University of Mumbai			
Class: S.E.	**Branch:** Instrumentation	**Semester:** III	
Subject: Analog Electronics (Abbreviated as AE)			
Periods per Week (60 min. each)	Lecture	04	
	Practical	02	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical/Oral	02	50
	Oral	---	---
	Term Work	---	25
	Total	05	175

Module	Contents	Hours
1	**Diode** Clipper & Clamper Circuits using Diode	03
2	**Bipolar Junction Transistor** Transistor biasing, different types of biasing circuit and their analysis, bias stability, stability factor, comparison of biasing circuits, thermister compensation, thermal runway.	08
3	**Transistor amplifier analysis and circuits** RC coupled amplifier, H- parameters, necessity of hybrid model and h - parameters, determination of h-parameter from transistor characteristics. Approximate conversion formulae for h- parameter for CE, CB, CC configurations, A.C. equivalent circuits of transistor amplifier using h-parameter. CE, CB, CC transistor amplifier circuits, DC and AC analysis.	08
4	**Feedback amplifier** General theory of feedback, types of feedback, effect of negative feedback on stability, bandwidth, noise, input resistance, output resistance. Detailed analysis of voltage series, voltage series amplifier, current series amplifier, emitter follower**.**	07
5	**Oscillators** Oscillator and its classification	06
6	**Field Effect Transistor** Junction field effect transistor, V-I characteristics, different configuration of JFET, different parameter of JFET, common source configuration as an amplifier, MOSFET & its classification.	08
7	**Low & high frequency response of common source amplifier** Low & high frequency FET model.	08

Theory Examination:

1. Question paper will comprise total 7 questions of 20 marks each.
2. Only 5 questions need to be attempted.
3. Q.1 will be compulsory covering the entire syllabus.
4. Remaining questions will be of mixed nature.
5. Question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Practical/Oral Examination:

Practical examination will be based on a given experiment performed from the list of experiments given in the syllabus and the oral will be based on entire subject syllabus.

Term work:

Term work consists of minimum eight experiments and a written test. The distribution of the term work shall be as follows,

Laboratory work (Experiments and Journal)	:10 marks
Test (at least one)	:10 marks
Attendance (Practical and Theory)	:05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of Laboratory Experiments:

1. Study of input / output characteristics of BJT- CB, CE, and CC Configuration.
2. Study of input & transfer characteristics of FET.
3. Study of input & transfer characteristics of FET.
4. Frequency response of common emitter amplifier with & without feedback using a bypass capacitor for Re.
5. RC coupled amplifier.
6. Determination of 'h 'parameter of a BJT.
7. Frequency response of FET amplifier with & without feedback using a bypass capacitor for Rs.
8. Wein bridge oscillator using transistors.
9. RC phase shift oscillator.
10. Design of fixed Voltage regulator using 78xx & 79xx ICs.
11. Design of adjustable Voltage regulator using IC723.
12. Any one of the following
    i) Darlington Amplifier
    ii) Cascade Amplifier

Note: The hardware results of minimum 5 experiments from the above list must be verified using simulation software like P-SPICE/Multi-Sim or equivalent.

Books Recommended:

1. Neamen Donald A., *Electronics Ckt. Analyzer & Design*, 2nd ed.,Tata McGraw Hill.
2. Boylestad Robert L., Nashelsky Louis, *Electronics Devices & Circuits*, Pearson Education.
3. *Semiconductor Data Manual*, BPB Publications.

University of Mumbai			
Class: S.E.	**Branch:** Instrumentation	**Semester:** III	
Subject: Engineering Mathematics-III (Abbreviated as EM-III)			
Periods per Week (60 min. each)	Lecture	05	
	Practical	---	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	05	100
	Practical/Oral	---	---
	Oral	---	---
	Term Work	---	---
	Total	05	100

Module	Contents	Hours
1	**Laplace Transform** Functions of bounded variations Laplace Transforms of 1, t^n, e^{at}, sin at, cos at, sinh at, cosh at, erf(t) Linear property of L.T .First shifting theorem Second shifting theorem $L\{t^n f(t)\}$, $L\{f(t)/t\}$, $L\{\int f(u)du\}$, $L\{d^n/dt^n f(t)\}$.Change of scale property of L.T. Unit step function , Heavyside, Dirac delta functions, Periodic functions and their Laplace Transforms. **Inverse Laplace Transforms** Evaluation of inverse L.T., partial fractions method, convolution theorem. **Applications** to solve initial and boundary value problems involving ordinary diff. Equation with one dependant variable.	20
2	**Complex Variables.** Functions of complex variables, continuity and derivability of a function, analytic functions, necessary condition for f(z) to be analytic, sufficient condition (without proof), Cauchy – Riemann conditions in polar forms. Analytical and Milne – Thomson method to find analytic functions f(z) = u + iv where (i) u is given (ii) v is given (iii) u+v (iv) u-v is given. Harmonic functions and orthogonal trajectories. **Mapping** Conformal mapping, Bilinear mapping, fixed points and standard transformation, inversion, reflection, rotation and magnification. **Line Integral** of function of complex variable, Cauchy's theorem for analytical function (with proof), Cauchy's Goursat theorem (without proof), properties of line integral, Cauchy's	30

	Integral formula and deduction. **Singularities and poles**: Taylor's and Laurent's development (without proof), residue at isolated singularity and it's evaluation. **Residue theorem** application to evaluate real integrals of type $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ *and* $\int_{-\infty}^{+\infty} f(x)dx$	
3	**Fourier series** Orthogonality & orthogonal functions, Expression for the function in a series of orthogonal functions, Dirichlet's conditions, Fourier series of periodic functions with period 2pi or 2*l*. (Derivation of fourier coefficients a0, an, bn is not expected) Dirichlet's theorem Even & Odd functions. Half range sine & cosine expressions Parsaval's identities (without proof) **Complex form of Fourier Series**: Fourier transform & Fourier integral in detail	25

Theory Examination:

1. Question paper will comprise total 7 questions of 20 marks each.
2. Only 5 questions need to be attempted.
3. Q.1 will be compulsory covering entire syllabus.
4. Remaining questions will be of mixed nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Books Recommended:

1. Wartikar P.N. / Wartikar J. N., *Textbook of Applied Mathematics*, Pune Vidyarthi Griha Prakashan, 1981.
2. Churchil, *Coplex variables*, Mc Graw Hill.
3. Shantinarayan, *Theory of function Complex Variable*, S. Chand & co.
4. Shastri S.S., *Engineering Mathematics,* Prentice Hall.

University of Mumbai			
Class: S.E.	**Branch:** Instrumentation	**Semester:** III	
Subject: Electrical Networks (abbreviated as EN)			
Periods per Week (60 min. each)	Lecture	04	
	*Practical	02	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical and Oral	---	---
	Oral	---	25
	Term Work	---	25
	Total	03	150

* Only tutorials should be conducted.

Module	Contents	Hours
1.	**Networks Theorems** Analysis of networks with dependent & independent sources, mesh analysis, nodal analysis, source transformation technique, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, solution of networks with AC sources. Analysis of coupled circuits (self inductance, mutual inductance, and dot convention)	12
2.	**Graph Theory** Introductory definition – Graph of a network, trees, co-trees, loops. Incidence matrix, loop matrix and cutest matrix. Network equilibrium equations, Duality.	06
3.	**Time and Frequency response of circuits** Voltage/current relations for R, L, C & their equations in time domain. Initial and final conditions, first and second order differential equations, steady state and transient response. Analysis of transient and steady state responses using Classical technique as well as by Laplace transforms. Steady state response to step, ramp, impulse & sinusoidal input functions.	10
4.	**Network Functions & Two-Port Network** Network functions- driving point and transfer functions. Poles and zeros, time domain behavior from pole zero plot. Concept of two port network. Open circuit impedance (Z) parameters, Short circuit admittance(Y) parameters, transmission (ABCD) parameters, inverse transmission parameters, hybrid parameters. Interrelation of different parameters. Interconnection of two port networks, T and π representation. Terminated two-port networks.	10

5.	**Fundamentals of Network Synthesis.** Casuality and stability, Hurwitz polynomials, positive real functions, synthesis of one port networks with two kinds of elements. Properties & synthesis of L-C, R-C, R-L driving point impedances, synthesis of R-L-C functions. Properties of transfer functions, zeros of transmission, synthesis of Y_{21} and Z_{21} with a 1-Ohm termination, synthesis of constant – resistance networks.	10

Theory Examination:

1. Question paper will consist of total 7 questions carrying 20 marks each.
2. Only 5 questions need to be attempted.
3. Q.1 will be compulsory and based on the entire syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

The oral will be based on the entire subject.

Term work:

Term work consists of minimum ten tutorials properly recorded and graded as well as assessed test paper(s). The distribution of the term work shall be as follows,

Laboratory work (Tutorials) :10 marks
Test (at least one) :10 marks
Attendance (Tutorials and Theory) :05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of Tutorials:

1. Examples indicating concept of super loop and super node.
2. Examples of indicating the application of thevenin,s and Norton,s theorem in presence of dependent sources.
3. The incidence, Cut-set, Tieset, F-Cutest and F-Tie-Set Matrices should be written for given graph.
4. Examples on evaluating the transient and steady-state conditions for a R-L-C series or parallel connections for different values of resistance. The concept of overdamped, critically damped, underdamped, oscillatory and unbounded response should become clear from this problems.
5. Examples on evaluating the transient and steady-state conditions for a R-L, R-C circuits for DC conditions.
6. Evaluating the above examples using Laplace Transform.
7. Examples on Hurwitz Polynomial. Necessary and sufficient condition for Positive real function.
8. Examples on realization of R-L, R-C, L-C functions.
9. Examples on synthesis of R-L-C function.
10. Examples on the synthesis of Y_{21} and Z_{21} with a 1 ohm termination.

Text Books:

1. Kuo Franklin F., *Network analysis & synthesis,* 1st ed., Wiley International, 1962.
2. Van Valkenburg M.E., *Network analysis*, 3rd ed., Eastern Economy Edition, 1983.

Referance Books:

1. Roy Chaudhary D., *Network & systems*, Wiley Eastern Limited, 1991.
2. Hayt William, Kemmerly Jr.Jack E., *Engineering circuit Analysis,* 6th ed., Tata McGraw Hill, New Delhi 2002.
3. Edminister Joseph A., Nahvi Mohmood, *Electric Circuits,* 3rd ed., Tata McGraw Hill New Delhi 1999.
4. Shyammohan Sudhakar, *Circuits & Networks Analysis & Synthesis*, 13th reprint, Tata McGraw Hill, 2000
5. Bruce Carsion A., *Circuits*, Brooks/Cole Thomson Learning, 2000.
6. Dav Artice M., *Linear Circuits Analysis*, PWS Publishing company, 1998.
7. Alexander Charlesk, Mathew N.O., Sadlku, *Fundamentals of Electric Circuits*, McGraw Hill, 2000.

University of Mumbai			
Class: S.E.	**Branch:** Instrumentation	**Semester:** III	
Subject: Transducers-I			
Periods per Week (60 min. each)	Lecture	04	
	Practical	02	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical & Oral	02	50
	Oral	---	*25
	Term Work	---	25
	Total	05	200

*-Oral examination will be based on object-oriented industrial visit.

Module	Contents	Hours
1	**Instrumentation System** Units & standards of measurement. Introduction, block diagram, functional elements of measurement system, static & dynamic characteristics or performance characteristics of transducer. Error: definition, classification, statistical analysis of errors.	06
2	**Transducer** Definition, classification (active, passive, primary, secondary, mechanical, electrical, analog, digital), selection criteria, sources of error for parameter under measurement, transducer specifications, test condition & operating conditions.	03
3	**Displacement** **a) Resistance potentiometer:** (linear & logarithmic), piezo-resistive effect, ultrasonic transducer. LVDT, RVDT (transfer function, linearity, sensitivity, source frequency dependence, phase null, & signal conditioning). Selection & properties of materials for LVDT, and general electromagnetic sensors. **b) Capacitance type transducers:** with applications, materials for capacitive, ultrasonic and elastic transducers. **c) Digital transducer:** translational & rotary encoders (absolute position & incremental position encoders), Optical & magnetic pickups. **d) Pneumatic transducer**: flapper- nozzle transducer.	12
4	**Temperature transducers** Modes of heat transfer, laws of conduction convection and radiation, engineering materials for Temperature and conductive, resistive sensors, properties of materials for RTD, thermister, thermocouple. Temperature scales (standard scale), glass thermometers, liquid expansion thermometer, gas thermometer (filled system thermometer), bimetallic thermometer, solid state temperature sensor. **a) Resistance temperature detector (RTD**): types, construction, errors associated with RTD & its solutions (3	12

	wire & 4 wire method, null balance, power supply stability), self heating effect, sensitivity, response time, dissipation constant, range advantages, disadvantages and limitations. **b) Thermistors**: principle, types (NTC, PTC) , characteristics, construction, sensitivity, range, response time, signal conditioning measuring circuit, calibration & applications. **c) Thermocouple:** Principle, thermoelectric effect, Seebeck effect, Peltier effect, laws of thermocouple, types of thermocouple with characteristic curve, thermocouple table, sensitivity, construction, range, signal conditioning, electrical noise & noise reduction techniques, cold junction compensation method, thermowell, thermopile, thermocouple emf measurement method. **d) Pyrometers:** Radiation & optical.	
5	**Level Transducers** Dipsticks, displacers, float system, bubbler, diaphragm bore type, capacitive devices for level measurement, ultrasonic level gauge, DP cell, load cell, vibrating type, microwave, radar, radioactive type level gauges, LASER type transducers, fiber optic level sensors, solid level detectors, Intelligent level measuring instruments.	07
6	**Metrology** Elements of Engineering measurement: Abbas & Taylorr's principle, theory of limits and fits and their selection, screw thread measurement, gear profile measurement, absolute & comparative measurement & measuring principle, alignment testing, use of auto collimators and design & use of limit gauges, screw & slip gauges.	08

Theory Examination:

1. Question paper will consist of total 7 questions carrying 20 marks each.
2. Only 5 questions need to be attempted.
3. Q.1 will be compulsory and based on the entire syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Practical & Oral Examination:

Practical examination will be based on one experiment performed from the list of experiments given in the syllabus and the oral will be based on entire subject. The distribution of the marks shall be as follows,

Practical examination : 25 marks
Oral examination : 25 marks

Term work:

Term work consists of minimum eight experiments, a written test and industrial visit report. The distribution of the term work shall be as follows,

Laboratory work (Experiments and Journal) :10 marks
Test (at least one) :10 marks
Attendance (Practical and Theory) :05 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

*Oral Examination Based on Object-Oriented Industrial Visit

Visit to transducer manufacturing industry to study the manufacturing of the transducer from raw material to finished product. The student should submit the detailed report depending on the observations made. The concerned teachers of subject Transducer-I will co-ordinate the visit. Oral examination will be based on object oriented industrial visit.

List of Laboratory Experiments:

1. To plot & study the characteristics of- RTD.
2. To plot & study the characteristics of Thermistor (NTC, PTC).
3. To plot & study the characteristics of- Thermocouple J, K, R, S, T (any three).
4. To plot & study the characteristic of LVDT.
5. To plot & study the characteristic of capacitive transducers.
6. Measurement of angular and linear displacement by using digital encoder.
7. Level measurement by using capacitive, air purge method.
8. Study of Flapper nozzle transducer.
9. Application of ultrasonic transmitter receiver for any one parameter.

Text Books:

1. B.C Nakra, K.K. Cahudhary, *Instrumentation Measurement and Analysis*, Tata Mc Graw Hill.
2. Sawney A.K., *Electrical and Electronic Measurement and Instrumentation*, Dhanpatrai And Co.

Reference Books:

1. Doeblin E.D., *Measurement system,* 4th ed..
2. Liptak B.G., *Process measurement and analysis*.
3. Neubert Hermann K. P., *Instrument Transducer*, 2nd ed., Oxford University Press, New Delhi, 2003.
4. Johnson Curtis D., *Process Control Instrumentation Technology*, 5th ed..
5. Jain R.K., *Engineering Metrology*, Khana Publishers.
6. Rangan, Mani, Sarma., *Instrumentation Systems and Devices*, 2nd ed., Tata Mc Graw Hill.
7. S.P. Sukhatme, *Heat Transfer*, 3rd edition, University Press.
8. B.E. Jones, *Instrument Technology*.
9. Cheatle Keith R., *Fundamentals of Test Measurement Instrument Instrumentation*, ISA Publication.

University of Mumbai			
Class: S.E.	**Branch:** Instrumentation Engineering	**Semester:** III	
Subject: Digital Electronics (abbreviated as DE)			
Periods per Week (60 min. each)	Lecture	04	
	Practical	02	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory	03	100
	Practical & Oral	02	50
	Oral	---	---
	Term Work	---	25
	Total	05	175

Module	Contents	Hours
1	**Introduction** Number systems, binary, octal, hexadecimal and others. Conversion from one system to another. Arithmetic, binary BCD and hexadecimal.	04
2	**Binary codes** Weighted, reflective, sequential, gray, error detecting codes, odd, even parity, hamming codes, alphanumeric, Morse teletypewriter ASCII, EBCDIC codes, converting binary to gray & gray to binary and XS3.	04
3	**Boolean Algebra Logic Gates** AND, OR, NOT, XOR, XNOR, operations NAND, NOR use of universal gates for performing different operations. Laws of Boolean Algebra, De-Morgan's theorems. Relating a truth table to a Boolean expression. Multi level circuit.	04
4	**Combinational Circuits** K-Maps and their use in simplifying Boolean expressions, minterm, maxterm SOP and POS implementation. Implementing a logic function using universal gates. Variable entered maps for five and six variable functions: Quine McClusky tabular techniques.	08
5	**Combination Logic Circuit Design** Designing code converter circuits e.g. binary to gray, BCD to seven segment parity generator. Binary arithmetic circuits:- Adders, subtractors (half and full), BCD adder-subtractor, carry look head adder, serial adder, multiplier magnitude comparator, arithmetic logic units.	04
6	**Use of Multiplexers in logic design** Multiplexer (ULM) Shannon's theorem, ULM trees, de-	04

	Multiplexers, designing using ROMs & ULMs. Hazards in combinational circuits.	
7	**Sequential Logic Circuits** Comparison of combinational and sequential circuits, multi-vibrators (astable, monostable and bistable), flip-flops, SR, T, D, JK. converting one flip-flop into another, use of debounce switch, counters modulus of a counter, ripple counters, up/down counter, designing sequential counters using gate IC and counter by drawing state transition diagram and state transition table. Ring counter, Johnson counter, twisted ring counter, pseudo random number generator, unused states and locked conditions.	08
8	**Registers** Serial input serial output serial input parallel output, left shift, right shift register, use of register ICs for sequence generator and counters.	05
9	**Memories** RAM, ROM the basic cell IC bipolar, CMOS, RAM dynamic RAM cell. Magnetic core NVRAM, bubble memory, CCD, PAL, PLA. Introduction to PLD's.	03
10	**Logic Families** Basics of digital integrated circuits, basic operational characteristics & parameters. TTL, schottky clamped TTL, tri-state gate ECL,IIL, MOS devices CMOS comparison of logic families. PMOS & NMOS&E^{2}CMOS. Introduction to FPGA.	04

Theory Examination:

1. Question paper will consist of total 7 questions carrying 20 marks each.
2. Only 5 questions need to be attempted.
3. Q.1 will be compulsory and based on the entire syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Practical & Oral Examination:

Practical examination will be based on one experiment performed from the list of experiments given in the syllabus and the oral will be based on entire subject. The distribution of the marks shall be as follows,

Practical examination : 25 marks
Oral examination : 25 marks

Term work:

Term work consists of minimum eight experiments and a written test. The distribution of the term work shall be as follows,

Laboratory work (Experiments and Journal) :10 marks
Test (at least one) :10 marks
Attendance (Practical and Theory) :05 marks
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

List of Laboratory Experiments:

1. Implementing study of Gates and Logic Operations like, NOT, AND , OR, NR, XOR & XNOR using (i)all NAND Gates (ii)all NOR Gates.
2. Implementing a binary to gray, gray to binary or binary to XS3 code converter using gate ICs.
3. Simplifying 3, 4 variable logic functions and implementing them using gate ICs AND/OR, OR/AND, ALL NAND & ALL NOR.
4. Implementation of Half & Full Adder Circuit.
5. Study of Multiplexer & Demultiplexer.
6. Constructing flip flops like SR, D, JK and T using all NAND gates and a de-bounce switch.
7. Designing a mod N counter where N<14 using JK F/F and D F/F.
8. Design a ripple counter/or a two bit comparator using gate ICs.
9. Building a ring counter and a twisted ring counter using D f/f ICs.
10. Any one of the following:
    i. Full Adder using Gates and using Decoder or a multiplexer.
    ii. Using a counter ICs like 7490 or 7492 or 7493 as a BCD counter.
    iii. Using a shift register as a sequence generator.

Text Books:

1. Jain R.P., *Modern Digital Electronics,* Tata McGraw Hill, 1984.
2. Malvino Leach, *Digital Principles and Applications,* Tata McGraw Hill, 1991.

Reference Books:

1. Floyd Thomas L., *Digital Fundamentals,* 3rd ed., Belland Howell Company-1993.
2. Morris Mano M., *Digital Design,* Prentice Hall International-1984.
3. Almaini A.E., *Electronic Logic Systems,* 2nd ed., PHI-1986.
4. Malvino, *Digital Electronics,* Tata McGraw Hill, 1997.
5. Tocci, *Digital Systems,* PHI, 2000.
6. Dr. Jog Nandini K., *Logic Circuits,* 2nd ed., Nandu Publishers and printers Pvt, Ltd, 1998.
7. Floyd & Jain, *Digital Fundamentals*, Pearson Education.

University of Mumbai			
Class: S.E.	**Branch:** Instrumentation Engineering	**Semester:** III	
Subject: Presentation and Communication Techniques			
Periods per Week (each 60 min)	Lecture	02	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory	---	---
	Practical and Oral	--	--
	Oral	---	--
	Term Work	---	50
	Total	--	50

	Contents	Hours
1.	**Communication in a business organization:** Internal and external communication, Types of meetings, strategies for conducting successful business meetings, documentation (notice, agenda, minutes, resolution) of meetings. Introduction to modern communication techniques. (e-mail, internet, video-conferencing, etc.) Legal and ethical issues in communication (Intellectual property rights: patents, TRIPS, Geographical indications).	05
2	Advanced technical writing. Report writing, Definition and importance of reports, qualities of reports, language and style in reports, types of reports, formats (letter, memo, project-repots). Methods of compiling data for preparing report. A computer-aided presentation of a technical project report based on survey-based or reference based topic. The topics are to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages. Technical paper-writing, Writing business proposals.	07
3	**Interpersonal skills**: Introduction to emotional intelligence, motivation, Negotiation and conflict resolution, Assertiveness, team-building, decision-making, time-management, persuasion	03

4	**Presentation skills**: Elements of an effective presentation, Structure of a presentation, Presentation tools, Audience analysis, Language: Articulation, Good pronunciation, Voice quality, Modulation, Accent and Intonation.	03
5	**Career skills**: Preparing resumes and cover letters. Types of Resumes, Interview techniques: Preparing for job interviews, facing an interview, verbal and non-verbal communication during interviews, observation sessions and role-play techniques to be used to demonstrate interview strategies (mock interviews).	03
6	**Group discussion**: Group discussions as part of selection process. Structure of a group discussion, Dynamics of group behavior, techniques for effective participation, Team work and use of body language.	03

Term work:

Part-I (25 Marks): Assignments;

Two assignments on communication topics
Three assignments on report-writing
Three assignments on interpersonal skills
Two assignments on career skills
At least one class test (written)
Distribution of term work marks will be as follows:

Assignments	: 10 marks
Written test	: 10 marks
Attendance (Theory and Practical)	: 05 marks

Part-II (25 Marks): Presentation;

Distribution of term work marks will be as follows:

Project report presentation	: 15 marks
Group discussion	: 10 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Text books:

1. Lesikar and Petit, *Report writing for business*, Tata McGraw Hill.
2. Raman and Sangeeta Sharma, *Technical communication*, Oxford University Press, New Delhi.

Reference Books:

1. Wallace & Masters, *Personal development for Life & work*, Thomson Lerning.
2. Heta Murphy, *Effective Business Communication*, McGraw Hill.
3. Huckin & Olsen, *Technical writing and professional communication*, McGraw Hill.
4. Fred Luthans, *Organizational behavior*, McGraw Hill.