NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

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

Faculty of Engineering and Technology

COURSE OUTLINE

Semester – III

W.E.F 2013 – 2014

SE Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory			Practical	Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Solid State Devices & Circuits-I (TH)	D	3	1	---	4	20	80	---	---	100	4
Electrical Circuits and Machines (TH)	B	3	---	---	3	20	80	---	---	100	3
Digital Techniques & Applications (TH)	D	3	1	---	4	20	80	---	---	100	4
Component Devices & Instrumentation Technology (TH)	D	3	---	---	3	20	80	---	---	100	3
Communication Systems-I (TH)	D	3	---	---	3	20	80	---	---	100	3
Soft Skills – III	C	1	---	2	3	---	---	50	---	50	2
Electrical Circuits and Machines (LAB)	B	---	---	2	2	---	---	50	---	50	1
Solid State Devices & Circuits-I (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Communication Systems-I (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Digital Techniques & Applications (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

SE Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Mathematics-III (TH)	A	3	1	---	4	20	80	---	---	100	4
Solid State Devices & Circuits-II (TH)	D	3	1	---	4	20	80	---	---	100	4
Microprocessors (TH)	D	3	---	---	3	20	80	---	---	100	3
Linear Integrated Circuits (TH)	D	3	---	---	3	20	80	---	---	100	3
Network Analysis & Synthesis (TH)	D	3	---	---	3	20	80	---	---	100	3
Computer Programming-II (LAB)	B	1	---	2	3	---	---	50	---	50	2
Linear Integrated Circuits (LAB)	D	---	---	2	2	---	---	50	---	50	1
Solid State Devices & Circuits-II (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Network Analysis & Synthesis (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Microprocessors (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Total		**16**	**2**	**10**	**28**	**100**	**400**	**175**	**75**	**750**	**23**

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

Solid State Devices & Circuits- I

COURSE OUTLINE

Course Title	Short Title	Course Code
Solid State Devices & Circuits- I	**SSDC-I**	

Course Description:

This course includes semiconductor-based devices such as diodes, bipolar transistors, FETs, and related components. This course is designed to introduce to the students to the basic principles and applications of semiconductor devices. It includes semiconductor physics and semiconductor diodes, fundamentals, BJT, FET, MOSFET (operation & characteristics), frequency response of BJT and FET. This course provides instruction in the theory and application of solid state devices in the electronics industry. Emphasis is placed on the physical characteristics and uses of solid state devices.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	04
Tutorial	01	14	14	

Prerequisite Course(s): Knowledge of Elements of Electronics Engineering

COURSE CONTENT

Solid state Devices and Circuits-I **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: Introduction to Semiconductor **No of Lect. – 9, Marks: 16**

a) Intrinsic and Extrinsic Semiconductor - Concept of Doping, N type Semiconductor, P type semiconductor.
b) Conduction Mechanism - Drift and Diffusion Current, Carrier Concentration after doping (N and P type material).
c) Law of mass action.
d) Introduction to Diode application – Voltage Multiplier circuit, Analysis of half wave rectifier & full wave rectifier. Analysis of Full wave rectifier with capacitor filter.

Unit-II: Introduction to BJT Biasing **No of Lect. – 9, Marks: 16**

a) Concept of DC and AC Load line.
b) Introduction to biasing, Need of biasing, Different biasing circuit (Fixed bias, collector- base bias, Voltage divider bias), Stability factor.

c) Bias Compensation technique - Bias Compensation technique using Diode and Thermistor.
d) Small Signal model of BJT- Hybrid parameter model of BJT for Low frequency analysis, Derivation for Av, Ai, Ri, & Ro using Exact and Approximate analysis in terms of H parameter for CE amplifier.
e) Exact and Approximate analysis for all Configurations, Conversion formulae for CE, CC.
f) Millers Theorem and its Dual.

Unit-III: Introduction to FET **No of Lect. – 8, Marks: 16**

a) Symbol, Construction Principle of operation, V-I and Transfer Characteristics for N & P channel FET.
b) FET Parameter.
c) Biasing of FET, Different biasing methods.
d) Analysis of Voltage divider biasing method (Analytical and Graphical method).
e) Small Signal model of FET, CS, CG& CD amplifier.
f) FET as an amplifier CS (Bypass and Un bypassed excluding rd).

Unit-IV: Introduction to MOSFET **No of Lect. – 8, Marks: 16**

a) MOSFET - Symbol, Types of MOSFET - Depletion and Enhancement type MOSFET (N channel & P channel).
b) Construction, Operation, & V-I characteristics of MOSFET.
c) MOSFET biasing - Types of Depletion & enhancement MOSFET biasing.
d) MOSFET as amplifier.

Unit-V: Cascade Amplifier and Frequency response of BJT **No of Lect. – 8, Marks: 16**

a) Multistage amplifier - Need of multistage amplifier, multistage amplifier with combination of different configuration (CE-CE, CE-CB).
b) Concept of frequency response of BJT, B.W. of Single stage and cascaded amplifier.
c) Square wave Testing **-** Derivation for F_L & F_H of Square wave testing of an amplifier.
d) Concept of Capacitor in Frequency response - Effect of coupling, bypass capacitor and junction capacitor on frequency response of BJT.

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, 1st Edition, 1991.

Electrical Circuits and Machines

COURSE OUTLINE

Course Title	Short Title	Course Code
Electrical Circuits and Machines	**ECM**	

Course Description:

The course considers the basic principles of electrical machines. In this course we will introduce some of the basic concepts and terminology that are used in modern electrical engineering. The students can use this knowledge to analyze electrical networks, D.C. machines, A.C. machines & transformer etc.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): knowledge of Elements of Electrical and Electronics Engineering.

COURSE CONTENT

Electrical Circuits and Machines **Semester-III**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Three phase circuits & A.C. circuits **No of Lect. – 9, Marks: 16**

a) Thevenin's, Norton's theorem's application for A.C. network.
b) Three phase circuit power measurement (Star and Delta load).
c) Single watt meter, two Watt meter method.
d) Active, reactive, apparent power and power factor.

Unit-II: DC Machines **No of Lect. – 9, Marks: 16**

a) DC machine construction.
b) EMF equation of Generator, working principle (series & shunt).
c) Motor working principle; back EMF (series & shunt).
d) Torque equation and speed equation of motor.
e) Characteristics, losses and power stages of generator & motor.
f) Necessity of starter (3-point starter).

Unit-III: Single phase & three phase transformers **No of Lect. – 8, Marks: 16**

a) Transformers construction, EMF equation, working Principle: 1ϕ and 3ϕ.
b) Transformer phasor diagram no load & on load.
c) C.T, P.T. & Auto-transformer.
d) Open circuit and short circuit tests, Efficiency and regulation.

Unit-IV: Synchronous Machines **No of Lect. – 8, Marks: 16**

a) Alternator construction, principle of operation and EMF equation.
b) Principle of operation of synchronous motor.
c) Synchronous Motors on load with different excitation.
d) Explain hunting in synchronous motor.

Unit-V: Induction Motors **No of Lect. – 8, Marks: 16**

a) Three phase I.M. construction.
b) Principle of working of three-phase I.M.
c) Slip, torque equation (T_{st} & T_{max}) & torque - slip characteristics.
d) Types of starters (DOL, star-delta, auto-transformer).
e) Single phase Induction motors
f) Special machines (stepper motor, servo motor, universal motors) working, data analysis and application.

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

COURSE OUTLINE

Course Title	Short Title	Course Code
Digital Techniques and Applications	**DTA**	

Course Description:

This course provides an introduction to digital electronics & its applications covering different types of codes, Boolean laws, SOP and POS form, k-map technique, arithmetic circuits such as adder, substractor, Multiplexer, Demultiplexer and their applications, different types of flip-flops and their applications, sequential circuits such as ripple counter, synchronous counter, Mod-n counter, shift resister and its applications. Logic families TTL, MOS and its interfacing. This course is designed to give a broad understanding of the principles of Digital Techniques and its applications.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	14	42	04
Tutorial	01	14	14	

Prerequisite Course(s): Knowledge of Basic gates and semiconductor devices.

COURSE CONTENT

Digital Techniques and Applications **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: Codes and Boolean algebra **No of Lect. – 9, Marks: 16**

a) Introduction to Number Systems.
b) Representation of signed numbers.
c) Classification of Binary codes. BCD codes, Excess -3 codes, Gray codes, ASCII codes, Hamming code and pulsed operation of logic gates.
d) Boolean algebra, reducing Boolean expressions, SOP form, POS form, Minterm, Maxterm.
e) Simplification of Boolean function using K-map method and don't –care condition.

Unit-II: **Combinational Logic Circuits** **No of Lect. – 9, Marks: 16**

a) Half and Full adder/ Substractor Circuits**.**
b) IC 7483 parallel adder, BCD adder, 1bit / 2 bit's digital comparator.
c) Code converters: - binary to gray, BCD to Excess-3, BCD to 7 Segment
d) Multiplexer, De-multiplexer, decoder and their Applications.

Unit-III: **Sequential Circuits and Shift Register.** **No of Lect. –9, Marks: 16**

a) Classification of Sequential Circuits.
b) Latches and Edge triggered Flip-Flops:- SR, JK, T, D, Master Slave JK flip-flop and their application.
c) Excitation table, conversion of Flip- Flops.
d) Shift Register: - Definition, different types and their operation.
e) 4-bit bidirectional Shift register, 4-bit universal shift Register.
f) Application of shift Register: - ring counter, twisted ring counter.

Unit-IV: **Counters and Clocked sequential circuits.** **No of Lect. – 9, Marks: 16**

a) Design Ripple and MOD-N counters using Flip- Flops.
b) Design 4 bit UP/DOWN Ripple counter.
c) Design synchronous and MOD- N counters using Flip- Flops.
d) Synchronous sequential Machine.
e) Design Synchronous sequential circuits.

Unit- V: **Logic Families** **No of Lect. – 9, Marks: 16**

a) Characteristics of digital ICs.
b) Operation of TTL NAND gate, totem – pole, open collector output, wired AND, unconnected inputs.
c) CMOS inverter, NAND, NOR gate, unconnected inputs, wired logic, open drain output.
d) Interfacing of CMOS to TTL and TTL to CMOS.
e) Tri-State logic.
f) Comparison of different logic families.

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

COURSE OUTLINE

Course Title	Short Title	Course Code
Component Devices & Instrumentation Technology	**CDIT**	

Course Description:

This course provides an introduction to different devices used in instrumentation & electronics engineering covering types of errors in measurement, different analog and digital instruments such as voltmeter, current meter, ohm meter, recorders, instrumentation amplifier and function generator, AC and DC bridges, study of different transducers like temperature, humidity, flow, pyrometer, piezoelectric and phototransistor and basic of printed circuit board designing.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Knowledge of Physics and Elements of Electrical & Electronics Engineering.

COURSE CONTENT

Component Devices & Instrumentation Technology **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Measurement, Error and Display device **No of Lect. – 8, Marks: 16**

a) Definition of different term: Accuracy, precision, sensitivity, resolution, Significant figures.
b) Errors: gross error, systematic error, random error, limiting errors.
c) Statistical Analysis.
d) Permanent magnet moving coil mechanism (PMMC).
e) DC ammeter and DC volt meter.
f) Series and shunt type of ohmmeter.

Unit-II: Electronic instruments **No of Lect. – 8, Marks: 16**

a) Digital multi-meter.
b) Types of DVM: Linear Ramp type, Integration, Dual slope integration and successive approximation.
c) Recorders: Galvanometric, potentiometer, magnetic recorder.

d) Designing of Instrumentation amplifier.
e) Basic Standard Sine Wave Generator, Function generator block diagram.

Unit-III: Bridges and their applications **No of Lect. – 9, Marks: 16**

a) Wheatstone bridge.
b) Kelvin Bridge and Kelvin's double bridge.
c) General form of AC Bridge.
d) Maxwell Bridge, Hay Bridge.
e) Schering Bridge.
f) Wien Bridge & Wagner ground connection.

Unit-IV: Transducers and application **No of Lect. – 8, Marks: 16**

a) Thermometer and Thermocouple.
b) Integrated Circuit Temperature Transducers.
c) Measurement of Humidity by Hygrometer.
d) Flow transducer: - Turbine and Electromagnetic flow meter.
e) Pyrometer.
f) Piezoelectric Transducer, Phototransistor.

Unit-V: Printed Circuit Boards **No of Lect. – 9, Marks: 16**

a) Classification of PCBs, Manufacturing of basic printed circuit boards.
b) Artwork generation: Basic approach, general design guideline, Artwork generation guideline, film master preparations.
c) Copper clad laminates: properties and types.
d) Etching techniques, mass-soldering techniques.
e) Multilayered Boards.
f) Overview of Passive Components.

Reference Books:

1. H. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition, 2007.
2. A. Helfric and 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", TMH, 1st Edition 2005.
6. A. Kalavar, "Electronic Materials Components and Devices Technology", Everest Publishing House, 10th Edition, 2004.

Communication Systems-I

COURSE OUTLINE

Course Title	Short Title	Course Code
Communication Systems-I	**CS-I**	

Course Description:

The course considers analog communication systems. In this course we will introduce some of the basic mathematical concepts that will allow us to think in the two "domains" of communications, the time domain and the frequency domain. We will cover the basic types of analog modulation (AM, FM, and phase modulation) from both a mathematical description and from a block-diagram system approach.

	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Analog signal and fundamentals.

COURSE CONTENT

Communication Systems-I **Semester-III**

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Introduction to Communications System & Noise No of Lect. – 8, Marks: 16

a) Communications Systems and need of modulation.
b) Introduction, External noise, internal noise.
c) Noise Calculations.
d) Noise Figure and noise Temperature.

Unit-II: Amplitude modulation & SSB Techniques No of Lect. – 8, Marks: 16

a) Amplitude Modulation Theory.
b) Generation of Amplitude Modulation.
c) Evolution and Description of Single Side Band Techniques (SSB).
d) Suppression of Carrier and Unwanted Side Band.
e) Extensions of SSB.

Unit-III: Frequency and Phase modulation concept **No of Lect. –8, Marks: 16**

a) Theory of Frequency and Phase Modulation.
b) Noise and Frequency Modulation.
c) Generation of Frequency Modulation.

Unit-IV: AM / FM receiver **No of Lect. – 8, Marks: 16**

a) Receiver Types.
b) A.M. Receivers.
c) F.M. Receivers.
d) Single and Independent Sideband Receivers.

Unit-V: Pulse Modulation

No of Lect. – 8, Marks: 16

a) Fourier Transform and properties.
b) Statement of Sampling theorem and types of Sampling.
c) Pulse amplitude Modulation and concept of TDM, FDM.
d) Pulse Width Modulation and Pulse Position Modulation.
e) PWM and PPM generation block diagram and wave form description.

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

COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	**SK-III**	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	14	14	2

Prerequisite Course(s): Fundamental knowledge of High School Mathematics.

COURSE CONTENT

Soft Skills – III **Semester-III**

Teaching Scheme **Examination Scheme**

Lecture: 1 hour / week **Internal Continuous Assessment (ICA): 50 Marks**

Unit-I: Arithmetic-1 **No. of Lect. – 3, Marks: 10**

a. Basic Formulae

i. Divisibility Rules.
ii. Speed Maths.
iii. Remainder Theorem.
iv. Different Types of Numbers.
v. Applications.

b. HCF, LCM and Linear Equations

i. HCF – Successive Division and Prime Factorization Methods.
ii. LCM – Successive Division and Prime Factorization Methods.
iii. Applications.
iv. Linear Equations – Elimination Method.
v. Substitution Method.
vi. Applications.

c. Averages and Mixtures

i. Concept of Average.

ii. Faster Ways of Finding It.
iii. The Allegation Method.
iv. Applications.

Unit-II: Arithmetic–II **No of Lect. – 3, Marks: 10**

a. Percentages

i. Concept of Percentage.
ii. Working with Percentages.
iii. Applications.

b. Profit and Loss

i. Difference between Cost and Selling Price.
ii. Concept of Profit Percentage and Loss Percentage.
iii. Applications.

c. Time and Work

i. Basic Time and Work Formula.
ii. Relation between Time and Work.
iii. Applications.

Unit-III: Arithmetic–III **No of Lect. –3, Marks: 10**

a. Permutations and Combinations

i. Sum Rule of Disjoint Counting.
ii. Product Rule of Counting.
iii. Concept of Factorial.
iv. Permutations.
v. Linear Permutations.
vi. Combinations.
vii. Circular Permutations.
viii. Applications.

b. Probability

i. Definition and Laws of Probability.
ii. Mutually Exclusive Events.
iii. Independent Events.
iv. Equally Likely Events.
v. Exhaustive Events.
vi. Cards.
vii. Dice.
viii. Applications.

c. Time and Distance

i. Speed.
ii. Conversion Factors for Speed.
iii. Average Speed.
iv. Moving Bodies – Passing, Crossing and Overtaking.
v. Relative Speed.
vi. Boats and Streams.
vii. Applications.

Unit-IV: Non-Verbal Reasoning **No of Lect. 2, Marks: 10**

a. Analogies

i. Examples.
ii. Applications.

b. Classification

i. Examples.
ii. Applications.

c. Sequences

i. Examples.
ii. Applications.

Unit-V: Analytical Reasoning **No of Lect. – 3, Marks: 10**

a. Analytical Puzzles

i. Classification Puzzles.
ii. Ordering Puzzles.
iii. Assignment Puzzles.
iv. Applications.

b. Letter and Number Series

i. Different Types of Letter Series.
ii. Different Types of Number Series.
iii. Mixed Series.

c. Coding and Decoding

i. Letter Coding.
ii. Number Coding.
iii. Mixed Coding.
iv. Odd Man Out.
v. Applications.

Guide lines for ICA:
ICA will be based on credit tests and assignments submitted by the student in the form of journal.

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 OUTLINE

Course Title	Short Title	Course Code
Electrical Circuits and Machines	**ECM**	

Course Description:

In this laboratory course emphasis is on the understanding need of electrical engineering and their application.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Elements of Electrical & Electronics Engineering

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Two Wattmeter method of power measurement in three phase balanced load.**

    a. Measure the line Voltage for star / delta inductive load.
    b. Measure the line current for star / delta inductive load.
    c. Measure the power of watt-meters.
    d. Draw the phasor diagram for the star / delta inductive load.
    e. Calculate total power.

2. **Speed control of D.C. shunt motor by armature voltage and flux control method**.

    a. Measure armature voltages of D.C. shunt motor.
    b. Measure the field current of D.C. shunt motor.
    c. Plot graph for measure values voltages and field current.
    d. Verification of characteristics of motor.

3. **Load test on three phase induction motor.**

    a. Measure input Voltage and current of motor.
    b. Measure output speed of motor.
    c. Measure output torque of motor.
    d. Calculate the input power of motor.

e. Calculate the output power of motor.
f. Calculate the efficiency of motor.
g. Verification of performance characteristics of motor.

4. O.C. and S.C. test of single phase transformer to determine regulation and efficiency.

a. Measure the reading of ammeter.
b. Measure the reading of voltmeter.
c. Measure the reading of wattmeter.
d. Calculate no load resistance & reactance.
e. Calculate equivalent resistance, reactance and impedance.

5. Load test on D.C. series motor

a. Measure load current I_L.
b. Measure armature current I_a.
c. Verification of performance characteristics of motor.

Group B

1. Study of specification & application single phase motors.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

2. Study of specification & application of stepper motor.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

3. Study of specification & application of servo motor.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

4. Study of specification & application of universal motors.

a. Describe working and construction.
b. Selection criteria for application.
c. Use of datasheet for same.
d. Assembly & dissembling.

5. **Study of starter of three-point starter.**

    a. Identify and explain different parts of starter.
    b. Assembly & dissembling of starter.
    c. Connection of starter according to wiring diagram.

6. **Study of starter of star-delta starter.**

    a. Identify and explain different parts of starter.
    b. Assembly & dissembling of starter.
    c. Connection of starter according to wiring diagram.

7. **Study of starter of DOL starter.**

    a. Identify and explain different parts of starter.
    b. Assembly & dissembling of starter.
    c. Connection of starter according to wiring diagram.

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.

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 OUTLINE

Course Title	Short Title	Course Code
Solid State Devices & Circuits-I	**SSDC-I**	

Course Description:

In this laboratory course emphasis is on the understanding of semiconductor diodes, Transistor, Field effect transistor and other devices.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Basics of Elements of Electronics engineering.

LAB COURSE CONTENT

Outline of Content:

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **To find load regulation of full wave Bridge wave rectifier circuit with capacitor filter.**

   a.Calculate load regulation of full wave bridge rectifier circuit.

2. **Plot I/P and O/P characteristics of BJT.**

   a. Determine input & output resistance from the characteristics.

3. **To Plot DC Load Line for BJT (Voltage Divider biasing circuit).**

   a. D.C. analysis of Circuit (Theoretical Calculation of ICq , VCEq i.e. Q point)
   b. Calculation of ICq, VCEq i.e Q Point Practically.

4. **To plot regulation characteristics of Voltage doubler circuit**

   a. Calculation of Load regulation.
   b. Plot characteristics of Doubler circuit.

5. Plot frequency response of CE-CE Cascade amplifier.

h. Find voltage gain and bandwidth.
i. Plot frequency response.
j. Calculate Ri, Ro.

6. Study the effect of bypass capacitor on frequency response of single stage CE amplifier

a. Calculate Voltage gain and Bandwidth without bypass capacitor.
b. Calculate Voltage gain and Bandwidth with bypass capacitor.
c. Compare "a" and "b".

Group B

1. To Plot DC Load Line for FET (Voltage Divider biasing circuit).

a. D.C. analysis of Circuit (Theoretical calculation of Idq , Vdsq i.e. Q point)
b. Calculation of Idq, Vdsq i.e. Q Point Practically.

2. Plot characteristics of CSFET.

a. Determine amplification factor, trans-conductance, and dynamic resistance.

3. Study the frequency response of CSFET.

a. Calculate Voltage gain and Bandwidth. Plot frequency response
b. Calculate of Ri, Ro.

4. Square wave testing of an amplifier.

a. Calculate Lower cutoff frequency and higher cutoff frequency.
b. Calculate bandwidth.

5. Plot frequency response of CE-CC Cascade amplifier.

a. Find voltage gain and bandwidth
b. Plot frequency response.
c. Calculate Ri, Ro

6. **To determine A_V, R_i, R_o of Darlington amplifier.**

a. Calculate A_v.
b. Calculate R_i, R_o.

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. Thomas L. 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 and 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 OUTLINE

Course Title	Short Title & Course Code
Communication Systems-I	**CS-I**

Course Description:

In this laboratory course emphasis is on the understanding of need of modulation and demodulation and their uses.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Analog signal and its fundamentals.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Study of AM transmitter and calculate of modulation index of AM wave by envelope method.**

   a. Sketch and recognize the resulting waveforms for a sinusoidal carrier being amplitude modulated by a single frequency audio signal.
   b. Draw and analyze graphs to show the resulting waveform, and frequency spectrum for a sinusoidal carrier amplitude modulated by an audio signal, to a given depth of modulation, m;
   c. Select and use the formula:

$$m = \frac{(V_{max} - V_{min})}{(V_{max} + V_{min})}$$

   To calculate the depth of modulation for given amplitude modulated RF signal.

2. **Analyze and generate A.M. Demodulation signal by diode detector.**

   a. Generate AM modulated wave form.
   b. Apply Modulated AM signal to demodulator.
   c. Observe clipping effect.
   d. Compare original modulating signal with demodulated output.

3. **Study of FM and calculate of modulation index of FM wave.**

   a. Generate FM waveform.
   b. Calculate Modulation Index.
   c. Compare over with A.M. modulation.

4. **F.M. Demodulation (Phase discriminator/Ratio detector method.)**

   a. Generate FM modulated wave form.
   b. Apply Modulated FM signal to demodulator.
   c. Compare original output with demodulated output.
   d. Plot S-curve

5. **To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.**

   a. Apply the sinusoidal signal as input signal to pre emphasis circuit.
   b. By increasing the input signal frequency observe the output voltage and calculate gain.
   c. Plot the graph between gain Vs frequency.
   d. Repeat same procedure for de-emphasis circuit.

6. **Study of Amplitude limiter circuit.**

   a. Apply sinusoidal signal.
   b. Find out limiting range of applied input signal.
   c. Draw the graph for same and discussed about result.

Group B

1. **Calculate gain for RF / IF stage with AGC and without AGC.**

   a. Explain concept regarding with and without AGC.
   b. Calculate gain of RF/IF stages with AGC.
   c. Calculate gain of RF/IF stages without AGC

2. **DSB-SC signal generation using balanced modulator.**
   a. Observe that the output is double side band suppressed carrier.
3. **Analyze voltage and waveform at various stages/points in A.M. radio receiver (i.e. Super-heterodyne Radio Receiver).**

   a. Identify the different stages and write down the information about the individual stage.
   b. Observation may be any available information such as number, value, type or any other indication.
   c. Observed and draw waveform of various stages.
   d. Analyze signal each points.

4. PAM modulator & demodulator.

a. Generate pulse amplitude modulated waveform.
b. Observed waveform and made calculation.
c. Detection of modulated waveform.
d. Observed demodulated PAM waveform compute information.

5. PWM modulator & demodulator.

a. Generate pulse width modulated waveform.
b. Observed waveform and made calculation.
c. Detection of modulated waveform.
d. Observed demodulated PWM waveform compute information.

6. PPM modulator & demodulator.

a. Generate pulse position modulated waveform.
b. Observed waveform and made calculation.
c. Detection of modulated waveform.
d. Observed demodulated PPM waveform compute information.

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:

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.

Digital Techniques and Applications

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Digital Techniques and Applications	**DTA**	

Course Description:
In this laboratory course emphasis is on the understanding of combinational and sequential circuit design.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Knowledge of Basic gates and semiconductor devices.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group)

Group A

1. **Realization of logic gates OR, AND, NOT, NOR, NAND gates using discrete components and verify their truth tables.**

    a. Apply different combinations of inputs and observe the outputs.
    b. Compare the outputs with the truth tables.

2. **Design of 4 bit Gray to binary Code Converter.**

    a. Prepare the truth table of Gray to binary code.
    b. All the 16 combinations of inputs are given at respective pins
    c. Verify the truth tables of Gray to binary code.

3. **Realization of IC7483 as parallel adder and substractor.**

    a. Apply the inputs toA3 to A0 and B0 to B3.
    b. Check the output sum S3 to S0 and also C4.
    c. For Subtraction, Apply B input through NOT gate, which gives compliment of B.
    d. Verify the truth table of adder/substractor.

4. **Verification of Ex-3 to BCD code conversion using NAND gates.**

    a. Apply the logic inputs to A3 - A0 and B3- B0.
    b. Check the output sum S3 to S0 and also C4.
    c. For Subtraction, Apply B input through NOT gate, which gives compliment of B.
    d. Verify the truth table of adder/substractor.

5. **Verification of 4-Bit Magnitude Comparator using IC7485.**

    a. Feed the 4-bit binary input to A3-A0 and B3-B0.
    b. Observe the output A>B, A=B, and A<B on logic indicators for different combinational input. The outputs must be 1 or 0 respectively.
    c. Verify the truth table of 4-bit comparator.

6. **Design and Implement BCD to 7 Segment display decoder using IC 447/7448.**

    a. Apply BCD Number to Decoder IC.
    b. Observe the output on 7- segment display.

Group B

1. **Verify the truth table of multiplexer and de-multiplexer using ICs.**
    a. Prepare the truth table of multiplexer.
    b. Based on the select line one of the input will be selected at the output.
    c. Observe the output of multiplexer and verify the truth table.

2. **Verify the truth table of J-K, T, and D Flip-flops using ICs.**

    a. Prepare the truth table of flip-flops.
    b. Examine the output of flip-flops and validate the truth table.
    c. Check out the output for J-K flip-flops, when J and k both inputs are at logic “1”.

3. **Design ring and Johnson counter using flip-flops.**

    a. Organize the truth table of ring and Johnson counters.
    b. Apply clock pulses and note the outputs after each clock pulse
    c. Verify the truth table of ring and Johnson counters.

4. **Design decade ripple counter using flip-flops.**

    a. Prepare circuit diagram and make connection as per diagram.
    b. Apply clock pulse.
    c. Monitor the output after each clock pulse and note down the outputs Q_3, Q_2, Q_1, and Q_0.

5. **Realization of Decade counter using IC.**

    a. Apply clock pulse at the clock input
    b. Observe the output at Q_A, Q_B, Q_C, and Q_D.

6. **Design 4-bit UP/DOWN synchronous counter using IC.**

    a. Apply clock pulse at the clock input
    c. Observe the output at Q_A, Q_B, Q_C, and Q_D.

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, 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

Semester – IV

W.E.F 2013 – 2014

Engineering Mathematics-III

COURSE OUTLINE

Course Title	Short Title	Course Code
Engineering Mathematics-III	**EM-III**	

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	04
Tutorial	01	14	14	

Course Description:
This course provides the elementary level knowledge of n^{th} order Linear Differential Equations, Transforms, Complex Analysis and Vector Calculus. Course includes solution of n^{th} order linear differential equations, Laplace transform, Fourier Transforms, Z-Transform, and Vector Calculus.

Prerequisite Course(s): Engineering Mathematics-I, Engineering Mathematics-II

COURSE CONTENT

Engineering Mathematics-III **Semester-IV**

Teaching Scheme	Examination Scheme
Lecture: 3 hours / week	**End Semester Examination (ESE): 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE) : 03 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

UNIT-I: Linear Differential Equations: No of Lect. – 8, Marks: 16

a. Solution of LDE of order n with constant coefficients.
b. Method of variation of parameters (Only second order).
c. Cauchy's linear equation.
d. Legendre's linear equation.
e. Applications of Linear differential equations to electrical circuits.

UNIT-II: Function of Complex Variable No of Lect. – 8, Marks: 16

a. Analytic functions, Cauchy-Riemann equations.
b. Cauchy's Residue theorem(Without proof)
c. Cauchy's Integral theorem and Cauchy's Integral formula (without proof).
d. Conformal mapping, bilinear transformations.

UNIT-III: Laplace Transform **No of Lect. – 8, Marks: 16**

a. Definition and Existence of Laplace transforms.
b. Laplace Transform of elementary/standard functions.
c. LT of some special functions viz, error, Periodic, Unit Step, Unit Impulse.
d. Theorems & Properties of Laplace Transform (without proof).
e. Inverse Laplace Transform.
f. Applications of LT for Network Analysis.
g. Applications of LT to solution of linear differential equation.

UNIT-IV: Fourier Transform and Z-Transform **No of Lect. – 8, Marks: 16**

A. Fourier Transform:

a. Introduction to Fourier Integral theorem.
b. Fourier Transforms, Fourier Cosine Transforms, Fourier Sine Transform and their inverse.

B. Z- Transform:

a. Definition and standard properties (without proof)
b. Region of Convergence.
c. Z-Transform of standard / elementary sequences.
d. Inverse Z-transform.

UNIT-V: Vector Differentiation **No of Lect. – 8, Marks: 16**

a. Definition, physical Meaning of vector differentiation.
b. Tangential and normal components of acceleration, Radial and transverse components of velocity and acceleration.
c. Vector differential operator (∇)
d. Gradient of Scalar point function.
e. Directional Derivatives of Scalar point function.
f. Divergence and Curl vector field.
g. Solenoidal and Irrotational vector fields.

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

COURSE OUTLINE

Course Title	Short Title	Course Code
Solid State Devices & circuits- II	**SSDC-II**	

Course Description:

This is an introductory graduate-level course on the various applications of Electronics Circuit. Basic Electronics is an interdisciplinary branch of Engineering and mathematics that deals with the behavior of Various Devices. The goals of the course are to understand the basic principle of various Devices and its application in different area.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	14	42	04
Tutorial	01	14	14	

Prerequisite Course(s): Knowledge of Elements of Electronics Engineering and Solid state devices and circuit I.

COURSE CONTENT

Solid state devices and circuits-II **Semester-IV**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: **Waveshaping Circuit** **No of Lect. – 9, Marks: 16**

a) Different Types of Waveshaping circuit- Astable multivibrator, Bistable multivibrator and monostable multivibrator.
b) Analysis of different Time Base circuits – Miller integrator, Bootstraps sweep circuit.
c) Introduction of Differential amplifier, Different modes of Differential amplifier.
d) DC Analysis of Differential amplifier with Re, AC analysis of Differential amplifier.
e) Calculation of CMRR for Balanced & Unbalanced operation, Techniques to improve CMRR of Differential amplifier.
f) Schmitt trigger circuit.

Unit-II: **High frequency model of BJT** **No of Lect. – 8, Marks: 16**

a) Introduction High frequency model of BJT.
b) Behaviour of transistor at high frequency, high frequency CE amplifier π model
c) CE short circuit current gain for π model, Definition and derivation of Fα, Fβ & F_T
d) Introduction to Tuned Circuit, Classification of Tuned amplifier.
e) Circuit diagram, Operation & characteristics of Single Tuned amplifier.
f) Circuit diagram, Operation & characteristics of Doubled Tuned amplifier and Stagger Tuned amplifier.

Unit-III: **Large signal amplifier** **No of Lect. – 8, Marks: 16**

a) Introduction of power amplifier.
b) Need of Power amplifier, Concept of Load Line, Performance parameter of Power amplifier.
c) Classification of power amplifier. DC and AC Analysis of Class A power amplifier with Resistive Load and efficiency calculation.
d) DC and AC Analysis of Transformer coupled Class A power amplifier and efficiency calculation.
e) DC and AC Analysis of Class B Push Pull power amplifier and efficiency calculation, calculation of Maximum output power, Maximum Power Dissipation
f) Working of Class B Complementary power amplifier, efficiency calculation
g) Concept of Crossover distortion, Elimination of Crossover distortion.
h) Analysis of Harmonic distortion (Five point method).

Unit-IV: **Feedback amplifier** **No of Lect. –9, Marks: 16**

a) Introduction of Feedback amplifier.
b) Concept of feedback amplifier, Types of feedback (Positive & Negative feedback), Basic amplifier types.
c) Derivation of gain with feedback. Topology used in feedback amplifier, Classification of Feedback amplifier.
d) Analysis of Voltage series and Current series Negative feedback amplifier with derivations of Ri and Ro.
e) Analysis of Voltage shunt and Current shunt Negative feedback amplifier with derivations of Ri and Ro.

Unit-V: **Voltage Regulator and Oscillator** **No of Lect. – 8, Marks: 16**

a) Introduction of voltage regulator.
b) Block diagram of Regulated power supply, concept of Line and Load regulation, Types of Voltage regulator.
c) Emitter Follower series voltage regulator, Transistorized series voltage regulator.
d) Short circuit protection circuit (Using Transistor and Diode), Fold back protection circuit.
e) Concept of Oscillator, classification of oscillator, Construction, working and Derivation of frequency and hfe of Phase shift, Wien Bridge oscillator.

f) Circuit diagram, working and Derivation of frequency and hfe of Hartley, Colpitts oscillator, Clap oscillator.
g) Crystal oscillator.

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

COURSE OUTLINE

Course Title	Short Title	Course Code
Microprocessors	**MP**	

Course Description:

Introduction to the basic concepts of microprocessor, assembly language programming and peripheral interface. Course includes instruction set, Machine cycles, assembly language programming, interrupts, sub-routine, stack, call and return for 8085 microprocessor and interfacing of memory Programmable Peripheral Interface, and Programmable Timer/Counter. This course is designed to give a broad understanding of the microprocessor, assembly language programming and peripheral interfaces.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Digital Electronics.

COURSE CONTENT

Microprocessors **Semester-IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **8085 microprocessor.** **No of Lect. – 8, Marks: 16**

a) Block diagram and operation of microcomputer system.
b) 8085 Microprocessor architecture & operation.
c) Program Counter and Stack pointer and Pin diagram of 8085 microprocessor.
d) De-multiplexing of lower order address bus and generation of control signals.
e) Memory classification, Basic of memory interfacing and Address decoding techniques.
f) Interfacing of memory with 8085 microprocessor. (With interfacing Numerical).

Unit-II: **Instruction set of 8085 microprocessor.** **No of Lect. – 8, Marks: 16**

a) Instruction structure and classification (One/two/three Byte).
b) Machine cycles & Bus Timing: Opcode Fetch, Memory Read, and Memory Write.
c) Instruction Set: Instruction for Data transfer operations and Arithmetic operations.
d) Instruction for Logic operations and Branch operations.
e) Concept of sub-routine.
f) Unconditional Call and Return instruction.
g) Conditional Call and return instructions.

Unit-III: **Assembly Language Programming.** **No of Lect. – 9, Marks: 16**

a) Addressing modes of 8085 microprocessor.
b) Ideal steps for writing assembly language programs and basic of flowchart symbols.
c) Assembly Language Programming on: Data Transfer operations and, Accessing I/O devices.
d) Assembly language programming on Arithmetic operations, Logical operations and Branch operations.
e) Concept and designing of counters and time delay and their assembly language programming.
f) Assembly language programming on subroutines.

Unit-IV: **Stack, Interrupts and Serial I/O of 8085 microprocessor.** **No of Lect. –8, Marks: 16**

a) Stack and stack related instructions.
b) Assembly language programming on string/array related operations.
c) Introduction to Memory mapped I/O and I/O mapped I/O. (Difference Only).
d) The 8085 Interrupt and 8085 vectored Interrupts.
e) Serial I/O lines SID &SOD. Data transfer through SID and SOD lines.

Unit-V: **General Purpose Peripheral Devices.** **No of Lect. – 8, Marks: 16**

a) Internal architecture of 8255-Programmable Peripheral Interface. I/O and BSR Mode of 8255.
b) Interfacing of I/O device using 8255 - Programmable Peripheral Interface.
c) Programmable Interval Timer/ Counter 8254, block diagram, control word register, Modes of 8254.
d) Programming on counter and mode 0-3 (only) of 8254.

References 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.

Linear Integrated Circuits

COURSE OUTLINE

Course Title	Short Title	Course Code
Linear Integrated Circuits	**LIC**	

Course Description:

Introduce the basic concepts of operational amplifier, linear & non-linear application of OP-AMP. Course includes basics and designing of various comparator and signal generators using OP-AMP, various data convertors, active filters, PLL and its use for communication applications. This course is designed to give a broad understanding of the operational amplifier, its application in various fields.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): EEEE, SSDC-I.

COURSE CONTENT

Linear Integrated Circuits **Semester-II**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **Operational amplifier:** **No of Lect. – 9, Marks: 16**

a) Ideal op-amp characteristics; schematic development stages of op-amp.
b) Current sources and active loads.
c) Difference, intermediate and output stages including Miller capacitors for frequency computation.
d) Internal circuit of op-amp IC μA741, operational amplifier parameters, offset null techniques of op-amp features.
e) Data sheet interpretation and data sheet study of op-amp IC 741.
f) Measurement of op-amp parameters, effects of real operational amplifier parameters on circuit performance.
g) Frequency response and stability, frequency and phase compensation techniques.

Unit-II: **OP-AMP Applications** **No of Lect. – 9, Marks: 16**

a) Non-inverting amplifier and voltage follower, inverting amplifier.
b) Peak amplifier, ac amplifier, AF amplifier IC LM380.
c) Analog adder, averaging amplifier, integrator, differentiator.
d) Analog computation, basic building blocks, basic linear differential equation.
e) Differential and instrumentation amplifiers using one, two and three op-amps, instrumentation amplifier IC μA725, bridge amplifier.
f) Voltage-to-current and current-to-voltage converters, Analog multipliers, dividers.
g) Log/antilog amplifiers.

Unit-III: **Active filters and Voltage regulators** **No of Lect. – 8, Marks: 16**

a) Active filters: types and response.
b) Analysis and synthesis of first, second and higher order active filters.
c) Butterworth filters all pass filter.
d) Voltage regulators: Series op-amp regulator, IC voltage regulator.
e) Voltage regulator IC μA723 and its applications as positive/negative and fixed/adjustable voltage regulators.
f) Three terminal voltage regulators: positive/negative and fixed/adjustable voltage regulators.
g) Dual tracking regulators; switching regulator: concept and schematic, IC MC1723and its application.

Unit-IV: **Comparators and waveform generation.** **No of Lect. –8, Marks: 16**

a) Comparators: introduction, parameters; op-amp as comparator, comparator IC 710, peak detectors.
b) Waveform generation: Schmitt's trigger, square-triangle wave oscillators, relaxation oscillators and pulse generators.
c) Timer IC 555 and its use as timer circuit and multi-vibrators.
d) Analysis and design of R-C (phase shift, wien bridge) oscillators.
e) Voltage controlled oscillator IC SE/NE566, function generator IC LM 8038.
f) Clippers and clampers; precision rectifiers.

Unit-V: **A/D interface circuits and PLL** **No of Lect. – 8, Marks: 16**

a) A/D interface circuits: Analog to digital (A/D) and digital to analog (D/A) converters.
b) Sample and hold circuits; analog multiplexers.
c) Phase lock loop (PLL): operating principles, lock and capture range.
d) PLL as amplitude and frequency modulation detection, frequency shift keying (FSK) decoder, frequency synthesiser.
e) PLL IC SE/NE565.

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", 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.

Network Analysis and Synthesis

COURSE OUTLINE

Course Title	Short Title	Course Code
Network Analysis and Synthesis	**NAS**	

Course Description:

This course introduces the student to Network Analysis & Synthesis. The student will learn to analyze & Synthesize Electric circuits either one port & two port networks. Student will study the different techniques to analyze, synthesize and design of network, analysis of standard signals and learn new synthesis tools also analysis of two port networks using Z, Y, h, ABCD parameters. Student will also learn types of network function. Theory as well as tools for classical & modern filter design. Emphasis have given to the following topics related to network analysis and synthesis, complex frequency, frequency domain concept, properties of LC, RC, and RLC. Pole-zero concepts, design of different types of filters and attenuators.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): knowledge of basic Electrical and Electronics engineering and their concept.

COURSE CONTENT

Network Analysis and Synthesis **Semester-IV**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit-I: **System and Network Functions.** **No of Lect. – 9, Marks: 16**

a. Definition and types of network function with their Numerical.
b. Concept of complex frequency and characteristics of standard signals.
c. Concept of Laplace transform and Laplace transform of basic R, L, and C Component.
d. Network Analysis using Laplace transform with initial condition, Numericals.
e. Concept of Pole and Zero, time-domain behavior from pole-zero plot, concept of residues.

Unit-II: **Frequency Selective Networks.** **No of Lect. – 8, Marks: 16**

a. Concept of resonance, types of resonance, Q-factor and their significance.
b. Series resonance, resonance frequency with derivation, variation of impedance, current with frequency, bandwidth and selectivity, examples.
c. Parallel resonance, resonance frequency, bandwidth and selectivity, examples.

Unit-III: **Two Port Networks Parameters.** **No of Lect. – 8, Marks: 16**

a. Introduction of two port network and their different parameters such as Z, Y, h, ABCD parameter with equivalent circuit
b. Concept of reciprocity and symmetry condition for two port network parameters.
c. Inter connection of two port networks in series, parallel, cascade connection and series-parallel connection.
d. Inter conversion of the parameters, examples on finding the different two port network parameters.

Unit-IV: **Attenuators and Filters**. **No of Lect. – 8, Marks: 16**

a. Concept of Neper and Decibel (dB).
b. Introduction of attenuator, types of attenuator, design of symmetrical 'T' and '**π**' attenuator, examples.
c. Filters fundamentals & Design of different types of filters such as constant K-type Low pass and high pass filter, examples.
d. Design of m-derived low pass and high pass filter, examples. Concept of band pass, band stop filter, terminating half section and concept of composite filter

Unit-V: **Synthesis of Networks**. **No of Lect. – 9, Marks: 16**

a. Hurwitz polynomial and its properties, check Hurwitz criteria by Routh array or continued fraction expansion method, examples.
b. Positive real function and its properties, procedure for testing of positive real function, examples.
c. Synthesis of one port network such as LC, RC, RL with their properties.
d. Synthesis of L-C, R-C, and R-L networks using Foster and Cauer forms, examples.

Reference Books:

1. D. Choudhary, "Network and system", New Age international Publication, 1st Edition, Reprint 2005.
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, 6th Edition, .2012.
4. B. R. Gupta, "Network Analysis and synthesis", S. Chand and company Ltd., 2010.
5. G. K. Mithal, "Network Analysis", Khanna Publishers, 2000.

Computer Programming-II

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Computer Programming-II	**CP-II**	

Course Description:

This laboratory course emphasis is on the understanding of C programming and open source operating system.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	2
Lecture	1	14	14	

Total Semester Credits: 2

Prerequisite Course(s): C Programming and its fundamentals.

LAB COURSE CONTENT

(Note: Group A is **mandatory** and Minimum **EIGHT** practical from B group.)

Group A

1. Installation of Linux (Ubuntu 10.04).with various essential packages
2. Study of basic commands in Linux terminal (Minimum 20 commands)

Group B

Note: Required software is Ubuntu 10.04, gcc

1. Program for sum of digits.
2. Program for reverse number.
3. Program for counting digits in a number.
4. Program for bubble sort.
5. Program for Matrix multiplication.
6. Program for stack operations using switch case.
7. Program for queue using arrays.
8. Program for string operations without using library functions.
9. Program to convert decimal to binary/hexadecimal.
10. Write a Program with Bit wise operations.
11. Write a Program with Right and left Shift Operation.
12. Program to swap two numbers using pointer.
13. Program for implementation of DOS copy/type command using FILE operations and command line arguments.

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.

Guide lines for ICA:

The Internal Continuous Assessment shall be based on practical record and knowledge/skill acquired. The performance shall be assessed experiment wise using continuous assessment format A&B.

Linear Integrated Circuits

LAB COURSE OUTLINE

Course Title	Short Title	Course Code
Linear Integrated Circuits	**LIC**	

Course Description:

In this laboratory course emphasis is on the understanding of operational amplifier, and its application for various.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): EEEE, SSDC-I

LAB COURSE CONTENT

(Note: Minimum EIGHT Experiments from below list.)

1. **Op-amp parameter measurement: input bias current, input offset current, Input offset voltage, slew rate of op-amp 741).**
    a. Calculation of input bias current, input offset current, input offset voltage, slew rate of op-amp Practically.

2. **Design and test active integrator and differentiator circuits for given Frequency.**
    b. Apply different I/P signals & observe the O/P waveform.
    c. Plot the frequency response.

3. **Study the operation of half wave and full wave precision rectifier**
    a. Observe the I/P & O/P waveforms for both the circuits.

4. **Design and test positive and negative clamper.**
    a. Observe the I/P & O/P waveforms for both the circuits.

5. **Design and test Schmitt trigger circuit for given hysteresis.**

    a. Measure the hysteresis voltage.

6. **Design and test of square wave and triangular and saw tooth wave generator using Op-amp for given frequency.**

    a. Observe the O/P waveforms
    b. Measure the O/P frequency of the circuits.

7. **Design and test timer using IC 555 in monostable and astable mode.**

    a. Observe the o/p waveforms.
    b. Measure the o/p frequency of the circuits.

8. **Design and test function generator using IC 8038.**

    a. Observe the o/p waveforms
    b. Measure the o/p frequency of the different waveforms.

9. **Design and test PLL using IC 565 PLL for given lock and capture range.**

    a. Observe the o/p waveforms.
    b. Measure the lock & capture range.

10. **Design and test audio amplifier using IC LM380 with and without positive feedback.**

    a. Measure the gain of amplifier.

11. **Setup DAC circuit Using IC LM 741 and study its performance.**

    a. Apply the different i/p & measure the o/p voltage.

12. **Setup ADC circuit Using IC LM 741 and study its performance.**

    a. Apply different i/p voltages & observe its digital equivalents.

13. **Design and test second order Butterworth LP / HP filter.**

    a. Plot the frequency response.

14. **Design and test BP Butterworth filter.**

    a. Plot the frequency response.

15. Design and test BR Butterworth filter.

a. Plot the frequency response.

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 OUTLINE

Course Title	Short Title & Course Code
Solid State Devices & circuits -II	**SSDC- II**

Course Description:
In this laboratory course emphasis is on the understanding of combinational and sequential circuit design.

	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Solid State Devices

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. **Calculation of CMRR of Emitter coupled differential amplifier using Emitter resistance and Compare it with Constant current source circuit.**

    a. Calculate Avd in differential mode operation.
    b. Calculate Avc in Common mode operation.
    c. Compare CMRR in above two methods.

2. **Observe the response of Miller integrator for given i/p.**

    a. Draw input and output waveform of miller integrator.

3. **Measure response of Schmitt trigger circuit for sine wave input.**

    a. Calculation of UTP and LTP.
    b. Observe Hysteresis characteristics.
    c. Draw input and output waveform.

4. **Determine the period and frequency of oscillation for Astable/Monostable Multivibrator**.

a. Draw output waveforms at base and collector of Q1 and Q2.

5. Class B Push Pull amplifier efficiency calculation.

a. Calculate A.C. output power Pac.
b. Calculate D.C. i/p Power Pdc.
c. Calculate efficiency.

6. Class B Complementary Symmetry efficiency calculation and elimination of crossover distortion.

a. Calculate A.C. output power Pac.
b. Calculate D.C. I/P Power Pdc.
c. Calculate efficiency.
d. Observe how to eliminate crossover distortion.

Group B

1. Plot regulation characteristics of Series voltage regulator circuit.

a. Calculate Line regulation.
b. Calculate Load regulation.

2 Plot frequency response of Voltage series/ Voltage shunt feedback amplifier.

a. Compare Voltage gain and Bandwidth for with and without feedback.

3. Calculate Voltage gain Av, input impedance Ri, and output impedance Ro for current series/ voltage series negative feedback amplifier

a. Compare Voltage gain Av, input impedance Ri, and output impedance Ro for current series/voltage series amplifier in with and without feedback.

4. Plot frequency response of Single tuned amplifier.

a. Calculate of resonant frequency and bandwidth.

5. Study of Phase shift, Wien Bridge, Hartley, Colpitts.(Any Two)

a. Calculate theoretical frequency of oscillator using formula.
b. Compare theoretical frequency with fundamental frequency.

6. **Determination of frequency and output voltage of Crystal Oscillator.**

    a. Calculate frequency of oscillator and compare with fundamental frequency of Crystal.

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.

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 OUTLINE

Course Title	Short Title	Course Code
Network Analysis and synthesis Lab	**NAS**	

Course Description:

In this laboratory course emphasis is on the understanding of basic electrical circuits. The students can use this knowledge to analyze and synthesize Electrical networks and Design of different filters and attenuators.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Course on Basic Electrical and Electronics Engineering..

LAB COURSE CONTENT

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

1. **Determine transfer / driving point Impedance function of given two port reactive network.**

    a. Measure electrical quantity such as Voltages and currents at different ports of the two ports the network.
    b. Find the Driving point impedance or transfer impedance of given network.
    c. Compare analytical and the practical values.

2. **Determine Pole-Zero plot of given one port reactive network.**

    a. Measure the output current of the one port reactive network with frequency variation.
    b. Calculate impedance by taking ratio of input voltage and measured currents for each frequency value.
    c. Draw the graph of impedance and frequency and find practical values of poles and zeros
    d. Compare analytical and practical values of poles and zeros.

3. **Study of Series and parallel resonance, find BW and Q- factor.**

    a. Measure the current of Series RLC and Parallel RLC resonance circuit with varying frequency.

b. Draw the graph of frequency and currents and find out resonance frequency, bandwidth, and quality factor.
c. Compare the analytical and measured values of the Resonance frequency and Bandwidth.

4. Determine Z parameter of networks connected in series.

a. Determine the open circuit impedance parameters by connecting 2 two ports network in series combination.
b. Measure the voltage and current in network by taking any one port open circuited and take a ratio of voltage to current of different ports of the networks.
c. Compare the analytical and practical values of Open circuit impedance parameters i.e. Z_{11}, Z_{12}, Z_{21}, Z_{22}.

5. Determine Y parameter of networks connected in parallel.

a. Determine the short circuit admittance parameters by connecting 2 two ports networks in parallel combination.

b. Measure the voltage and current in network by taking any one port short circuited and take a ratio of current to voltage of different ports of the networks.
c. Compare the analytical and practical values of short circuit admittance parameters i.e. Y_{11}, Y_{12}, Y_{21}, Y_{22}.

6. Determine transmission parameter of networks connected in cascaded form.

a. Determine the ABCD / Transmission parameters by connecting 2 two ports networks in Cascade combination.
b. Measure the voltage and current in network by taking output one port open circuited and similarly measure the voltage and current by taking output port short circuited take a ratio of voltage to current and current to voltage of different condition i.e. short circuit and open circuit of the networks.
c. Compare the analytical and practical values of ABCD / transmission parameters i.e. $A= V_1/ V_2$, $B=V_1/ I_2$, $C=I_1/ V_2$, $D=I_1/ I_2$.

7. Frequency response of constant k- low pass filters and find out cut of frequency.

a. Design constant K-Low Pass filter with given cut off frequency and given design impedance.
b. Take different readings of V_0 for varying frequency from function generator.
c. Calculate attenuation (α) in dB for each frequency.

d. Plot the graph of attenuation in dB Vs Frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

8. Frequency response of constant k- high pass filters and find out cut of frequency.

a. Design constant K-High Pass filter with given cut off frequency and given design impedance.
b. Take different readings of V_0 for varying frequency from function generator.
c. Calculate attenuation (α) in db for each frequency.
d. Plot the graph of attenuation in db Vs Frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

9. Frequency response of m- derived filters and find out cut of frequency.

a. Design m- derived filter with given cut off frequency and given frequency of maximum attenuation, with given design impedance.
b. Take different readings of V_0 for varying frequency from function generator.
c. Calculate attenuation (α) in dB for each frequency.
d. Plot the graph of attenuation in dB Vs frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

10. Frequency response of band pass filter.

a. Take different readings of V_0 for varying frequency from function generator.
b. Calculate attenuation α in dB for each frequency.
c. Plot the graph of attenuation in dB Vs frequency and determine the cut-off frequency from graph. Compare this practical cut-off frequency with the design value.

11. Design build and test symmetrical T or Π attenuator (plot attenuation Vs RL).

a. Design a symmetrical 'T' attenuator to given attenuation (In dB) to work into a use of given impedance.
b. Apply variable DC input voltage at input with respect to ground, Measure voltage 'Vs' & Measure voltage 'V_R', and calculate value of $N= V_S/ V_R$.
c. Calculate attenuation in dB for each input voltage.
d. Compare measured values and Theoretical values of attenuation.

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.
4. B. R. Gupta, “Network Analysis and synthesis”, S. Chand and company Ltd., 2010.
5. G. K. Mithal, “Network Analysis”, Khanna Publishers, 2000.

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

LAB COURSE OUTLINE

Course Title | Short Title & Course Code

Microprocessors Lab | **MP LAB**

Course Description:

This course is designed to teach students the practical aspects of principles, interfacing and applications of microprocessor architecture, including both hardware and basic assembly language programming using the 8085 Microprocessor.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Total Semester Credits: 1

Prerequisite Course(s): Digital Electronics.

LAB COURSE CONTENT

(Note: Minimum Eight from List)

1. **Addition of two 8 bit numbers.**
   Performing simple arithmetic operations of addition using 8085 Microprocessor.
2. **Subtraction of two 8 bit numbers.**
   Performing simple arithmetic operations of subtraction using 8085 Microprocessor.
3. **Addition of two 16 bit numbers.**
   Performing simple arithmetic operations of addition using 8085 Microprocessor.
4. **Subtraction of two 16 bit numbers.**
   Performing simple arithmetic operations of subtraction using 8085 Microprocessor.
5. **Multiplication of two 8 bit numbers.**
   Performing simple arithmetic operations of multiplication using 8085 Microprocessor.
6. **Division of two 8 bit numbers.**
   Performing simple arithmetic operations of division using 8085 Microprocessor.
7. **Program for block transfer of data bytes.**
   Perform block transfer of data.
8. **To find square of a number using look-up table.**
9. **To find largest/smallest number in array of data.**
10. **Arrange an array of data in ascending/descending order.**
11. **Program to implement decimal up/down counter.**
12. **BCD to Hex / Hex to BCD Conversion.**

13 **Interfacing of 8253/54 Timer with 8085 Microprocessor and generate the square wave.**

14 **Case study of Microprocessor controlled temperature system / microprocessor controlled manufacturing process/ traffic signal controller. (Study only)**

References 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.

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.