interpolation – Interpolation with unevenly spaced points - Lagrange"s Interpolation formula

UNIT III Numerical solution of Ordinary Differential equations:

Solution by Taylor"s series-Picard"s Method of successive Approximations-Euler"s Method-Runge-Kutta Methods

UNIT IV: Functions of a complex variable

Complex function, Real and imaginary parts of Complex function,Limit and Continuity and Derivative of a complex function, Cauchy-Reimann equations, Analytic function, entire function, singular point, conjugate function, C-R equations in polar form, Harmonic functions, Milne-Thompson method

UNIT V: Series expansion and Complex Integration

Line integral of a Complex function, Cauchy's theorem(only statement), Cauchy's integral formula

Taylor's series, Maclaurin's series expansion, Laurent's series

UNIT VI: Singularities and Residue theorem

Zero's of an analytic function, singularity,Isolated, Removable and Essential singularities, Pole of order m, simple pole, Residues, Residue theorem(without proof), Calculation of residues, Residue at a pole of order m, Evaluation of real definite integrals: Integration around the unit circle, Integration around semi circle, Indenting the contours having poles on the real axis

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press

2. V.Ravindranath and P.Vijayalakshmi, Mathematical Methods, Himalaya Publishing House.

3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India

4. David Kincaid, Ward Cheney, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.

5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.

6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt.Ltd, Delhi.

(DR. HABIBULLA KHAN)

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Course Code 20EC3T2	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
	Maximum expected contact hours : **64**	3	0	0	3

INSTRUCTIONAL COURSE OBJECTIVES:	
1	The basic concepts of semiconductor physics are to be reviewed
2	Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3	Conversion of AC to DC
4	Working and operation of BJT and FET and their characteristics are discussed
5	Transistor biasing and its significance and quiescent point or operating point is explained
6	small signal low frequency transistor amplifier circuits using BJT, FET in different configurations
COURSE OUTCOMES: At the end of the course the student will be able to	
1	Understand the principle involved in CRT & measure various parameters of a signal.
2	Able to design small applications based on diodes
3	Design a DC power supply for the given specifications.
4	Understand the working principle of transistor
5	Apply necessary transistor configuration for the give specifications
6	Able to design and analyse the small signal low frequency transistor amplifier circuits using BJT, FET in different configurations.

UNIT – I: CONDUCTION IN SEMICONDUCTORS AND ELECTRONIC BALLISTICS

Types of materials – Insulators, Semiconductors, metals; charge densities in a semiconductor; electrons and holes in Intrinsic semiconductor; Electrical properties of Ge and Si; The Hall effect; Drift and Diffusion Currents.

UNIT – II: JUNCTION – DIODE CHARACTERISTICS

P-N junction – equilibrium PN junction, Reverse-biased, Forward-biased; diode current equation: V-I characteristics; Effect of temperature on PN junction diode. Construction, Working, Characteristics – Zener Diode, Varactor Diode, Tunnel Diode, Photo Diode, LED, SCR, UJT and applications.

UNIT – III: Rectifiers and Filters

Operation and characteristics of rectifiers – Half wave, centre – tapped transformer Full wave, Bridge rectifier. Filters – Capacitive, L – Section, π – section. Compare filters. Zener diode as voltage regulator.

UNIT – IV: TRANSISTOR CHARACTERISTICS

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through effect.

UNIT-V: FET: FET types, construction, operation, characteristics, MOSFET-types, construction, operation, characteristics, Comparison of FET and MOSFET

UNIT – VI: TRANSISTOR BIASING AND THERMAL STABILIZATION

Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixedbias, collector to base bias, self-bias, Stabilization against variations in V_{BE}, I_c, and β, Stability factors, (S, S', S"), Bias compensation, Thermal runaway, Thermal stability.

Suggested Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw H ill, 2009.

Suggested References:

1. Electronic Devices and Circuits-K. Satya Prasad, VGS Book Links.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc- Graw Hill, Second Edition
3. Electronic Devices and Circuits – Bell, Oxford

Prepared By:

BOS CHAIRMAN

BOS MEMBER (S) (Dr. I. S. PRABHA)

(DR HABIBULLA KHAN)

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Course Code	SIGNALS AND SYSTEMS	L	T	P	C
20EC3T3	Maximum expected contact hours : 64	3	1	0	4

This fundamental course will enable the students to learn the concepts of continuous and discrete time signal analysis in frequency and time domain

1	Analysis of signals and systems
2	Representation of signals using Fourier series and Fourier transform and their properties
3	Time - Domain and Frequency Domain aspects of signals and systems
4	Concept of convolution and correlation
5	Sampling and types of sampling
6	Laplace transform of signals;
7	Z-Transform of sequences and their properties

COURSE OUTCOMES

1	Trigonometric and exponential Fourier series representation of periodic signals
2	Fourier transform of signals
3	Convolution and correlation of functions
4	Sampling Process
5	Laplace transforms, ROC for Laplace Transform
6	Z-Transform of discrete sequences and ROC for Z –Transform
7	Perform time and frequency domain analysis of various continuous and discrete time signals and systems
8	Develop solutions to stable and causal systems
9	Solve engineering problems critically in the area of signal processing

UNIT-I

Introduction: Definitions of signals and systems, representations of signals and applications of signals and systems. Elementary signals :Unit Impulse, Unit Step Functions, Exponential and Sinusoidal Signals. Classification of Continuous Time and Discrete Time Signals, compare to Continuous Time and Discrete Time Signals. Basic operations on signals, Classification of Continuous Time and Discrete Time Systems, Basic System Properties, Linear Time-Invariant Systems, Discrete Time LTI Systems.

Signal Analysis : Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions. .

UNIT-II

Fourier Series And Fourier Transforms and Sampling:

Fourier Series: Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum, Fourier series representation of periodic signals using symmetry.

Fourier Transforms : Deriving Fourier transform from Fourier series, Fourier transform of impulse, step, ramp, Signum, exponential signals, a periodic and periodic signals. Properties of Fourier transform, Introduction to Hilbert Transform , Compare to Fourier Series to Fourier Transforms.

UNIT III

Sampling: Representation of a Continuous time signal by its samples, Sampling theorem, reconstruction of a signal from its samples, different sampling techniques, Effect of under sampling: aliasing.

UNIT-IV

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system, Linear Time Invariant (LTI) system, Linear Time Variant (LTV) system, Transfer function of a LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT-V

Laplace Transforms: Laplace transform of impulse, step, ramp, Signum, exponential signals, aperiodic and periodic signals. Region of Convergence for Laplace transforms, Inverse Laplace transform, relation between Fourier and Laplace transform, Properties of the Laplace transform, Laplace transform and ROC for various classes of signals, Problem Solving.

UNIT-VI

Z-Transforms: Z-transform of discrete impulse, step, ramp, exponential signals. Region of Convergence for the Z-transform, The Inverse Z-transform, relation between Fourier and Z-transform, Properties of the Z-transform, Z-transform and ROC for various classes of signals.

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S) (DR. I SANTHI PRABA)

(DR. HABIBULLA KHAN)

Suggested Books :

1. Signals, Systems & Communications – B PLathi, 2nd edition, BS Publications,2003.
2. Signals and Systems – A V Oppenheim, ASWillsky and S HNawab, 2nd edition, PHI,1997.
3. Signals and Systems – Narayan Iyer and K SatyaPrasad,1st edition, Cenage Publications,2011.

Suggested References :

1. Signals & Systems - Simon Haykin and Van Veen,2ndedition,Wiley Publications, 1999.
2. Signals & Systems - AAnand Kumar, 2nd edition, PHI, 2011.
3. Signals & Systems - K R Rajeswari and B V Rao,2nd edition, PHI, 2014.
4. Fundamentals of Signals and Systems - Michel J Robert, MGH International Edition, 2008.

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S) (DR. B RAJENDRA NAIK)

(DR. HABIBULLA KHAN)

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Course Code 20EC3T4	SWITCHING THEORY AND LOGIC DESIGN	L	T	P	C
	Maximum expected contact hours : 64	2	0	0	2

	INSTRUCTIONAL COURSE OBJECTIVES:
1	TO learn the basic technique for the design of digital circuits and fundamental concepts used in design of digital systems
2	To understand common forms of number representation in digital electronic circuits and to be able to convert between different representation
3	To implement simple logic operations using combinational logic circuits
4	To design combinational logic circuits
5	To design sequential logic circuits
6	To study some of the Programmable Logic Devices and their use in realization switching functions.
COURSE OUTCOMES:	After going through this course the student will be able to
1	Be able to manipulate numeric information in different forms eg. Different bases, signed integers, various courses such as ASCII, Gray and BCD
2	Be able to manipulate simple Boolean expressions using the theorem and postulates of Boolean Algebra and minimize combinational circuits.
3	Be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices and arrays.
4	Be able to use concepts of Boolean Algebra for the analysis and design of various combinational logic circuits
5	Be able to use concepts of Boolean Algebra for the analysis and design of various sequential logic circuits
6	Be able to use concepts of Finite State Machines.

UNIT – I

REVIEW OF NUMBER SYSTEMS & CODES:

i)Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, problem solving. ii)4 bit codes, BCD, Excess-3, 2421, 84-2-1 9's compliment code etc.,
iii)Logic operations and error detection & correction codes; Basic logic operations -NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS, Forms, Gray code, error detection, error correction codes (parity checking, even parity, odd parity, Hamming code) NAND-NAND and NOR-NOR realizations.

UNIT – II: MINIMIZATION TECHNIQUES

Boolean theorems, principle of complementation & duality, De-Morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

UNIT – III: COMBINATIONAL LOGIC CIRCUITS DESIGN

Design of Half adder, full adder, half Subtractor, full Subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit, Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing.

UNIT – IV: INTRODUCTION OF PLD's

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

UNIT – V: SEQUENTIAL CIRCUITS I

Classification of sequential circuits (synchronous and asynchronous); basic flip-flops, truth tables and 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). Conversion from one flip-flop to flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter.

UNIT – VI: SEQUENTIAL CIRCUITS II

Finite state machine; Analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures. Realization of circuits using various flip-flops. Meelay to Moore conversion and vice-versa.

Suggested Books:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Digital Design by Mano PHI.

Suggested Reference:

1. Modern Digital Electronics by RP Jain, TMH
2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S) (DR. I SANTHI PRABHA)

(DR. HABIBULLAH KHAN)

AMRITA SAI INSTITUTE OF SCIENCE & TECHNOLOGY
(AUTONOMOUS)
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www.amritasai.edu.in, Phone: 0866 2428399.

Course Code 20EC3T5	NETWORK THEORY	L	T	P	C
	Maximum expected contact hours : 64	3	0	0	3

INSTRUCTIONAL COURSE OBJECTIVES	
1	To prepare the students to have a basic knowledge in the analysis of Electric Networks
2	To solve the given circuit with various theorems and methods.
3	To analyse the various three phase circuits star and delta connections.
4	To distinguish between tie set and cut set methods for solving various circuits.
5	To design various types of filters.
6	To relate various two port parameters and transform them.
COURSE OUTCOMES	
1	Will able to articulate in working of various components of a circuit.
2	Will be familiar with ac and dc circuits solving.
3	Will be ready with the most important concepts like mesh and nodal analysis.
4	Ability to Solve Circuits using Tree, Node, Branch, Cut set, Tie Set Methods.
5	Ability to measure Three phase voltages and current, active, reactive powers
6	Ability to convert Three phase Star to Three phase Delta circuits and Vice-Versa.

UNIT – I:Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. Star-Delta conversion, problem solving

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

UNIT – II: Steady State Analysis of A.C Circuits : Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples. Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, problem solving.

UNIT – III: Coupled Circuits: Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case resistance present in both branches, anti resonance at all frequencies.

UNIT – IV: Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, ax Power Transfer, Tellegens- problem solving using dependent sources also.

UNIT – V :Two-port networks : Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also.

UNIT – VI :Transients : First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, nonhomogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related tos-plane rotation of roots. Solutions using Laplace transform method.

Suggested **Text Books**

1.Network Analysis ,Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2.Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning
3.Electric Circuit Analysis by Hayt and Kimmarle, TMH

Suggested **Reference Books**

1.Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
2.Basic Circuit Analysis by DR Cunninghan, Jaico Publishers.
3.Network Analysis and Filter Design by Chadha, Umesh Publications.

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

CDR. HABIBULLA KHAN)

Course Code 20EC3L1	ELECTRONIC DEVICES AND CIRCUITS LAB	L	T	P	C
	Minimum of 12 experiments	--	--	3	1.5

INSTRUCTIONAL COURSE OBJECTIVES	
1	To identify various components and testing of active devices.
2	To study and operation of multimeters, function generators ,regulated power supplies and CRO To know the characteristics of various active devices
3	To study frequency response amplifier
COURSE OUTCOMES	
1	After Completion of the course the student is able to Apply various devices to real time problems
2	Compute frequency response of various amplifiers

Part A: (Only for viva-voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):

1. Identification, Specification, testing of R,L,C components (color codes), Potentiometers (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Board, PCB's
2. Identification, Specification, testing of Active devices: Diodes, BJT, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT
3. Study and operation of: i. Multimeters (Analog and Digital) ii. Function Generator iii. Regulated Power Supplies iv. CRO

Part B: (For Laboratory Examination – Minimum of 12 experiments)

1. Forward and Reverse Bias V-I characteristics of PN junction Diode.
2. Zener diode V-I characteristics and Zener diode as voltage regulator.
3. Half Wave rectifier, with and without filters
4. Full wave rectifier with and without filters.
5. Input and output Characteristics of a BJT in CE configuration and calculation of h-parameters.
6. Input and output Characteristics of a BJT in CB configuration and calculation of h-parameters.
7. FET characteristics in CS configuration.
8. Design of self-bias circuit
9. Frequency response of CE Amplifier.
10. Frequency response of CC Amplifier.
11. Frequency response of CS FET Amplifier.
12. SCR characteristics.
13. UJT characteristics.
14. Wien bridge oscillator
15. RC Phase shift Oscillators

Prepared By:

BOS CHAIRMAN

BOS MEMBER (S)

CDR. HABIBULLA KHAN)

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Course Code 20EC3L2	Network Theory Lab	L	T	P	C
	Any five experiments are to be conducted from each part	--	--	3	1.5

INSTRUCTIONAL COURSE OBJECTIVES	
1	To determine resonance frequency, Q-factor of RLC network.
2	To analysis time response of first orders RC/RL network for non-sinusoidal inputs.
3	To estimate parameters of two port networks
4	To understand the concept network theorems in network reduction of electrical networks
5	To determine efficiency of dc shunt machine with actual loading.
6	To analyze performance of 3 phase induction motor
7	To understand the significance of regulation of an alternators through synchronous impedance method
COURSE OUTCOMES	
1	Able to analyze RLC circuits and understand resonant frequency and Q-factor.
2	Able to determine first order RC/RL networks of periodic non- sinusoidal waveforms.
3	Able to apply network theorems to analyze the electrical network.
4	Able to describe the performance of dc shunt machine.
5	Able to investigate the performance of 1-phase transformer.
6	Able to perform tests on 3-phase induction motor and alternator to determine their performance characteristic

PART – A

Any five experiments are to be conducted from each part

1. Series and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer & compensation theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Speed control of D.C. Shunt motor by Armature & flux control methods
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Swinburne's test on dc shunt machine.
6. Brake test on 3-phase Induction motor (performance characteristics).
7. Regulation of alternator by synchronous impedance method

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

CDR. HABIBULLA. KHAN)

Course Code 20EC3L3	Switching Theory And Logic Design Lab	L	T	P	C
	Minimum of Twelve Experiments has to be performed	--	--	3	1.5

INSTRUCTIONAL COURSE OBJECTIVES	
1	To understand the digital logic and create various systems by using these logics.
2	Introduction to digital electronics lab- nomenclature of digitalICs,specifications, study of the data sheet, concept of Vccand ground, verification of the truth tables of logic gates usin g TTL ICs
3	Implementation of the given Boolean function using logic gates in both SOP and POS forms.
COURSE OUTCOMES	
1	Understand number systems, binary addition and subtraction, 2's complement representation and operations with this representation and understand the different binary codes.
2	Explain switching algebra theorems and apply them for logic functions
3	Identify the importance of SOP and POS canonical forms in the minimization or other optimization of Boolean formulas in general and digital circuits.

List of Experiments: (Minimum of Twelve Experiments has to be performed)

1. Verification of truth tables of Logicgates
1. Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital TrainerKit
3. Verification of functional table of 3 to 8 line Decoder /De-multiplexer
4. 4 variable logic function verification using 8 to 1multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of
   i. J K Edge triggered Flip –Flop
   ii. J K Master Slave Flip – Flop (iii)D Flip -Flop
7. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output
8. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip- Flops and Test it with a low frequency clock and Sketch the output waveforms.
11. Design MOD – 8 synchronous counter using T Flip-Flop and verify the result and Sketch the output waveforms.
12. (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and testit.

ADD on Experiments:

1. Design BCD Adder Circuit and Test the Same using RelevantIC
2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of74154 De-Multiplexer using LEDs foroutputs.

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

CDR. HABIBULLA KHAN)

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Course Code 20EC3S3	PCB DESIGN	L	T	P	C
	Maximum expected contact hours : 64	1	0	2	2

INSTRUCTIONAL COURSE OBJECTIVES:	
1	The basic concepts about electronic Coponens
2	Upon completion of the PCB design course, the students should be able to carry out any PCB design necessary for their graduation projects
3	Upon completion of the PCB design course, the students should be able to carry out any PCB design necessary for their graduation projects
4	The course includes single-sided and double-sided printed circuit board design, emphasizing the drawings, standards, and the processes required to layout printed circuit board and manufacturing documentation
5	The course includes single-sided and double-sided printed circuit board design, emphasizing the drawings, standards, and the processes required to layout printed circuit board and manufacturing documentation
6	Students will also be able to create schematics from blue-prints, they will also be able to perform simple simulations
COURSE OUTCOMES: At the end of the course the student will be able to	
1	Electrical, communication, computer mechatronic, energy and industrial engineering students who want to include the PCB Design experience as part of their skill set
2	Those who want to peruse a career in the PCB industry by for example working as a online freelance engineer
3	Beginners and hobbyist who are interested in starting a career in electronics engineering

UNIT – I: Introduction

Defining the main stages of PCB design from a simple idea to physical reality by having a PCB board ready for production, Familiarize the students with EDA user interface and design environment Defining the types of libraries and the function of each one, Getting started with a new project Opening, storing and managing various schematic designs and projects Understanding different patterns of differed components and their corresponding package styles and footprints Description of IPC (industry standards) of every aspect of PCB design Developing a comprehensive design strategy to produce a state of the art schematics and PCB layouts.

UNIT – II: SCHEMATIC CAPTURE

placing schematic component from various integrated libraries into designer schematics, connection of components such as (Integrated Circuits or Passive-components) by using Wire, Bus, Net-label, Harness-Connector or a Port Compiling and checking the schematic design against warnings, errors and faults Creating output reports such as BOM (Bill of Material) Exporting and importing schematic data

UNIT – III: PCB DESIGN

PCB design process by defining the board shape 10 Hours Defining the PCB board profile and details Specifying the number of signal-layers and power-planes Placement of components using either: manual, interactive and automatic technique Routing using either manual or interactive routing Tricks and tips of best component placement and interactive routing strategies Defining, setup and editing of power and ground planes (Polygons)

UNIT – IV: Component & Schematic Libraries

Introducing to the basic steps of Using, editing and creating new component and schematic libraries 7 Hours Creating schematic components with single and multiple parts Checking the components using Schematic Library Editor reports Creating PCB component footprints manually and using the PCB Component Wizard Handling other special footprint requirements, including irregular pad shapes Checking the component footprints using PCB Library Editor reports Creating an integrated library of the new components and models

UNIT-V : PCB ANOTOMY

Description of different types of PCB by discussing the difference between single & double sided PCB 2 Hours Understanding the difference between singlelayer, double-layer and multiple-layer PCB Understanding the main physical layers of a given PCB: Top-Overlay, Mechanical-Layer, SolderPaste, Solder-Mask, Solder-Pad Demonstrating the physical parts of a PCB such as: Via, Drill-hole, Copper-Tracks, MountingHoles and Legends

UNIT – VI: FABRICATION OUTPUT

Generation of GERBER File (Gerber Setup in order to specify the accuracy, Layers and DrillDrawings) 2 Hours Setup and generate an NC-Drill Files.

Suggested Books:

1.Printed Circuit Boards by Khandpur
2.PCB Design : Printed Circuit Board by Michael Dsouza.

Prepared By:

BOS CHAIRMAN

BOS MEMBER (S)

CDR. HABIBULLA KHAN)

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Course Code	Constitution of India	L	T	P	C
20EC3M3	Maximum expected contact hours : 64	2	--	--	0
	Prerequisites : General Knowledge				

PURPOSE :	
INSTRUCTIONAL COURSE OBJECTIVES:	
1	To Enable the student to understand the importance of constitution
2	To understand the structure of executive, legislature and judiciary
3	To understand philosophy of fundamental rights and duties
4	To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission ofIndia.
5	To understand the central and state relation financial and administrative.
COURSE OUTCOMES	
1	Understand historical background of the constitution making and its importance for building a democratic India.
2	Understand the functioning of three wings of the government ie.,executive, legislative and judiciary.
3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
4	Analyze the decentralization of power between central, state and localself-government.
5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and PachayatiRaj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes:-After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of Supreme Court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Learning outcomes:-After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat

Prepared By:

BOS CHAIRMAN

BOS MEMBER (S)

(Dr. HABIBULLA KHAN)

- Differentiate between structure and functions of state secretariat

UNIT-IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes:-After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

Suggested References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. NewDelhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and PoliticsHans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. NewDelhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press2012

resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

CH. HABIBULLA KHAN

AMRITA SAI INSTITUTE OF SCIENCE & TECHNOLOGY
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Course Code	Probability and Statistics	L	T	P	C
20BS4T1	Maximum expected contact hours : 64	3	--	--	3
	Prerequisites : Basics of Mathematics				

PURPOSE :	
INSTRUCTIONAL COURSE OBJECTIVES:	
1	To acquaint students with the fundamental concepts of probability and statistics and to develop an understanding of the role of statistics in engineering
2	Introduce numerical techniques to solve the real world applications
COURSE OUTCOMES	
1	Examine, analyze, and compare various Probability distributions for Discrete random variable
2	Examine, analyze, and compare various Probability distributions for continuous random variable
3	Describe and compute confidence intervals for the mean of a population. Describe and compute confidence intervals for the proportion and the variance of a population
4	Test the hypothesis concerning mean, proportion and variance and perform ANOVA test.
5	Fit a curve to the numerical data and establish a relationship between two are more variables.
6	Preparing different control charts and check whether the process is in control or not

UNIT I: Discrete Random variables and Distributions:
Introduction-Random variables- Discrete Random variable-Distribution function-Expectation-Moment Generating function-Moments and properties. Discrete distributions: Binomial, Poisson and Geometric distributions and their fitting to data.

UNIT II: Continuous Random variable and distributions:
Introduction-Continuous Random variable-Distribution function- Expectation-Moment Generating function-Moments and properties. Continuous distribution: Uniform, Exponential and Normal distributions, Normal approximation to Binomial distribution -Weibull, Gamma distribution.

UNIT III: Sampling Theory:
Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem-t-distribution- Sampling distribution of means (s unknown)- Sampling distribution of variances-Chi-Square and F-distributions- Point estimation- Maximum error of estimate - Interval estimation.

UNIT IV: Tests of Hypothesis:
Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

UNIT V: Curve fitting and Correlation:
Introduction - Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares-Goodness of fit. Correlation - Linear Regression and Multiple Regression

UNIT VI: Statistical Quality Control Methods:
Introduction - Methods for preparing control charts – Problems using x-bar, R charts, Sigma Chart and attribute charts.

Suggested Text Books:

1. **Jay l.devore,** Probability and Statistics for Engineering and the Sciences.8th edition, engage.
2. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition,PHI.

Suggested Reference Books:

1. **Shron L.Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. **William Menden Hall, Robert J. Bever and Barbara Bever**, Introduction to probability and statistics, Cengage learning.2009
3. **Sheldon, M. Rosss**, Introduction to probability and statistics Engineers and the Scientists, 4th edition, Academic Foundation,2011
4. **Johannes Ledolter and Robert V.Hogg**, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson,2010

Prepared By:

BOS CHAIRMAN

BOS MEMBER (S)

(Dr. HABI BULLA KHAN)

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www.amritasai.edu.in, Phone: 0866 2428399.

Course Code 20EC4T2	Computer Architecture and Organization	L	T	P	C
	Maximum expected contact hours : 64	3	0	--	3

PURPOSE: This fundamental course will enable the students to learn the concepts of architectures & memory

	INSTRUCTIONAL COURSE OBJECTIVES
1	To understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
2	To understand the memory management system of computer.
3	To Understand the various instructions, addressing modes
4	To Understand the concept of I/O organization
	COURSE OUTCOMES
1	Students can understand the architecture of modern computer.
2	They can analyze the Performance of a computer using performance equation
3	Understanding of different instruction types
4	Students can calculate the effective address of an operand by addressing modes
5	They can understand how computer stores positive and negative numbers.
6	Understand the concepts of I/O Organization and Memory systems.

UNIT -I:

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

Machine Instruction and Programs:

Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,

UNIT -II:

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT -III:

INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,

Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -IV:

The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read- Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING **Secondary Storage:** Magnetic Hard Disks, Optical Disks,

UNIT -V:

Processing Unit: Fundamental Concepts: Register Transfers, Performing an Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control,

Unit-VI:

Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

Suggested Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5thEdition, McGrawHill,2011.
2. Computer Architecture and Organization, John P. Hayes ,3rdEdition, McGrawHill,2002.

Suggested Books:

1. Computer Organization and Architecture – William Stallings SixthEdition,Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th EditionPHI/Pearson, 2012.
3. Fundamentals or Computer Organization and Design, - SivaraamaDandamudiSpringer Int.Edition,2003.
4. "Computer Organization and Design: The Hardware/Software Interface" by DavidA. Patterson and John L.Hennessy, 1998.
5. J .P. Hayes, "Computer Architecture and Organization",McGraw-Hill,1998.

Prepared By:

BOS CHAIRMAN

BOS MEMBER (S)

DR. HABIBULLA KHAN

AMRITA SAI INSTITUTE OF SCIENCE & TECHNOLOGY
(AUTONOMOUS)
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www.amritasai.edu.in, Phone: 0866 2428399.

Course Code 20EC4T3	Electronic Circuit Analysis	L	T	P	C
	Maximum expected contact hours : 64	3	0	--	3

	INSTRUCTIONAL COURSE OBJECTIVES
1	Familiarize with Small signal low frequency transistor amplifier circuits using BJT,FET in different configurations.
2	Familiarize with Small signal high frequency BJT transistor amplifier Hybrid-π equivalent circuit and the expressions for conductance and capacitances are derived.
3	Familiarize with Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
4	The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
5	Familiarize with Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.
6	Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.
	COURSE OUTCOMES
1	Design and analysis of small signal low frequency transistor amplifier using BJT and FET .
2	Design and analysis of small signal high frequency transistor amplifier using BJT .
3	Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT
4	Know the types of feedbacks and generalized analysis of negative feedback amplifiers.
5	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
6	Know the classification of the power and tuned amplifiers and their analysis with performance comparison.

UNIT-I: SMALL SIGNAL LOW FREQUENCY TRANSISTOR AMPLIFIER MODEL

BJT: Two port network and the transistor Hybrid model, Analysis of a Transistor Amplifier circuit using h- parameters, Analysis of CB,CE, and CC amplifier using exact and approximate analysis, Comparison of Transistor Amplifiers, Miller's Theorem.

FET: Generalized analysis of small signal model

UNIT-II: SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS

Transistor at High Frequencies, Hybrid-π Common Emitter transistor model, Hybrid π conductance, Hybrid π capacitances, Validity of hybrid π model, Variation of Hybrid Parameters, CE short circuit gain, Current gain with resistive load, Single stage CE transistor amplifier response, Gain Bandwidth product.

UNIT-III: MULTISTAGE AMPLIFIERS

Classification of amplifiers, Choice of Transistor configuration in Cascade amplifier, methods of coupling, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT – IV: Feedback Amplifiers

Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT – V: Oscillators

Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and their analysis, Crystal oscillators, Frequency and amplitude stability of oscillators.

UNIT – VI: Power Amplifiers

Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

Suggested Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 1972.
2. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

Suggested Reference Books:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
4. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

(Dr. HABIBULLA KHAN)

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Course Code 20EC4T4	ANALOG and DIGITAL COMMUNICATIONS	L	T	P	C
	Maximum expected contact hours : 64	3	0	--	3

INSTRUCTIONAL COURSE OBJECTIVES	
1	Familiarize with the fundamentals of analog communication systems
2	Familiarize with various techniques for analog modulation and demodulation of signals
3	Familiarize with Basic concepts of Frequency Modulation
4	Develop the ability to classify and understand various functional blocks of radio transmitters and receivers
5	Distinguish the figure of merits of various analog modulation methods
6	Familiarize with basic techniques for generating and demodulating various pulse modulated signals
COURSE OUTCOMES	
1	Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
2	Analyze noise characteristics of various analog modulation methods
3	Analyze various functional blocks of radio transmitters and receivers
4	Design simple analog systems for various modulation techniques.

UNIT I

AMPLITUDE MODULATION: Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II

DSB & SSB MODULATION: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation **concept and applications**. Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT III

ANGLE MODULATION: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

UNIT IV

TRANSMITTERS & RECEIVERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. **Radio Receiver** - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of superheterodyne principle and additional circuits.

UNIT V

NOISE : Review of noise and noise sources, noise figure, Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

UNIT VI

PULSE MODULATION: Time Division Multiplexing,, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, TDM Vs FDM

Suggested Text Books:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

Suggested Reference Books

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.,.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
4. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006.
5. Electronic Communication systems – Tomasi, Pearson.

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

CDR. HABIBULLA KHAN

COMMUNICATIVE ENGLISH - II

Course Code	~~20BS~~ 20HSMT1	Year	II	Semester	I/II
Course Category	Humanities	Branch	All Branches	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Knowledge in English Language
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Objectives:
1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical components.
3. To develop communication skills of the students in both formal and informal situations.

Course Outcomes	
Upon successful completion of the course, the student will be able to -	
CO1	**Demonstrate** good writing skills for effective paraphrasing and synthesizing information.
CO2	Analyze facts from opinions while reading and writing formal letters and e mails using a range of vocabulary in formal writing.
CO3	**Evaluate** reading texts and learn good writing skills for effective argumentative essays and formal correspondence.
CO4	**Understand** the structure of project reports applying grammatically correct structures and knowledge of grammar.
CO5	**Develop** advanced reading skills for deeper understanding of texts and employability skills.

SYLLABUS		
Unit No.	Contents	Mapped CO
I	**Text 1**: **The Greatest Resource-** Education– Schumacher. **Text 2:** Essentials of effective letter writing ,C's of effective letter writing. **Grammar and Vocabulary :** Question Tags , Deriving Nouns.	CO1,CO2, CO3,CO4, CO5
II	**Text 1 : A Dilemma** :A Layman looks at science – Raymond .B.Fosdick. **Text 2 :** Personal Letter Writing. **Grammar and Vocabulary :** Usage of Prepositions, Deriving Adjectives.	CO1,CO2, CO3,CO4, CO5

III	**Text 1: The Secret of Work-** Swami Vivekananda. **Text 2**: E - Correspondence. **Grammar and Vocabulary:** Voice, Prefixes and Suffixes.	CO1,CO2, CO3,CO4, CO5
IV	**Text 1: Work brings solace-**A.P.J Kalam. **Text 2:** Business Letter Writing. **Grammar and Vocabulary:** Reported speech, One- word Substitutes.	CO1,CO2, CO3,CO4, CO5
V	**Text 1: The Scarecrow**-Satyajit Ray **Text 2** : Technical Report Writing . **Grammar and Vocabulary:** Comparison of Adjectives, Synonyms and Antonyms from the text.	CO1,CO2, CO3,CO4, CO5
VI	**Text 1**: **The Chief Software Architect** from English Encounters. **Text 2:** Soft skills: Attitude, Self management, Working in a team. **Grammar and Vocabulary:** Correction of sentences, Collocations.	CO1,CO2, CO3,CO4, CO5

Learning Resources
Text Book:
Reference Books:
1. **Business Communication** by Urmila Rai&S.M.Rai – Himalaya Publishing House 2. **The Functional aspects of Communication Skills** by Prajapati Prasad &Rajendra P.Sharma-S.K. Kataria&Sons 3. **Oxford Practice Grammar,** John Eastwood, Oxford University Press. 4. **Essential Communication Skills** – Shalini Agarwal, Ane Books Pvt Ltd 5. **Dictionary of Synonyms and Antonyms**, Oxford & IBH, III Ed 6. **A Practical English Grammar**, Agnes V. Martinet and Audrey Jean Thomson, Oxford University Press.

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Course Code 20EC4L1	MATLAB and Arduino Programming LAB	L	T	P	C
	Minimum of twelve experiments	0	0	3	1.5

	INSTRUCTIONAL COURSE OBJECTIVES
1	Introduce the MATLAB software environment.
2	To familiarize students with Arduino as IDE, programming language & platform
	COURSE OUTCOMES
1	Use MATLAB effectively to analyze and visualize data.
2	Familiar with Arduino environment and its applications.

Part A: (Minimum of 6 experiments)

MATLAB Programming

Basic Programs using MATLAB

1. The Matlab user interface
2. Working with Matlab data types
3. Creating matrices and arrays
4. Operators and control statements
5. Using scripts and functions
6. Data import and export
7. Using the graphical features
8. Programming with simple examples

Part B: (Minimum of 6 experiments)

Arduino Programming

1. Electrical Circuit
2. Blinking LED
3. LCD Display
4. Switch
5. Potentiometer
6. Serial Port
7. Temperature
8. Light Sensor
9. Thermistor

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

CDR. HABIBULLA KHAN.

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Course Code 20EC4L2	ELECTRONIC CIRCUIT ANALYSIS LAB	L	T	P	C
	Minimum of Ten Experiments	0	0	3	1.5

	INSTRUCTIONAL COURSE OBJECTIVES:
1	Frequency response of single stage and multi stage amplifiers.
2	Working of Power amplifier.
3	How frequency response varies by applying negative feedback on amplifiers.
4	Different frequency sinusoidal signal generation.
	COURSE OUTCOMES:
1	Understand the effect of capacitors on frequency response of amplifier
2	Determine the efficiency of power amplifiers.
3	Generate Sinusoidal signals with different frequencies and know the difference between different Multivibrators.

List of Experiments :(Minimum of Ten Experiments has to be performed and same should be carried out using **multisim)**

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)

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Course Code 20EC4L3	Analog and Digital Communications Lab	L	T	P	C
	Minimum of Sixteen Experiments	0	0	3	1.5

PURPOSE: ToFamiliarize with Basic principle of amplifiers and oscillators

INSTRUCTIONAL COURSE OBJECTIVES:

1	Familiarize the students with basic analog and digital communication systems.
2	Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course, e.g., amplitude and frequency modulation, pulse modulation
3	To know the steps involved in the analysis of digital communication systems
4	To know how to synthesize a digital communication module with the given specifications.

COURSE OUTCOMES:

1	Design analog modulation circuits as amplitude and frequency modulation.
2	Design various pulse modulation techniques as PAM, PPM, PWM.
3	The ability of visualization and practical implementation of baseband modulation technique
4	The ability to design pass band digital demodulation techniques

List of Experiments:
(Eight experiments to be done- **The students have to calculate the relevant parameters**)– (a. Hardware, b. MATLAB Simulink,c. MATLAB Communication toolbox)

A. Amplitude Modulation - Modulation &Demodulation
B. AM - DSB SC - Modulation &Demodulation
C. Spectrum Analysis of Modulated signal using Spectrum Analyzer
D. Diode Detector
E. Pre-emphasis &De-emphasis
F. Frequency Modulation – Modulation &Demodulation
G. AGC Circuits
H. Verification of Sampling Theorem
I. Pulse Amplitude Modulation & Demodulation
J. PWM, PPM –Modulation & Demodulation
K. PLL IC-565 as FM demodulator
L. Radio receiver characteristics
M. Radio Receiver/TV Receiver Demo kits or Trainees.

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

List of Experiments: Minimum Eight Experiments to be conducted:

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
6. Frequency shift keying.
7. Phase shift keying.
8. Differential phase shift keying.
9. Companding
10. Source Encoder and Decoder
11. Linear Block Code-Encoder and Decoder
12. Binary Cyclic Code - Encoder and Decoder
13. Convolution Code - Encoder and Decoder
14. BCH Codes

Prepared By:

BOS CHAIRMAN

BOS MEMBER (S)

Equipment& Software required: Software :

i) Computer Systems withlatestspecifications
ii) Connected in LAN(Optional)
iii) Operating system(Windows/Linux software)
iv) Simulations software (Simulink &MATLAB)

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 MHz.
3. Function Generators - 0 – 1 MHz
4. RF Generators - 0 – 1000 M Hz./0 – 100 MHz.
15. Rated Voltmeters and Ammeters
16. Lab Experimental kits for Digital Communication
17. Discrete Components
18. Breadboards and Multimeters
19. Spectrum Analyzer

Prepared By:

BOS CHAIRMAN

BOS MEMBER(S)