NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Second Year Engineering (E&TC/E&C/Elex/IE)

Faculty of Engineering and Technology

Teacher and Examiner's Manual

Semester – III

W.E.F 2013 – 2014

Solid State Devices & Circuits-I

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Semiconductor, Basic of semiconductor Devices and its application.

1.	Introduction to Semiconductor.		Lecture required	Reference No
	a	**Intrinsic and Extrinsic Semiconductor** Concept of Doping, N type Semiconductor, P type semiconductor.	01	02
	b	**Conduction Mechanism** Drift and Diffusion Current, Carrier Concentration after doping (N and P type material).	01	02 & 03
	c	**Law of mass action. (Numerical expected)** Statement of law of mass action, Donar and acceptor impurity.	01	03
	d	**Introduction to Diode (Numerical expected)** Construction , working , V-I characteristics, Diode current equation with numerical , Diode resistances (Static and Dynamic) with numerical, Diode switching time , Junction Capacitance (Transition and Diffusion Capacitance)	02	01 , 02 &03
	e	**Voltage Multiplier circuit** Working of Voltage Doubler, Tripler and Quadruple.	01	03
	e	**Diode Application** Analysis of Half wave Rectifier – Construction, working and Derivation of ripple factor.	01	03
	f	**Full wave Rectifier** Construction, working and Derivation of Ripple factor, Efficiency, PIV, TUF and Regulation. Full wave rectifier with capacitor filter, Derivation of Ripple Factor.	02	03

Unit – II

Teacher should facilitate learning of Basics of Transistor, Biasing of transistor and need of multistage amplifier.

2.	Introduction to BJT Biasing		Lecture required	Reference No
	a	Concept of DC and AC Load line, DC analysis of BJT.	01	02
	b	Voltage divider bias, Stability factor derivation.	01	03
	b	**Bias Compensation technique** Bias Compensation technique using Diode and Thermistor. Thermal runway.	01	03
	c	**Small Signal model of BJT** Hybrid parameter model of BJT for Low frequency	03	03

		analysis, Derivation for Av, Ai, Ri, & Ro using Exact and Approximate analysis interms of H parameter for CE amplifier.		
	d	**Exact and Approximate analysis.(Numerical expected)** Numerical on Exact and Approximate analysis for all Configuration , Conversion formulae for CE,CC.	02	03
	e	**Millers Theorem and its dual.(Numerical expected)**	02	02

Unit – III

Teacher should facilitate learning of Field effect transistor, Biasing of transistor and FET as an amplifier.

3.	**Introduction to FET**		**Lecture required**	**Reference No**
	a	**FET** Symbol, Construction Principal of operation, V-I and Transfer Characteristics for N & P channel FET, FET Parameter.	03	03
	b	**Biasing of FET (Numerical expected)** Voltage divider bias method (Analytical, Graphical)	03	04
	c	**FET amplifier (Numerical expected)** Small Signal model of FET, CS, CG& CD amplifier.	02	03 , 04

Unit – IV

Teacher should facilitate learning of MOSFET; it's biasing and MOSFET as amplifier.

4.	**Introduction to MOSFET**		**Lecture required**	**Reference No**
	a	**MOSFET** Symbol, Types of MOSFET - Depletion and Enhancement type MOSFET (N channel & P channel).	03	03
	b	**MOSFET** Construction, Operation and V-I characteristics (Both Types).	02	03
	c	**MOSFET biasing and amplifier (Numerical expected)** Voltage divider biasing method and amplifier (CS, CG, and CD).	03	01

Unit - V

Teacher should facilitate learning of cascaded amplifier using BJT and frequency response of BJT.

5.	**Cascade Amplifier Using BJT and Frequency response of BJT.**		**Lecture required**	**Reference No**
	a	Analysis of Two stage amplifier (CE-CE, CE-CB). **(Numerical expected)**	03	02
	b	**Frequency response of BJT**	01	02

		Concept of Frequency response, Bandwidth, Derivation for F_L, F_H for n stage cascaded amplifier.		
	c	**Square wave testing of an amplifier (Numerical expected**) Derivation of F_L, F_H for square wave testing (for Derivation Refer Page No.611 of Reference No. 4)	03	04
	d	Effect of Coupling capacitor, Bypass capacitor and Junction capacitance on frequency response of BJT.	01	04

Reference Books:

1. R. Boylestad, L. Nashelsky "Electronics Devices and Circuit Theory", 10th Edition, Pearson, 2009.
2. S. Salivahanan, N. Sureshkumar and A. Vallavaraj, "Electronics Devices and Circuits", Tata McGraw Hill, 3rd Edition, 2009.
3. S. C. Sarkar, "Electronics Devices and Circuits- I" Everest Publishing House, The Millennium 12th enlarged and revised Edition, 2001.
4. T. Floyd, "Electronics Devices" conventional current version, 7th Edition, Pearson, 2008.
5. D. Cheruku, B. Tirumala Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.
6. J. Miillman, C. Halkias, "Integrated Electronics", Tata McGraw Hill Edition, 1st Edition, 1991.

Electrical Circuits and Machines

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Basics of A.C. circuit and power measurement in three phase AC supply

1.	Three phase circuits & A.C. circuits		Lecture required	Reference No
	a	Thevenin's and Norton's theorems application for solution of A.C. network.**(Numerical)**	03	01
	b	Relation between line & phase voltages and currents in Star connected and Delta connected load system with phasor diagrams.	02	01
	c	Explanation of three phase power measurement by single watt meter method, two Watt meter method	02	01
	d	Calculation of Active, reactive, apparent power and power factor in three phase circuit with balance load for star and delta connections. **(Numerical)**	02	01

Unit – II

Teacher should facilitate learning of Basic of D C machine and its Application

2.	DC Machines		Lecture required	Reference No
	a	**DC machine :** Constructional features of DC machine, Working principal of Generator and EMF equation (series & shunt).	03	02
	b	Working principal of Motor, back EMF equation (series & shunt).	01	02
	c	Derivation of torque and speed equation of motor.	01	02
	d	**Characteristics of :** Shunt and series motors for performance parameter.	01	02
	e	**Losses and power stages:** Losses and power flow diagram of dc generator & motor **(Numerical)**.	01	02
	f	Explain the necessity of starter and 3-point starter.	02	02

Unit – III

Teacher should facilitate learning of fundamental of Single phase & three – phase transformers

3.	Single phase & three phase transformers		Lecture required	Reference No
	a	Construction & working Principle of 1ϕ and 3ϕ transformer & derive EMF equation.	02	02
	b	Phasor representation of Transformer no load & on load and Concept of equivalent circuit.	02	02
	c	Working Principle of Auto-transformer , C.T and P.T.	02	02
	d	**Open circuit and short circuit tests of transformer:** Explain open circuit and short circuit tests, Efficiency and regulation **(No Numerical)**.	02	02

Unit – IV

Teacher should facilitate learning of Synchronous Machines

4.	Synchronous Machines		Lecture required	Reference No
	a	**Alternator :** Constructional features of alternators and principle of operation.	02	02
	b	Derivation of Induced EMF equation of alternator **(No Numerical)**.	01	02
	c	**Synchronous Motors :** Working Principle of Synchronous Motors and method of starting	02	02
	d	Synchronous Motor on load with different excitation **(No Numerical).**	02	02
	e	Explain hunting in synchronous motor.	01	02

Unit - V

Teacher should facilitate learning of Three-phase & Single-phase Induction motors

5.	Induction Motors		Lecture required	Reference No
	a	**Three phase Induction motors :** Constructional features of induction motor and principle of working.	01	02
	b	Define slip and derive torque equation, explain torque slip characteristics **(No Numerical).**	01	02
	c	Explain different types of starters and applications of induction motor (DOL, star-delta, auto-transformer).	02	02

	d	**Single phase Induction motors** - principle of operation, types, data analysis and applications.	02	02
	e	**Special purpose machines**: working, data analysis and application of stepper motor, servo motor, universal motors.	02	02

Reference Books:

1. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-I",S. Chand, 1st Edition, 2010.
2. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1st Edition, 2010.
3. V N Mittle/ Arvind Mittal, "Basic Electrical Engineering", McGraw Hill Companies, 2nd Edition.
4. H. Cotton, "Electrical Technology", CBS Publication, 7th Edition.

Digital Techniques and Applications

Teacher, Paper setter and Examiner should follow the following guidelines.

Unit - I

Teacher should facilitate learning of codes and Boolean algebra.

1.	Codes and Boolean algebra		Lecture required	Reference No
	a	**Introduction to Number System.** Binary, Octal, Decimal, Hexadecimal and conversion from one system to another system.	02	02
	b	**Representation of signed numbers.** Sign-magnitude representation, 1's complement representation, 2's complement representation.		
	c	**Codes:** Codes:- BCD codes, EX-3 codes, Gray codes, ASCII codes, 15-bit hamming code and pulsed operation of logic gates	02	01,02
	d	**Boolean algebra.** Boolean law, reduce Boolean expressions, SOP and POS form, minterms and maxterms.	02	01
	e	**Karnaugh map Method.** Minimization of the logic function using K-map(SOP and POS) and Implementation(up to 4 variable), Don't- care condition	03	02

Unit – II

Teacher should facilitate learning of Combinational Logic Circuits.

2.	Combinational Logic Circuits.		Lecture required	Reference No
	A	**Adder and Substractor:** Design Half and Full adder/substractor using basic gates and NAND gates.	02	01
	b	**Parallel adder IC and Comparator.** IC 7483 parallel adder, BCD adder, 1bit /2 bit's comparator.	02	01
	c	**Code converters.** Design binary to gray, BCD to Ex-3 and BCD to 7-Segment Decoder.	03	01
	d	**Multiplexer, demultiplxer and decoder.** Construct Multiplexer and demultiplxer tree, application of multiplexer and demultiplxer, decoder and its application	02	01,02

Unit – III

Teacher should facilitate learning of Sequential Circuit and Shift resister.

3.	Sequential Circuits and Shift Resister		Lecture required	Reference No
	a	**Classification of Sequential Circuit.** Synchronous sequential and asynchronous sequential circuits.	03	01,02
	b	**Latches and Edge triggered flip-flops.** S-R latch, Gate latches, Edge triggered flip-flops such as SR, JK, T, D, Master-slave JK flip-flop, Race around condition and their application.		
	c	**Excitation table and Conversion of Flip- Flops.** Excitation table of Flip-Flop, Convert SR to JK f/f, JK to SR f/f, JK to D f/f, JK to T f/f.	02	01
	d	**Shift Resistor.** Types of Shift resister and operation of SISO, SIPO, PIPO, PISO. Operations of bi-directional shift resister and universal shift resister	03	01
	e	**Application of shift resistor.** Operation of Ring and twisted ring counter	01	01

Unit - IV

Teacher should facilitate learning of Counters and Clocked sequential circuits**.**

4.	Counters and Clocked sequential circuits.		Lecture required	Reference No
	a	**Asynchronous/Ripple counters**: Design ripple counters and Mod-N ripple counters using flip-flops.	02	01
	e	**Synchronous counters.** Design synchronous counters and Mod-N synchronous counters using flip-flops, 4 bit UP/DOWN Ripple counter.	03	02
	d	**Synchronous sequential Machine.** Block diagram, state diagram, and state table of Mealy and Moore model. Comparison between Moore and Mealy model.	02	01
	e	**Synchronous sequential circuits design.** State assignment, state equivalence and minimization. Design synchronous sequential circuits using flip-flops	02	02

Unit - V

Teacher should facilitate learning of logic families.

5.	logic Families		Lecture required	Reference No
	a	**Characteristics of digital ICs.** Speed of operation, Power dissipation, Figure merit,	01	02

		fan-out, Current and voltage parameters, Noise immunity, Operating temperature range, power supply requirement.		
	b	**TTL Logic.** Operation of TTL NAND gate, TTL gate with totem-pole driver, Open collector output, wired AND, unconnected inputs.	02	02
	c	**CMOS Logic.** CMOS logic as an inverter, CMOS NAND and NOR gates, unconnected inputs, wired logic, open drain outputs	02	02
	d	**Interfacing.** Interfacing of CMOS to TTL and TTL to CMOS.	03	02
	e	**Tri-State logic.** Tristate TTL inverter and CMOS inverter.		
	f	Comparison of different logic families	01	02

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", PHI, 2nd Edition, 2011.
2. R. Jain, "Modern Digital Electronics", Tata McGraw Hill, 4th Edition, 2010.
3. Leach, Malvino, "Digital Principles and Applications", Tata McGraw Hill, 5th Edition, 2002.
4. J. Wakerly, "Digital Design Principles and Practices", Pearson 2nd Edition, 2009.
5. R. Tocci, "Digital Systems Principles and Applications", Pearson 2nd Edition, 2002.

Component Devices & Instrumentation Technology

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Basics of Measurement, Error and Display device and their characteristics.

1.		Measurement, Error and Display device	Lecture required	Reference No
	a	**Definition of different terms.** Accuracy, precision, sensitivity, resolution, Significant figures.	01	02,04
	b	**Errors.** Define error and explain gross error, systematic error, random error, limiting errors. **(No Numerical on limiting error)**	01	01,02,04
	c	**Statistical Analysis.** Arithmetic Mean, Deviation from Mean, Average Deviation, Standard Deviation. **(Numerical)**	01	01,02,04
	d	**Permanent magnet moving coil mechanism.** Explain with its diagram and derivation of torque. Advantages and disadvantages.	01	01,02,04
	e	**DC ammeter and DC volt meter.** Basic circuit and multirange circuit of DC ammeter. Basic circuit and multirange circuit of DC volt meter. Its sensitivity & loading effect of voltmeter. **(Numerical on Dc ammeter, Dc voltmeter)(No Numerical on loading effect)**	03	01,02,04
	f	**Ohmmeter.** Series and shunt type of ohmmeter its circuit and working with calibration. **(No derivation and Numerical)**	01	01,02,04

Unit – II

Teacher should facilitate learning of Basic of analog and digital instruments.

2.		Electronic instruments	Lecture required	Reference No
	a	**Digital multimeter.** Block diagram of digital multimeter with working.	03	01
	b	**Types of DVM** General specifications of DVM. Linear Ramp type, Integration type, Dual slope integration and successive approximation type DVM. Three and half Digit Display of		01,04

		Digital Meters.		
	c	**Recorders** Introduction to recorders. Galvanometric, potentiometer, magnetic recorder.	02	01,04
	d	**Instrumentation amplifier** Basic Instrumentation amplifier its features and how it is differ from ordinary Op-Amp. Circuit diagram and its derivation.	03	01
	e	**Wave Generator** Basic Standard Sine wave Generator, Function generator block diagram with explanations.		01,02,04

Unit – III

Teacher should facilitate learning of all types of bridges for calculation of unknown component.

3.	**Bridges and their applications**		**Lecture required**	**Reference No**
	a	**Wheatstone bridge**. Wheatstone bridge its circuit, derivation of balancing condition, sources of measurement errors. Unbalanced Wheatstone bridge with derivation to calculate current of detector. **(Numerical on Unbalanced Wheatstone bridge)**	02	01,02,04
	b	**Kelvin Bridge and Kelvin's double bridge** Diagram and derivation of bridge balance condition.	02	01,02,04
	c	**General Form of AC Bridge** Derivation of general AC bridge balance condition with generalize diagram. **(No Numerical on general AC bridge)**	01	02,04
	d	**Maxwell Bridge& Hay Bridge.** Diagram, derivation of both bridges and advantages and disadvantages. **(Numerical on both bridges)**	02	01,02,04
	e	**Schering Bridge** Schering Bridge: Diagram and derivation. **(Numerical)**	01	01,02,04
	f	**Wien Bridge & Wagner ground connection** Diagram of Wein Bridge, its derivation for balance condition. **(No Numerical on Wein Bridge)** Explanation of elimination of stray capacitance with diagram.	01	01,02,04

Unit - IV

Teacher should facilitate learning of different types of transducers and its applications.

4.	Transducers and application		Lecture required	Reference No
	a	**Thermometer** Diagram of resistance thermometer and its explanation with its advantages and disadvantages.	02	01,03
	b	**Thermocouple** Explanation of thermocouple and thermopile with its graph of temperature vs. output voltage. Advantages and limitation. **(No laws and thermoelectric phenomenon should be asked.)**		
	c	**Integrated Circuit Temperature Transducers** Compare thermocouple, RTD, thermistor and IC sensor with its advantages and disadvantages. Study of LM335 and LM34 **(No Numerical)**	01	03
	d	**Measurement of Humidity by Hygrometer.** Hygrometer with its type as Resistive, Capacitive, Microwave, Aluminum Oxide and Crystal hygrometer.	01	03
	e	**Flow transducer** Define flow and explain turbine and electromagnetic type of flow meter with is diagram.	01	01,03
	f	**Pyrometer** Total radiation Pyrometers, Infrared pyrometer and Optical Pyrometer detail explanation with its circuit.	02	03
	g	**Piezoelectric Transducer, Phototransistor** Circuit diagram and its explanation. **(No Numerical)**	01	01

Unit - V

Teacher should facilitate learning of basics of Printed Circuit Boards designing.

5.	Printed Circuit Boards		Lecture required	Reference No
	a	**Classification and Manufacturing** Classification of PCBs. Manufacturing of basic printed circuit boards.	01	05
	b	**Artwork generation** Basic approach to manual artwork, general design guideline for artwork preparation, Artwork generation guideline, film master preparations.	02	05
	c	**Copper clad laminates.** Manufacturing of laminates, Properties of laminates and types of laminates.	02	05

	d	**Etching techniques and mass-soldering techniques.** Immersion, bubble, splash and spray etching. Types of mass soldering: dip, drag, wave, reflow and vapor phase.	01	05
	e	**Multilayer Boards**. Design features of multilayer boards. Fabrication process for multilayer boards.	01	05
	f	**Overview of Passive Components** Color coding of resistor and capacitor. Brief introduction of components such as Resistor, Capacitor, Inductor. **(Construction details and classification are not required)**	02	06

Reference Books:

1. H. Kalsi, "Electronic Instrumentation", Tata McGraw Hill, 2nd Edition, 2007.
2. A. Helfric, W. Cooper, "Modern Electronics Instrumentation and Measurement Technique", Pearson LPE, 2005.
3. A. Sawhney, "Electrical and Electronics measurement and Instrumentation", Dhanpat Rai and company, 18th Edition, 2007.
4. K. Kishore, "Electronic Measurement and Instrumentation", Pearson 4th, Edition, 2012.
5. R. Khandpur, "Printed Circuit Boards Design Fabrication, Assembly and Testing", Tata McGraw Hill, 1st Edition, 2005.
6. A. Kalavar, "Electronic Materials Components and Devices Technology", Everest Publishing House, 10th Edition, 2004.

Communication Systems-I

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Basic Communication System, need of modulation and analysis of different noise.

1.	Introduction to Communications System & Noise		Lecture required	Reference No
	a	Information, Transmitter, Receiver, Modulation description, Need of modulation, bandwidth requirements.	01	01
	b	**Introduction, External noise, Internal noise** Statements of noise, External noise- Atmospheric noise, Extraterrestrial noise, Industrial noise, Introduction of internal noise, Thermal agitation noise**(Numerical)**, Shot noise, Transit-Time noise, Miscellaneous noise.	02	01
	c	**Noise Calculation. (Numerical)** Addition of noise due to several sources, Addition of noise due to several amplifiers in cascade, Noise in reactive circuits.	02	01
	d	**Noise Figure and noise Temperature(Numerical)** Signal to noise ratio, Definition of noise figure, Calculation of noise figure, Noise figure from equivalent noise resistance, Noise figure from measurement, Noise temperature.	03	01

Unit – II

Teacher should facilitate learning of Generation of AM and Evolution and Description of SSB.

2.	Amplitude modulation & Single Side Band Techniques		Lecture required	Reference No
	a	**Amplitude Modulation Theory(Numerical)** Frequency spectrum of the AM wave, Representation of AM, modulation by several sine waves, Power relations in the AM wave.	03	01
	b	**Generation of AM** Collector and Base modulator , High and low level transmitter	02	01
	c	**Evolution and Description of Single Side Band Techniques**	02	01
		Suppression of Carrier and Unwanted Side Band Suppression of Carrier, Effect of nonlinear resistance on added signals, The balanced modulator, The filter system, The phase shift method System evaluation and comparison **(Numerical)**.		
	d	**Extensions of SSB** Forms of AM, Carrier reinsertion, pilot carrier systems,	01	01

		Independent sideband(ISB) systems		

Unit – III

Teacher should facilitate learning of fundamental of FM and PM generation.

3.	Frequency and Phase modulation concept		Lecture required	Reference No
	a	**Theory of Frequency and Phase Modulation** Description of systems, Mathematical representation of FM **(Numerical),** Frequency spectrum of the FM wave, Phase modulation, Intersystem comparisons**.**	03	01
	b	**Noise and Frequency Modulation** Effects of noise on carrier – Noise triangle, Pre-emphasis and De-emphasis **(Numerical),** Other forms of interference, Comparison of wideband and narrowband FM.	03	01
	c	**Generation of Frequency Modulation** FM methods, Direct methods**(Numerical),** Stabilized reactance modulator-AFC, Indirect method,	02	01

Unit – IV

Teacher should facilitate learning of AM / FM receiver.

4.	AM / FM receiver		Lecture required	Reference No
	a	**Receiver Types** Tuned radio-frequency(TRF) receiver, Super heterodyne receiver and characteristics, **(Numerical)**	02	01
	b	**A.M. Receivers** RF amplifier, mixer, IF amplifiers, Detection and automatic gain control (AGC**).**	02	01
	c	**F.M. Receivers** Common circuits-comparison with AM receivers, Amplitude limiting, Basic FM demodulators, Slope detector, Balanced Slope detector, phase descriminator Ratio detector,	03	01
	e	**Single and Independent Sideband Receivers** Demodulation of SSB, Receiver types,	01	01

Unit - V

Teacher should facilitate learning of represent of analog signal is multiplex and represent in digital.

5.	Pulse Modulation		Lecture required	Reference No
	a	Fourier Transform and useful Fourier Transform properties like linearity, duality, time shift, time scaling, frequency shifting. FT of rectangular pulse, exponential decaying and raising function.(**Numericals**)	04	02

	b	Statement of Sampling theorem and types of Sampling.	01	02
	c	Pulse amplitude Modulation and concept of TDM, FDM.	02	02
	d	Pulse Width Modulation and Pulse Position Modulation. PWM and PPM generation block diagram and wave form description.	01	02

Reference Books:

1. G. Kennedy, B. Davis, "Electronic Communication Systems", Tata McGraw Hill Edition, 4th Edition, 1999.
2. H. Taub, D. L. Schilling and G. Saha, "Principles of Communication Systems", Tata McGraw Hill Edition, 3 rd Edition, 2012.
3. S. Kundu, "Analog and Digital Communication", Pearson, ISBN 978-81-317-3187-1.
4. D. Roddy, J. Coolen, "Electronic Communications", Pearson, 4th Edition, 2011.

Soft Skills – III

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit - I

Teacher should facilitate the learning basic foundation of mathematics.

1.	Arithmetic-1		Lecture required	Reference No
	a	**Number Systems** Basic Formulae, Divisibility Rules, Speed Maths, Remainder Theorem, Different Types of Numbers, Applications	01	01
	b	**HCF, LCM and Linear Equations** HCF – Successive Division and Prime Factorization Methods, LCM – Successive Division and Prime Factorization Methods, Applications, Linear Equations – Elimination Method, Substitution Method, Applications	01	01
	c	**Averages and Mixtures** Concept of Average, Faster Ways of Finding It, The Allegation Method, Applications	01	01

Unit II

Teacher should facilitate the learning basic foundation of mathematics.

2.	Arithmetic-2		Lecture required	Reference No
	a	**Percentages** Concept of Percentage, Working with Percentages Applications	01	01
	b	**Profit and Loss** Difference between Cost and Selling Price, Concept of Profit Percentage and Loss Percentage, Applications	01	01
	c	**Time and Work** Basic Time and Work Formula, Relation between Time and Work, Applications	01	01

Unit III

Teacher should facilitate the learning basic foundation of mathematics.

3.	Arithmetic-3		Lecture required	Reference No
	a	**Permutations and Combinations** Sum Rule of Disjoint Counting, Product Rule of Counting Concept of Factorial, Permutations, Linear Permutations, Combinations, Circular Permutations, Applications	01	01
	b	**Probability** Definition and Laws of Probability, Mutually Exclusive Events, Independent Events, Equally Likely Events, Exhaustive Events, Cards, Dice, Applications	01	01

	c	**Time and Distance** Speed, Conversion Factors for Speed, Average Speed, Moving Bodies – Passing, Crossing and Overtaking, Relative Speed, Boats and Streams, Applications	01	01

Unit IV

Teacher should facilitate learning of critical thinking.

4.	**Non-Verbal Reasoning**		**Lecture required**	**Reference No**
	a	**Analogies** Different type of examples of analogies and its Applications	01	02
	b	**Classification** Different type of examples of analogies and its Applications	01	02
	c	**Sequences** Different type of examples of analogies and its Applications		02

Unit V

Teacher should facilitate the learning of a deep sense of analysis towards solving a problem

5.	**Analytical Reasoning**		**Lecture required**	**Reference No**
	a	**Analytical Puzzles** Classification Puzzles, Ordering Puzzles, Assignment puzzles, Applications	01	03
	b	**Letter and Number Series** Different Types of Letter Series, different types of Number Series, mixed Series	01	03
	c	**Coding and Decoding** Letter Coding, Number Coding, Mixed Coding, Odd Man Out, Applications	01	03

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.

Electrical Circuits and Machines

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Note: Minimum FOUR Experiments from each group.)

	Group-A	**Lab hours required**
1	Two Wattmeter method of power measurement in three phase balanced load.	02
2	Speed control of D.C. shunt motor by armature voltage and flux control method.	02
3	Load test on three phase induction motor.	02
4	O.C. and S.C. test of single phase transformer to determine regulation and efficiency.	02
5	Load test on D.C. series motor	02
	Group-B	**Lab hours required**
6	Study of specification & application single phase motors.	02
7	Study of specification & application of stepper motor.	02
8	Study of specification & application of servo motor.	02
9	Study of specification & application of universal motors.	02
10	Study of starter of three-point starter.	02
11	Study of starter of star-delta starter.	02
12	Study of starter of DOL starter.	02

Reference Books:

1. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-I",S. Chand, 1st Edition, 2010.
2. B. Theraja, A. Theraja, "A Text book of Electrical Technology- Vol-II", S. Chand, 1st Edition, 2010.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Solid State Devices & Circuits-I

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Note: Minimum FOUR Experiments from each group.)

	Group-A	Lab hours required
1	To find load regulation of full wave Bridge wave rectifier circuit with capacitor filter.	02
2	Plot I/p and O/P characteristics of BJT.	02
3	To Plot DC Load Line for BJT (Voltage Divider biasing circuit).	02
4	To plot regulation characteristics of Voltage doubler circuit	02
5	Plot frequency response of CE-CE Cascade amplifier.	02
6	Study the effect of bypass capacitor on frequency response of single stage CE Amplifier.	02
	Group-B	**Lab hours required**
7	To Plot DC Load Line for FET (Voltage Divider biasing circuit).	02
8	Plot characteristics of CSFET.	02
9	Study the frequency response of CSFET.	02
10	Square wave testing of an amplifier.	02
11	Plot frequency response of CE-CC Cascade amplifier.	02
12	To determine AV, Ri, Ro of Darlington amplifier.	02

Reference Books:

1. R. Boylestad, L. Nashelsky "Electronics Devices and Circuit Theory", 10th Edition, Pearson, 2009.
2. S. Salivahanan, N. Sureshkumar and A. Vallavaraj, "Electronics Devices and Circuits", Tata McGraw Hill, 3rd Edition, 2009.
3. S. C. Sarkar, "Electronics Devices and Circuits - I" Everest Publishing House, The Millennium 12th enlarged and revised Edition, 2001.
4. T. Floyd, "Electronics Devices" conventional current version, 7th Edition, Pearson, 2008.
5. D. Cheruku, B. Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.
6. J. Miillman, C. Halkias, "Integrated Electronics", Tata McGraw Hill Edition, 1st Edition, 1991.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Communication Systems-I

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Note: Minimum FOUR Experiments from each group.)

	Group-A	**Lab hours required**
1	Study of AM transmitter and calculate of modulation index of AM wave by envelope method.	02
2	Analyze and generate A.M. Demodulation signal by diode detector.	02
3	Study of FM and calculate of modulation index of FM wave.	02
4	F.M. Demodulation (Phase discriminator/Ratio detector method.)	02
5	To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.	02
6	Study of Amplitude limiter circuit.	02
	Group-B	**Lab hours required**
7	Calculate gain for RF / IF stage with AGC and without AGC.	02
8	DSB-SC signal generation using balanced modulator.	02
9	Analyze voltage and waveform at various stages/points in A.M. radio receiver (i.e. Super-heterodyne Radio Receiver).	02
10	PAM modulator & demodulator.	02
11	PWM modulator & demodulator	02
12	PPM modulator & demodulator.	02

Reference Books:

1. G. Kennedy, B. Davis, "Electronic Communication Systems", Tata McGraw-Hill Edition, 4th Edition, 1999.
2. H. Taub, D. L. Schilling and G. Saha, "Principles of Communication Systems", Tata McGraw Hill Edition, 3 rd Edition, 2012.
3. S. Kundu, "Analog and Digital Communication", Pearson, ISBN 978-81-317-3187-1.
4. D. Roddy, J. Coolen, "Electronic Communications", Pearson, 4th Edition, 2011.

Guide lines for ICA:

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Guide lines for ESE:

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Digital Techniques and Applications

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Note: Minimum FOUR Experiments from each group.)

Group-A		Lab hours required
1	Realization of logic gates OR, AND, NOT, NOR, NAND gates using discrete components and verify their truth tables.	02
2	Design of 4 bit Gray to binary Code Converter.	02
3	Realization of IC7483 as parallel adder and substractor.	02
4	Verification of Ex-3 to BCD code conversion using NAND gates.	02
5	Verification of 4-Bit Magnitude Comparator using IC7485.	02
6	Design and Implement BCD to 7 Segment display decoder using IC 447/7448.	02
Group-B		**Lab hours required**
7	Verify the truth table of multiplexer and demultiplexer using ICs.	02
8	Verify the truth table of J-K, T, and D Flip-flops using ICs.	02
9	Design ring and Johnson counter using flip-flops.	02
10	Design decade ripple counter using flip-flops.	02
11	Realization of Decade counter using IC.	02
12	Design 4-bit UP/DOWN synchronous counter using IC.	02

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", PHI, 2nd Edition, 2011.
2. R. Jain, "Modern Digital Electronics", TMH. 4th Edition, 2010.
3. Leach and Malvino, "Digital Principles and Applications", TMH 5th Edition, 2002.
4. J. Wakerly, "Digital Design Principles and Practices", Pearson 2nd Edition, 2009.
5. R. Tocci, "Digital Systems Principles and Applications", Pearson 2nd Edition, 2002.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering
(E&TC/E&C/Elex/IE)
Faculty of Engineering and Technology

Teacher and Examiner's Manual
Semester – IV
W.E.F 2013 – 2014

Engineering Mathematics-III

Teacher, Paper setter and Examiners should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning the Solution of nth order Linear Differential Equations, Application to Linear Differential equation to electrical circuits.

1.	Linear Differential Equations		Lectures required	Reference No
	a	Introduction to nth order Linear Differential Equation, Auxiliary Equation , Complimentary Functions	01	02,06
	b	Solution of nth order L.D.E using General Method	01	02,06
	c	Particular Integral using short cut methods	02	02,06
	d	Solution of 2^{nd} order L.D.E using Variation Parameter Method	01	02,06
	e	Solution of Cauchy's D.E	01	02,06
	f	Solution of Legendre's D.E	01	02,06
	g	Application to Linear Differential equation to electrical circuits	01	02,06

Unit – II

Teacher should facilitate learning of Basics of Complex Analysis**.**

2.	Function of Complex Variable		Lecture required	Reference No
	a	Analytic functions, Cauchy-Riemann equations.	01	01,03
	b	Cauchy's Residue theorem(Without proof)	02	01,03
	c	Cauchy's Integral theorem and Cauchy's Integral formula (without proof).	02	01,03
	d	Conformal mapping	02	01,03
	e	Bilinear transformations	01	01,03

Unit – III

Teacher should facilitate learning of Basics of Laplace and Inverse Laplace transform, Solution of differential equations using Laplace Transform.

3.	Laplace Transform		Lectures required	Reference No
	a	Definition of Laplace Transform, Existence of Laplace Transform, Laplace Transform of standard Functions.	1	05,06
	b	Theorems and properties of Laplace transform	1	05,06
	c	Inverse Laplace Transform of standard Functions	1	05,06
	d	Properties of Inverse Laplace Transform	2	05,06

	e	Laplace Transform of Error Function , Periodic Functions, Unit Step Functions, Unit Impulse Functions	1	05,06
	f	Solution of Differential equations using Laplace Transform	1	05,06
	g	Applications of LT for Network Analysis	1	05,06

Unit – IV

Teacher should facilitate learning of Basic of Z- Transforms and Fourier Transform.

4.	**Fourier Transform**		**Lecture required**	**Reference No**
	a	Introduction to Fourier Integral theorem.	01	04
	b	Fourier Transforms and Inverse Fourier Transform	01	04
	c	Fourier Cosine Transforms and Inverse Fourier Cosine Transform	01	04
	d	Fourier Sine Transforms and Inverse Fourier Sine Transform	01	04
	Z-Transform			
	a	Definition of Z- Transform and standard properties of Z-Transform (without proof); Region of Convergence.	01	05
	b	Z-Transform of standard / elementary sequences	02	05
	c	Inverse Z-transform.	01	05

Unit - V

Teacher should facilitate learning of Basics of Vector Differentiation.

5.	**Vector Differentiation**		**Lecture required**	**Reference No**
	a	Definition, physical Meaning of vector differentiation.	01	03
	b	Tangential and normal components of acceleration, Radial and transverse components of velocity and acceleration.	01	03
	c	Vector differential operator (∇)	01	03
	d	Gradient of Scalar point function.	01	03
	e	Directional Derivatives of Scalar point function.	02	03
	f	Divergence and Curl vector field.	01	03
	g	Solenoidal and Irrotational vector fields	01	03

Reference Books:

1. H. Dass, "Advanced Engineering Mathematics",S. Chand Publication, New Delhi, 2008.
2. E. Kreyszig, "Advanced Engineering Mathematics",Wiley Eastern Ltd, 10th Edition.
3. B. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi, 42nd Edition, 2012.

4. C. Wylie, Barrett, “Advanced Engineering Mathematics”, McGraw Hill, 6th revised Edition, 1995.
5. B. Raman, “Engineering Mathematics”, Tata McGraw Hill, 2007.
6. N. Bali, “A Text Book of Engineering Mathematics”, Laxmi Publication, 2004.

Solid State Devices & circuits- II

Teacher, Paper setter and Examiner should follow the following guidelines.

Unit – I

Teacher should facilitate learning of different Waveshaping circuit, Time base circuits and Differential amplifier.

1.	Waveshaping Circuit		Lecture required	Reference No
	a	**Multivibrators:** Circuit dia. and working of Astable, Monostable and Bistable multivibrator.	02	02
	b	**Time Base Circuits (Working , I/P and O/P waveform)** Miller integrator and Bootstrap sweep circuit.	01	02
	c	**Differential amplifier Using BJT:** Introduction of Differential amplifier, Different modes of Differential amplifier.	01	01
	d	**Differential amplifier** DC Analysis of Differential amplifier with Re, AC analysis of Differential amplifier.	02	01
	e	**Differential amplifier(Numerical are expected**) Calculation of CMRR	02	01
	f	**Differential amplifier** Techniques to improve CMRR of Differential amplifier.		
	g	**Schmitt Trigger circuit**	01	01

Unit - II

Teacher should facilitate learning of High freq. model for BJT and Tuned circuit.

2.	High Frequency Π Model for a BJT		Lecture required	Reference No
	a	Behaviour of transistor at high frequency, high frequency CE amplifier π model.	02	01
	b	**High frequency Π Model (Numerical expected)** CE Short circuit Current gain and High frequency current gain with Resistive Load for π model, Definition and derivation of $F\alpha$, $F\beta$ & F_T.	03	01
	c	**Tuned amplifier** Introduction to Tuned Circuit, Classification of Tuned amplifier, Quality factor for L and C.	01	01
	d	Circuit dia., Operation & characteristics of Single Tuned amplifier.	01	01
	e	Circuit dia, Operation & characteristics of Doubled Tuned	01	01

		amplifier and Stagger Tuned amplifier.		

Unit – III

Teacher should facilitate learning of Large Signal amplifier.

3.		Large Signal amplifier (Power amplifier)	Lecture required	Reference No
	a	**Basics of Power amplifier** Need of Power amplifier, Concept of Load Line, Performance parameter of Power amplifier.	01	01
	b	**Class A power amplifier with Resistive Load (Numerical expected).** Classification of power amplifier. DC and AC Analysis of Class A power amplifier with Resistive Load and efficiency calculation.	01	01
	c	**Transformer coupled Class A power amplifier (Numerical expected).** DC and AC Analysis of Transformer coupled Class A power amplifier and efficiency calculation.	02	01
	d	**Class B Push Pull amplifier (Numerical expected)** DC and AC Analysis of Class B Push Pull power amplifier and efficiency calculation, calculation of Maximum output power, Maximum Power Dissipation.	02	01
	e	**Class B Complementary power amplifier (Numerical expected)** Working of Class B Complementary power amplifier, efficiency calculation.	01	01
	f	**Crossover distortion & Harmonic Distortion.** Concept of Crossover distortion, Elimination of Crossover distortion, Analysis of Harmonic distortion.	01	01

Unit – IV

Teacher should facilitate learning of Feedback amplifier.

4.		Feedback amplifier	Lecture required	Reference No
	a	**Feedback amplifier** Concept of feedback amplifier, Types of feedback (Positive & Negative feedback), Basic amplifier types.	03	01
	b	Derivation of gain with feedback. Topology used in feedback amplifier, Classification of Feedback amplifier.		
	c	**Voltage series and Current series feedback amplifier (Numerical expected)** Analysis of Voltage series and Current series Negative feedback amplifier with derivations of Ri and Ro.	03	01

	d	**Voltage shunt and Current shunt feedback amplifier (Numerical expected)** Analysis of Voltage shunt and Current shunt Negative feedback amplifier with derivations of Ri and Ro.	03	01

Unit - V

Teacher should facilitate learning of Regulator circuit and its different application.

5.	**Voltage Regulator and Oscillator**		**Lecture required**	**Reference No**
	a	**Basic of Regulator** Block diagram of Regulated power supply, concept of Line and Load regulation, Types of Voltage regulator.	01	01
	b	**Series Regulator (Numerical expected)** Transistorized series voltage regulator (derivation is expected)	01	01
	c	**Protection Circuit** Short circuit protection circuit (Using Transistor and Diode), Foldback protection circuit	01	01
	d	**SMPS & UPS** Block Diagram and working of Switched mode power supply and UPS.	01	02
	e	**Oscillator Using BJT:** Concept of oscillator, Types of Oscillator, Condition for oscillation(Barkhausen criteria), concept of Tank circuit,	01	02
	f	**Types of Oscillator**: Circuit dia, working and Derivation of frequency and hfe of Phase shift, Wien Bridge, Hartley oscillator, Colpitts oscillator.	02	02
	g	Circuit dia, working and Derivation of frequency and hfe of Clapp Oscillator. Construction, working of Crystal oscillator.	01	02

Reference Books:

1. R. Boylestad, L. Nashelsky, "Electronics Devices and Circuit Theory", Pearson, 10th Edition, 2009.
2. S. Salivahanan, N Sureshkumar, "Electronics Devices and Circuits" Tata McGraw-Hill, 3rd Edition 2008.
3. B. Singh, R. singh, "Electronics Devices and Circuits", Pearson, 2nd Edition.
4. D. Cheruku, B. Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.
5. Jacob Millman, "Electronis devices and circuits", McGraw-Hill, 1967.
6. S. C. Sarkar, "Electronics Devices and Circuits-I" Everest Publishing House, The Millennium 12th enlarged and revised Edition, 2001.

Microprocessors

Teacher, Paper setter and Examiner should follow the following guidelines.

Unit - I

Teacher should facilitate learning of microcomputer and basics of 8085 microprocessor.

1	8085 Microprocessor		Lecture required	Reference No
	a	Block diagram and operation of microcomputer system.	01	01
	b	8085 Microprocessor architecture & operation.	02	01
	c	Program Counter and Stack pointer, Pin diagram of 8085 microprocessor.	01	01
	d	De-multiplexing of lower order address bus and Generation of control signals.	01	01
	e	Memory classification, Basic of memory interfacing and Address decoding techniques.	01	01
	f	Interfacing of memory with 8085 Microprocessor (With interfacing Numericals).	02	01

Unit - II

Teacher should facilitate learning of instruction set of 8085.

2	Instruction set of 8085 microprocessor		Lecture required	Reference No
	a	Instruction structure and classification (One/two/three Byte)	01	01
	b	Machine cycles & Bus Timing: Opcode Fetch, Memory Read, and Memory Write.	01	01
	c	Instruction Set: Instruction for Data transfer operations and Arithmetic operations.	02	01
	d	Instruction for Logic operations and Branch operations.	02	01
	e	Concept of sub-routine. Unconditional Call and Return instruction. Conditional Call and return instructions.	02	01

Unit – III

Teacher should facilitate learning of Assembly Language Programming of 8085 microprocessor

3	Assembly Language Programming of 8085 microprocessor		Lecture required	Reference No
	a	Addressing modes of 8085.	01	01
	b	Ideal steps for Writing assembly language Programs and Basic of Flowchart Symbols.	01	01
	c	Assembly Language Programming on: Data Transfer operations and, Accessing I/O devices.	01	01,02
	d	ALP on Arithmetic operations, Logical operations and Branch operations	03	01 02
	e	Concept and designing of counters and time delay and their ALP.	02	01,02

	f	ALP on subroutines.	01	01,02

Unit – IV

Teacher should facilitate learning of stack, Interrupts and serial communication.

4	Stack, Interrupts and Serial I/O of 8085 microprocessor		Lecture required	Reference No
	a	Stack and stack related instructions.	01	01
	b	ALP on string/array related operations.	02	02
	c	Introduction to Memory mapped I/O and I/O mapped I/O. (Difference Only)	01	01
	d	The 8085 Interrupt, 8085 vectored Interrupts.	02	01
	e	Serial I/O lines SID & SOD, Data transfer through SID and SOD.	02	01

Unit - V

Teacher should facilitate learning of General Purpose Peripheral Devices.

5	General Purpose Peripheral Devices		Lecture required	Reference No
	a	Internal architecture of 8255-Programmable Peripheral Interface. I/O and BSR Mode.	02	01
	b	Interfacing of I/O device using 8255- Programmable Peripheral Interface.	02	01
	c	Programmable Interval Timer/ Counter 8254, block diagram, control word register, Modes of 8254.	02	01
	d	Programming on counter and mode 0/1/2/3 (only) of 8254.	02	01

Reference Books:

1 R. Gaonkar, "Microprocessor Architecture, Programming, and Applications with 8085", Penram Int. Publishing Pvt. Ltd, 5th Edition, 2007.

2 B. Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publication, 6th Edition, 2011(reprinted).

Linear Integrated Circuits

Teacher, Paper setter and Examiner should follow the following guidelines.

Unit - I

Teacher should facilitate learning of operational amplifier and basics of op-amp.

1	Op-amp Basics		Lecture required	Reference No
	a	Ideal op-amp characteristics; schematic development stages of op-amp: current sources and active loads, difference, intermediate and output stages including Miller capacitors for frequency computation	03	01
	b	Internal circuit of op-amp IC μA741, operational amplifier parameters, offset null techniques of op-amp; features, data sheet interpretation and data sheet study of op-amp IC 741	03	01
	c	measurement of op-amp parameters, effects of real operational amplifier parameters on circuit performance	01	01
	d	Frequency response and stability, frequency and phase compensation techniques.	02	01

Unit - II

Teacher should facilitate learning of linear & non-linear applications of op-amp.

2	Op-amp Applications		Lecture required	Reference No
	a	Non-inverting amplifier and voltage follower, inverting amplifier	01	01
	b	peak amplifier, ac amplifier, AF amplifier IC LM380	01	01
	c	Analog adder, averaging amplifier, integrator, differentiator, analog computation, basic building blocks, basic linear differential equation;	02	02
	d	Differential and instrumentation amplifiers using one, two and three op-amps, instrumentation amplifier IC μA725,bridge amplifier	02	02
	e	Voltage-to-current and current-to-voltage converters	01	01
	f	Analog multipliers, dividers, log/antilog amplifiers	02	01

Unit – III

Teacher should facilitate learning of application of op-amp as Active filters and Voltage regulators.

3	Active filters and Voltage regulators		Lecture required	Reference No
	a	Active filters: types and response; analysis and synthesis of first, second and higher order active filters; Butterworth filters, all pass filter.	03	02
	b	Voltage regulators: Series op-amp regulator, IC voltage regulator, voltage regulator IC μA723 and its applications as positive/negative and fixed/adjustable voltage regulators	03	01

	c	Three terminal voltage regulators: positive/negative and fixed/adjustable voltage regulators, dual tracking regulators; switching regulator: concept and schematic, IC MC1723and its application.	02	01

Unit – IV

Teacher should facilitate learning of op-amp as Comparators and waveform generation

4	**Comparators and waveform generation**		**Lecture required**	**Reference No**
	a	Comparators: introduction, parameters; op-amp as comparator, comparator IC 710, peak detectors.	01	01
	b	Waveform generation: Schmitt's trigger, square-triangle wave oscillators, relaxation oscillators and pulse generators	02	01
	c	Timer IC 555 and its use as timer circuit and multi-vibrators	02	01
	d	Sinusoidal oscillators: analysis and design of R-C (phase shift, wien bridge) oscillators	02	01
	e	Voltage controlled oscillator IC SE/NE566, function generator IC LM 8038.Clippers and clampers; precision rectifiers	01	02

Unit - V

Teacher should facilitate learning of opamp A/D interface circuits and PLL.

5	**A/D interface circuits and PLL**		**Lecture required**	**Reference No**
	a	ADC: Specifications, Flash ADC, counter type ADC, successive approximation type, dual slope ADC.	02	01
	b	DAC: Specifications, Weighted resistor DAC, its disadvantages, R-2R ladder DAC, inverted R-2R ladder.	02	01
	c	Sample and hold circuits; analog multiplexers	01	01
	d	Phase lock loop (PLL): operating principles, lock and capture range, PLL as amplitude and frequency modulation detection, frequency shift keying (FSK) decoder, frequency synthesiser, PLL IC SE/NE565	03	01

Reference Books:

1 D. Chaudhary, S. Jain, "Linear Integrated Circuit", New Age International Publishers, 4th Edition 2010.

2 R. Gaikward, "Op amp and Integrated circuit", 4th Edition, Prentice Hall India Ltd, 2008.

Network Analysis and Synthesis

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning of Different types of network functions & Analysis of network using Laplace transform.

1.	**System and network function:**		**Lecture required**	**Reference No**
	a	**Network function: Defination, Types of network function with their definations** & **Numerical on: find** driving point/ transfer impedance/admittance function, find out transfer voltage / current function.	03	01,02
	b	**Laplace Transform: Concept of complex frequency**, **Characteristics of standard signals**, Laplace transform, Laplace transform of basic R,L,C components(Laplace Transform circuits), initial condition, advantages in network analysis, **Laplace transform of the waveforms** (**Numericals**), Network analysis using Laplace transform by initial condition. **(Numericals)**.	03	01,02
	c	**Poles & Zeros in network function:** Concept of poles and Zeros, **Significance of poles and zeros**, Time–domain behavior from Pole-zero plot in S-domain, Concept of Residues.	03	01,02

Unit - II

Teacher should facilitate learning of Resonances and their phenomenon.

2.	**Frequency Selective Networks:**		**Lecture required**	**Reference No**
	a	**Resonance:** Concept, types of resonance, **Significance of quality factors (Q- factor).**	02	01,02
	b	**Series Resonance: Resonance frequency (derivation)**, variations of impedance, current with frequency, Q-factor of series resonance, **Bandwidth, Selectivity**. **(Numerical on series resonance).**	03	01,02
	c	**Parallel resonance:** Resonance frequency, variation of impedance, admittance, current with frequency, **Bandwidth and selectivity**, Effect of R_g on BW & Selectivity, **(numerical on parallel resonance).**	03	01,02

Unit – III

Teacher should facilitate learning of analysis of two port network with their different parameters.

3.	Two port network parameters:		Lecture required	Reference No
	a	**Introduction of two port network and their parameters**: Z-parameters (Open circuit impedance parameters), Y parameter (Short circuit admittance parameters), h–parameter (hybrid parameters), ABCD parameter (transmission parameters), Equivalent circuit using these parameters.	02	01,02
	b	**Reciprocity and symmetry condition for:** Z, Y, h, ABCD parameters. **Interconnection of two port networks**: - series connection, parallel connection, Cascade connection, series-parallel connections.	03	01,02
	c	**Inter conversion of parameters**: Z, Y, h, ABCD parameters, **Numericals:** for finding the two port networks parameter: Z, Y, h, ABCD.	03	01,02

Unit – IV

Teacher should facilitate learning of Design of different types of filters and attenuator, and their types.

4.	Attenuator and filters :		Lecture required	Reference No
	a	**Attenuators:** Introduction of attenuator, concept of Neper and Decibel(dB), types of attenuators, Symmetrical T & π attenuators, Ladder type attenuators, **(Numerical:- for design of Symmetrical T & π attenuators)**	03	01,02
	b	**Filters**: Filter fundamentals, types of filters. **Design of Constant K-Type:-** Low Pass , High Pass Filters, & their **Numerical,** **Design of m- derived: -** Low Pass and High Pass Filters, & their **Numerical.**	03	01,02
	c	Concept of Band Pass Filter and Band Stop Filters, Terminating half sections, **Concept of composite filters (No Numerical)**.	02	01,02

Unit - V

Teacher should facilitate learning of Synthesis of one port networks, and their methods.

5.	Synthesis of One Networks:		Lecture required	Reference No
	a	**Hurwitz polynomials**:-Properties of Hurwitz polynomial, Hurwitz criteria by Routh array, Or by continued fraction expansion method **(Numerical).** **Positive Real functions (PRF)**:- concept, properties of PRF, Procedure for testing of Positive real function, (**Numericals on Positive real function).**	03	01,02
	b	**Synthesis of one port networks**.- LC, RC, RL function. **LC Immittance function:-**Properties of LC immittance	03	01,02

		function, synthesis of LC driving point immittance, (**Numericals on Synthesis of LC immittance function in Foster-I, II, Cauer-I, II forms).**		
	c	Properties of RC driving point impedance / RL admittance, **Numericals** on Synthesis of RC impedance/ RL admittance function in Foster-I, II, Cauer-I, II form. Properties of RL impedances/RC admittances, **Numericals on synthesis of RL impedance / RC admittance function.** (Synthesis in all Cauer-I, Cauer-II & Foster-I, Foster-II form). (Numericals).	03	01,02

References Books:

1. D. Choudhury, "Network and system", New Age international Publication, 1st Edition, Reprint-2005.
2. A. Sudhakar, S. Palli, "Circuit & Networks Analysis and Synthesis", Tata McGraw Hill Publication, 3rd Edition, 2009.
3. A. Chakraborti, "Circuit Theory (Analysis and synthesis)", Dhanpat Rai Publication, 6th Edition, 2012.

Computer Programming Lab II

LAB COURSE CONTENT

Teacher should facilitate basic of Open Source Operating System and C programming.

Sr.No	Content	Lecture required	Reference No
1.	**Open Source Ubuntu OS** Introduction, installation, commands, gcc.	02	
2.	**Introduction** C operators, Decision making, Looping, Switch-case, Continue, Break, Return statement.	02	01
3.	**Arrays** Declaration and Initialization of one and two dimensional Arrays. String declaration and Initialization, String operations with C library and without using C library.	02	01
4.	**Functions** Need of Functions, Defining Functions, and user defined Functions and library Functions, Function parameters, return values, Function call (only call by value).	02	01
5.	**Pointers** Introduction, Memory Organization, The basics of Pointer, The Pointer operator, Application of Pointer, Pointer Expression, Declaration of Pointer, Initializing Pointer.	03	01
6.	**File Input/ Output** File Operations, Opening a File, Reading from a File, Closing the File, File Opening Modes	02	01

Reference Books:

1. E. Balagurusamy, "Programming in ANSIC C", Tata McGraw Hill Publications, 4th Edition, 2007.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill Publications, 4th Edition, 2008.
3. Y. Kanetkar, "Let Us C", BPB publication, 10th Edition, 2010.

Linear Integrated Circuits

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

(Note: Minimum EIGHT Experiments from below list.)

Group-A		Lab hours required
1	Op-amp parameter measurement: input bias current, input offset current, Input offset voltage, slew rate of op-amp 741).	02
2	Design and test active integrator and differentiator circuits for given Frequency.	02
3	Study the operation of half wave and full wave precision rectifier	02
4	Design and test positive and negative clamper.	02
5	Design and test Schmitt trigger circuit for given hysteresis.	02
6	Design and test of square wave and triangular and saw tooth wave generator using Op-amp for given frequency.	02
7	Design and test timer using IC 555 in monostable and astable mode.	02
8	Design and test function generator using IC 8038.	02
9	Design and test PLL using IC 565 PLL for given lock and capture range.	02
10	Design and test audio amplifier using IC LM380 with and without positive feedback.	02
11	Setup DAC circuit Using IC LM 741 and study its performance.	02
12	Setup ADC circuit Using IC LM 741 and study its performance.	02
13	Design and test second order Butterworth LP / HP filter.	02
14	Design and test BP Butterworth filter.	02
15	Design and test BR Butterworth filter.	02

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Reference Books:

1. D. Choudhari, S. Jain, "Linear Integrated Circuits", New Age International (P) limited,4th Edition, 2010.
2. R. Gayakwad, "Op-amps and Linear Integrated Circuits", Prentice Hall of India, 4th Edition, 2008.
3. K. Botkar, "Integrated Circuits", Khanna Publishers, 10th Edition, 2010.
4. S. Franco, "Design with operational amplifiers and analog integrated circuits", Tata McGraw Hill, 3rd Edition, 2002.
5. J. Wait, L. Huelsman and G. Korn, "Introduction to Operational Amplifier Theory and Applications", Tata McGraw Hill, 2nd Edition, 1991.
6. J. Fiore, "Op-amp and Linear Integrated Circuits Theory and Applications", Delmar Thompson Learning, 1st Edition, 2001.
7. R. Coughlin, F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", PHI, 6th Edition, 2001.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Solid State Devices & circuits -II

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments.

(Note: Minimum FOUR Experiments from each group.)

	Group-A	**Lab hours required**
1	Calculation of CMRR of Emitter coupled differential amplifier using Emitter resistance and Compare it with Constant current source circuit.	02
2	Observe the response of Miller integrator for given i/p.	02
3	Measure response of Schmitt trigger circuit for sine wave input.	02
4	Determine the period and frequency of oscillation for Astable/Monostable Multivibrator.	02
5	Class B Push Pull amplifier efficiency calculation.	02
6	Class B Complementary Symmetry efficiency calculation and elimination of crossover distortion.	02
	Group-B	**Lab hours required**
7	Plot regulation characteristics of Series voltage regulator circuit.	02
8	Plot frequency response of Voltage series/ Voltage shunt feedback amplifier.	02
9	Calculate Voltage gain Av, input impedance Ri, and output impedance Ro for current series/ voltage series negative feedback amplifier	02
10	Plot frequency response of Single tuned amplifier.	02
11	Study of Phase shift, Wien Bridge, Hartley, Colpitts.(Any Two)	02
12	Determination of frequency and output voltage of Crystal Oscillator.	02

Reference Books:

1. R. Boylestad, L. Nashelsky, "Electronics Devices and Circuit Theory", Pearson, 10th Edition, 2009.
2. S. Salivahanan, N. Sureshkumar, "Electronics Devices and Circuits" Tata McGraw Hill, 3rd Edition 2008.
3. B. Singh, R. singh, "Electronics Devices and Circuits", Pearson, 2nd Edition.
4. D. Cheruku, B. Krishna, "Electronics Devices and Circuits", 2nd Edition, Pearson, 2012.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Network Analysis and synthesis Lab

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments.

(Note: Minimum EIGHT practical's are to be performed.)

	Group-A	Lab hours required
1	Determine transfer / driving point Impedance of given two port reactive network.	02
2	Determine Pole-Zero plot of given one port reactive network.	02
3	Study of Series and parallel resonance, find BW and Q- factor.	02
4	Determine Z parameter of networks connected in series.	02
5	Determine Y parameter of networks connected in parallel.	02
6	Determine transmission parameter of networks connected in cascaded form.	02
7	Frequency response of constant k- low pass filters and find out cut of frequency.	02
8	Frequency response of m- derived filters and find out cut of frequency.	02
9	Frequency response of band pass filter.	02
10	Design build and test symmetrical T or Π attenuator (plot attenuation Vs RL).	02

Reference Books:

1. D. Choudhary, "Network and system", New Age international Publication.
2. A. Sudhakar, S. Palli, "Circuit & Networks Analysis and Synthesis", Tata MH 3rd Edition, 2009.
3. A. Chakraborti, "Circuit Theory (Analysis and synthesis)",Dhanpat Rai Publication,2012.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Microprocessors

LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments.

Group-A		Lab hours required
1	**Addition of two 8 bit numbers.** Performing simple arithmetic operations of addition using 8085 Microprocessor.	02
2	**Subtraction of two 8 bit numbers.** Performing simple arithmetic operations of subtraction using 8085 Microprocessor.	02
3	**Addition of two 16 bit numbers.** Performing simple arithmetic operations of addition using 8085 Microprocessor.	02
4	**Subtraction of two 16 bit numbers.** Performing simple arithmetic operations of subtraction using 8085 Microprocessor.	02
5	**Multiplication of two 8 bit numbers.** Performing simple arithmetic operations of multiplication using 8085 Microprocessor.	02
6	**Division of two 8 bit numbers.** Performing simple arithmetic operations of division using 8085 Microprocessor.	02
7	**Program for block transfer of data bytes.** Perform block transfer of data.	02
8	**To find square of a number using look-up table.**	02
9	**To find largest/smallest number in array of data.**	02
10	**Arrange an array of data in ascending/descending order.**	02
11	**Program to implement decimal up/down counter.**	02
12	**BCD to Hex / Hex to BCD Conversion.**	02
13	**Interfacing of 8253/54 Timer with 8085 Microprocessor and generate the square wave.**	02
14	**Case study of Microprocessor controlled temperature system / microprocessor controlled manufacturing process/ traffic signal controller. (Study only)**	02

Note:

- Concerned faculty should suitably frame at least **08 practical** assignments out of the above list.
- Every practical assignment should include algorithm with proper flowchart, program with comments, waveforms and conclusion.
- Every student is required to submit the assignments in the form of journal.

Guide lines for ESE:-

- ESE will be based on the practical assignments submitted by the students in the form of journal.
- In the ESE, the students may be asked to perform the practical assignment with minor modification.
- Evaluation will be based on the paper work of algorithm with proper flowchart, program with comments, waveforms and conclusion.

Reference Books:

1. R. Gaonkar, "Microprocessor, Architecture, Programming and Applications with 8085", Penram International Publication, 5th Edition, 2004.
2. B. Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publication, 6th Edition, 2011(reprinted).
3. Gilmore, "Microprocessors- Principles and application", Tata McGraw Hill.
4. M. Rafiquzzaman, "Microprocessors- Theory and applications: INTEL and MOTOROLA", Revised Edition.