Dr. Babasaheb Ambedkar Technological University, Lonere

Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No XXIX of 2014)
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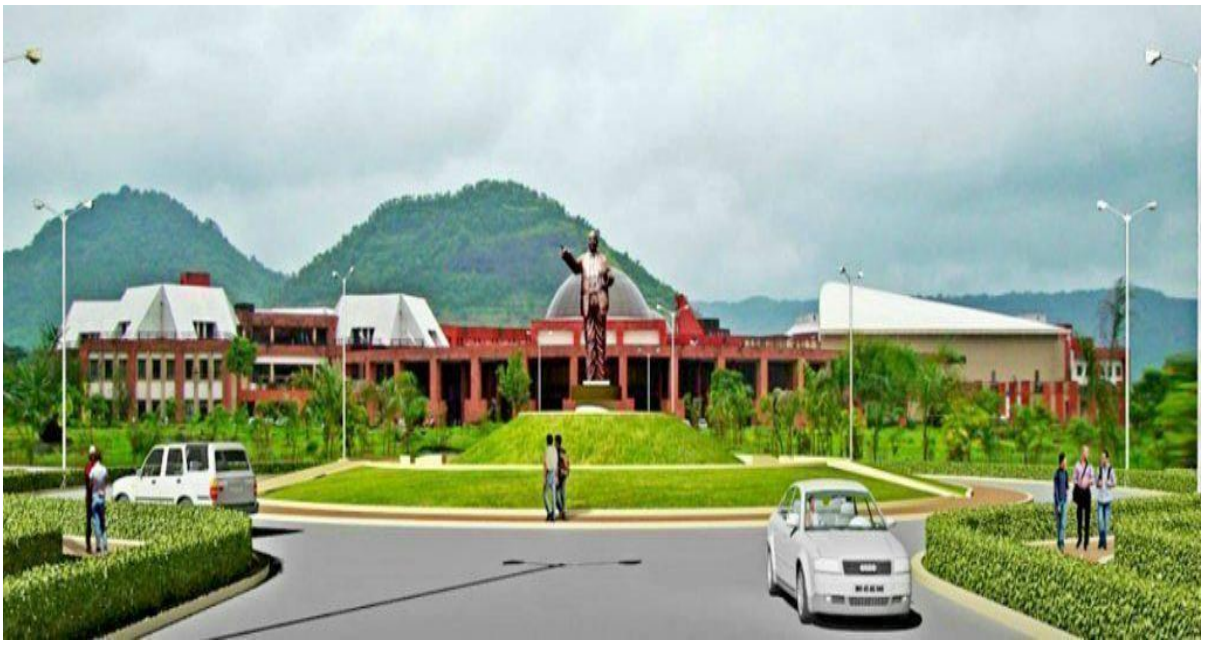
CURRICULUM

UNDERGRADUATEPROGRAMME

S. Y. B. Tech. (Instrumentation Engineering)

With effect from the Academic Year2021-2022



B. Tech in Instrumentation Engineering

Curriculum for Second Year

Semester III												
SR. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	BTBS301	Engineering Mathematics – III	3	1	-	20	20	60	100	4
2	PCC 1	BTINC302	Sensor and Transducer	3	1	-	20	20	60	100	4
3	PCC 2	BTINC303	Network Analysis and Synthesis	3	1	-	20	20	60	100	4
4	ESC	BTINES304	Analog Electronics	3	1	-	20	20	60	100	4
5	LC	BTINL305	Sensor and Transducer Lab	-	-	2	60	-	40	100	1
6	LC	BTINL306	Analog Electronics Lab	-	-	2	60	-	40	100	1
7	Seminar	BTINS307	Seminar I	-	-	4	60	-	40	100	2
8	Internship	BTINS211P	Internship – 1 Evaluation	-	-	-	-	-	50	50	1
Total				**12**	**4**	**8**	**260**	**80**	**410**	**750**	**21**

Semester IV											
SR. No	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PCC 1	BTINC401	Digital Electronics	3	1	-	20	20	60	100	4
2	PCC 2	BTINC402	Feedback Control System	3	1	-	20	20	60	100	4
3	HSSMC	BTHM403	Industrial Management and Economics	4	-	-	20	20	60	100	4
4	BSC	BTINBS404	Electrical and Electronics Measurement	3	1	-	20	20	60	100	4
5	PEC 1	BTINPE405	Group A	3	1	-	20	20	60	100	4
6	LC	BTINL406	Digital Electronics Lab	-	-	2	60	-	40	100	1
7	LC	BTINL407	Feedback Control System Lab	-	-	2	60	-	40	100	1
8	Seminar	BTINM408	Mini Project I	-	-	4	60	-	40	100	2
9	Internship	BTINP409	Field Training / Internship/Industrial Training (minimum of 4 weeks which can be completed partially in third semester and fourth semester or in at one time).	-	-	-	-	-	-	-	Credits To be evaluated in V Sem.
Total				**16**	**4**	**8**	**220**	**100**	**380**	**700**	**24**

BSC = Basic Science Course, ESC = Engineering Science Course, PCC = Professional Core Course PEC = Professional Elective Course, OEC = Open Elective Course, LC = Laboratory Course HSSMC = Humanities and Social Science including Management Courses

- **Important Note: Minimum Eight Experiment to perform based on the syllabus for the laboratory subject.**

Group A [Sem- IV] (Professional Elective)

Sr. No.	Course Code	Course Title
01	BTINPE405 A	Microprocessor based systems
02	BTINPE405 B	Industrial Safety
03	BTINPE405 C	Signals and Systems

Semester III

BTBSC 301 Engineering Mathematics – III

Teaching Scheme:
Lectures: 03
Tutorial: 01

Course Credits : 04

Examination Scheme :
End semester exam (ESE): 60 marks
Internal Sessional Exams (ISE): 40 marks
Duration of ESE: 03 hours

Prerequisite course(s): 11^{th} & 12^{th} Mathematics, Mathematics-I and II

Course objectives:

1. To introduce the solution methodologies for Fourier transform, Z-Transform and Laplace transform with applications in engineering.
2. To provide an overview of probability and statistics to engineers.

Course outcomes:

Upon completion of this course, students will be able to solve field problems in engineering involving ordinary differential equations using Laplace Transform. They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

Course Syllabus

Unit - I : Laplace Transform	**No. of Lectures:** 06 Hours	**Marks:** 12

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

Unit - II : Inverse Laplace Transform	**No. of Lectures:** 06 Hours	**Marks:** 12

Inverse transforms of some elementary functions; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find solutions of linear differential equations.

Unit - III : Fourier Transform and Z-transform	**No. of Lectures:** 09 Hours	**Marks:** 12

Fourier Transform: Fourier sine and cosine integrals, Fourier sine transform, Fourier cosine transform, Inverse Fourier transform.

Z-transform : Definition, Region of convergence, Properties of Z-Transform (without proof), Inverse Z-Transform

Unit - IV : Basic Statistics	**No. of Lectures:** 07 Hours	**Marks:** 12

Introduction to measures of central tendency, Moments, skewness and Kurtosis, Correlation and regression, Probability distributions: Binomial, Poisson and Normal distributions.

Unit - V : Functions of Complex Variables	**No. of Lectures:** 08 Hours	**Marks:** 12

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Text Books:-

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010,2016.
2. H.K.DASS "Advance Engineering Mathematics" S. Chand publications. Fifteenth revised edition 2006.
3. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
4. S. C. Gupta "Fundamentals of Statistics", Himalaya Publishing House ,sixth revised edition 2008.
5. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.

Reference Books : -

1. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.
4. Wylie C.R. & Barrett , "Advanced Engineering Mathematics," Mc Graw Hill.
5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

BTINC 302. SENSORS AND TRANSDUCERS

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Prerequisite	Basic electrical engineering	
Course Objective	To familiarize the students with Sensors and transducer	
Course Outcome	To expose the students to various sensors and transducers for measuring mechanical quantities. To understand the specifications of sensors and transducers. To learn the basic conditioning circuits for various sensors and transducers. To introduce advances in sensor technology.	
Unit	Contents	Contact Hrs
1	**Introduction to Transducers** Transducer: Definition, classification, selection criteria, specifications. static and dynamic characteristics of a measurement system. Errors, loading effects, basic configuration of control system. Displacement, force and torque transducers. Force measuring transducers, electrical load cell, LVDT. Piezoelectric, vibrating type. Torque-strain gauge and other suitable transducers.	8
2	**Speed, Vibration and Temperature Transducers** Tachometers, toothed rotor tachometers, Photoelectric, stroboscopic principal Theory of acceleration pick- ups, their calibration, Type of accelerometer, Jerk meter. Temperature Transducers: fills system thermometers, semiconductor temperature detector(thermostat and p-n junction IC and PTAT type) resistance thermometer, thermometer ultrasonic, crystal, infrared thermometer.	8
3	**Level and Flow Measurement** Level transducers for liquid and solids- float type displacer, Air plug method, diaphragm box level gauge, DP cell, Load cell, bicolor direct reading, Vibrating, Ultrasonic, radioactive transducers, Reed switches, microwave sensors. Flow transducer: Basic measurement principle, Bernoulli's theorem, Differential pressure type (orifice, venturi, pitot type), Variable area type, target type, magnetic, Ultrasonic vortex shedding, cross co-relation, positive displacement type, Mass flow meter, anemometer, total flow meter.	6
4	**Pressure, Viscosity Transducers** Pressure transducer: Pressure scale and standards, manometer, elastic (Bellows, bourdon tube, diaphragm) type. Dead weight and vaccum gauge, testers, electrical pressure sensors (LVDT, strain gauge, load cell, piezo- electric, capacitive). Tuning fork type, differential sensors (capacitive, force balance and vibrating cylinder type).	6

	Vacuum pressure measurement: McLeod gauge, thermal conducting and ionization type, Viscosity and density sensing and measurement: capillary type, Shearle's rotating cylinder, cone and plate, falling and rolling ball type viscometers.	
5	**PH, Conductivity, Humidity Sensors and Transducers** PH and conductivity sensors: pH scale and standards, principle of pH measurement. Different type of reference and measuring electrodes, ion selective electrodes. Principle of conductivity measurement, conductivity cells and bridges-their application. Effect of temperature on pH and conductivity sensors. Humidity and misc. transducers: Pyrometer, Hygrometer (Hair, wire and Electrolysis type), Dew point meter, piezoelectric humidity meter, Infrared conductance and capacitive type probes for moisture measurement. Flow detectors, leak detectors, Acoustic transducers and sound level measurement. Introduction to Biosensors	8
	Reference Books: 1. Bentley J.P., "Principles of Measurement Systems", Third Edition, Pearson Education Asia pvt.ltd. 2. Doebelin, E.O., "Measurement Systems", McGraw Hill Book Co. 3. Patranabis D, "Sensors and Transducers", Wheeler Publishing Co., Ltd. New Delhi. 4. Murthy, D.V.S., "Transducers and Instrumentation", Prentice Hall of India Pvt. Ltd., New Delhi. 5. Neubert, H.K.P., "Instrument Transducers", Clarenden Press, Oxford. 6. R. K. Jain, "Mechanical and Industrial Measurement". 7. http://nptel.iitm.ac.in	

BTINC 303. NETWORK ANALYSIS AND SYNTHESIS.

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Prerequisite	Basic electrical engineering	
Course Outcome	To review basic components of electric network. To design and develop network equations and their solutions. To apply Laplace theorem for electric network analyses To analyze AC circuit.	
Unit	Contents	Contact Hrs
1	Active & Passive Circuit Element:- Independent & dependent voltage & current sources, R, L, C, self and mutual inductance circuit parameters, Their mathematical models, Voltage- current- power relations, Independent voltage and current sources, dependent sources, Source transformation, star-delta conversion. Classification of element: Lumped and distributed, Linear and non-linear, Unilateral and Bilateral, Time invariant and variant,	6
2	Network theorems: - Kirchhoff‘s laws (KCL and KVL), Mesh analysis, nodal analysis, super node and super mesh analysis, Superposition theorem, Thevenin‘s theorem, Norton‘s theorem, Reciprocity theorem, Maximum power transfer theorem, Substitution theorem, Millman‘s Theorem, Tellegen's theorem for D.C and A.C. circuits. Graph Theory:- Network topology, graph, Tree, Branches, Chords, incidence, cut set and tie set matrix using network topology, Concept of duality & dual networks.	6
3	Two port network:- Terminals& terminal pairs, Driving points & transfer admittance, Transfer functions, Concept of poles & zeroes, Two port networks, Z, Y & the transmission parameters relationship between parameter sets.	6
4	Application of Laplace’s Transform:- Solution of differential equation using Laplace transform, Unit step, Impulse & ramp functions, Laplace transform of singular & shifted function, Convolution integral, Concept of complex frequency, Transform impedance & transform admittance, Series & parallel combination of these networks.	6
5	Sinusoidal Steady State A. C. Circuit:- R-L-C series circuits, Series resonance Variation of Z with frequency, maximum value of VC & VL, Magnification, Bandwidth, Q factor. Parallel Resonance: Resonance frequency for tank circuit frequency, Locus diagram of series R-L, R-C with variable R & X. Filter: Introduction classification, Low pass, High pass, Band pass & band reject filter, active & passive filters. Application of Fourier series, Expansion for periodic & non-sinusoidal waveforms.	6

	Referance Books:- 1. Mac.E Van Valkenburg, “Network Analysis”, 2. Franklin Fa-Kun. Kuo, “Network Analysis & Synthesis”, John Wiley & Sons. 3. M. L. Soni, J. C. Gupta, “A Course in Electrical Circuits and Analysis”, 4. Mac.E Van Valkenburg, “Network Synthesiss”, 5. Joseph A. Edminister, Mahmood Maqvi, “Theory and Problems of Electric Circuits”, Schaum's Outline Series,	

BTINC 304. ANALOG ELECTRONICS.

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Prerequisite	Basic electronics engineering	
Course Objective	To understand operational and performance characteristics of analog electronic devices To design and analyze transistor circuits	
Course Outcome	Analyze transistor circuit using h parameter model. Design and analyze different op-amp circuits for various applications. Describe characteristics of various power devices and power converters.	
Unit	Contents	Contact Hrs
1	**Diode Theory** Basic review of diode theory & Types of diode & their applications, Rectifiers, Filters, Clippers, clampers, Voltage Multipliers- Doublers, Trippler, quadrupler, Diode current equation.	7
2	**Basic Review of Transistor Configuration** Transistor biasing & Thermal stabilization, Bias compensation, Thermal runaway, Load line, Q –point, Transistor at low frequencies (h-parameter), Transistor at high frequencies (h-parameter), Darlington circuits, Frequency response of amplifier, Oscillators, Multivibrators.	7
3	**Basic Review Of Field Effect Transistor** Small signal FET analysis & FET applications, Single stage amplifier, Analog switches, Voltage variable resistance, UJT & its application, MOSFET & its application, IGBT & its application.	6
4	**Power amplifiers, Signal Generators and filters** Power amplifiers, audio power amplifier, classA/class-AB/class-B/classC; Push-pull class-AB power amplifier. Signal Generators and filters: Multi vibrators, triangular wave generator, saw tooth wave generator, square wave generator, sine wave generator, Bootstrap Sweep generator, basic low pass filters, low pass and high pass Butterworth filters, band pass, band reject filters, applications of filters	6
5	**Power Converters, Regulators** Power Converters: SMPS, working principles, performance parameters, DC-DC converters: different types, working principles and analysis, applications. Voltage regulators, stability of regulators.	5
	References : 1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Education, Tenth ed., 2009. 2. RamakantGayakwad, "Op-Amp and Linear Integrated Circuits", PHI,4th ed.,2000 3. M.Rashid, "Power Electronics Circuit,Devices &Applications "Pearson Edu., Third ed.2004	

BTINL 305. SENSOR AND TRANSDUCER LAB

Teaching scheme:

Lab Work : 2 Hrs

Total credit: 1

Examination Scheme:

Continuous Assessment (T/W): 60 Marks

Pr/Oral: 40 Marks

Pre requisite	Basic electrical and electronics engineering
Course Objective	To understand operational and performance characteristics of sensors and transdducers
Course Outcome	Identify various elements required for characterization of given transducers/sensors. Designand conduct experiments for measurement, characterization, and ability to analyze and interpret data Communicate effectively in oral and written form while formulating experiments, reports and other related documents.
Expt. No	Title of Expt.
1	To determine the LVDT characteristics.
2	To determine the characteristics of capacitive displacement transducer.
3	Speed Measurement using Magnetic pickup.
4	To determine Strain gauge characteristics.
5	To determine Thermocouple characteristics.
6	To determine RTD and Thermistor characteristics.
7	To study and calibration of Dead weight Tester for pressure gauge.
8	To Study of flow transducer measurement.
9	To Study of level transducer measurement.
10	Study of DP Cell .

BTINL306. ANALOG ELECTRONICS LAB

Teaching scheme:

Lab work : 2 hrs

Total credit: 1

Examination Scheme:

Continuous Assessment (T/W): 60 Marks

Pr/oral: 40 Marks

Pre requisite	Basic electrical engineering
Course Objective	To understand and apply various network theorems for solution of engineering problems
Course Outcome	Understand and apply various network theorems for solution of engineering problems
Expt. No	Title of Expt.
1	To study characteristics of JFET
2	To study clipping circuits.
3	To study clamping circuits.
4	To study voltage multiplier circuits.
5	To study half wave rectifier.
6	To study full wave rectifier.
7	To study frequency response of two-stage RC coupled amplifier.
8	To study Hartley oscillator.
9	Design and implementation of Astable multivibrator and Monostable multivibrator
10	Design and implementation of Phase Shift Oscillator
11	Design inverting and non-inverting amplifier using OPAMP

Semester –IV

BTINC 401. DIGITAL ELECTRONICS.

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Pre requisite	Basic electrical technology,	
Course Objective	To familiarize the students with Digital Electronics.	
Course Outcome	To Work with a variety of number systems and numeric representations, including signed andunsigned binary, hexadecimal, 2's complement. To introduce basic postulates of Boolean algebra and show the correlation between Booleanexpression. To introduce the methods for simplifying Boolean expressions. To outline the formal procedures for the analysis and design of combinational circuits andsequential circuits.	
Unit	Contents	Contact Hrs
1	Number system and fundamental concepts of digital circuits: Number system –different types of number system like binary Octal, Decimal and hexadecimal, Signed binary numbers, Conversion methods of one type number system to another type, Fundamental concepts: Digital circuits.(AND,OR,NOT,NOR,NAND and Exclusive-OR operation), Different types of codes – binary code, Gray code, BCD code. f. Excess- 3 code, Hamming code, ASCII code, Comparison of digital logic families such as RTL, DCTL, DTL, HTL, TTL, PMOS and CMOS Causes, Boolean algebra laws.	8
2	Combinational logic design: Standard representation for logical function, SOP & POS form, Min-term & Max-term. Simplification of logical function specified in min-term & max-term or along with don't care condition using K- MAP, Design examples such as half and Full adder, half and full Subtractor, BCD to Seven segment decoder.	8
3	Combinational logic design using MSI circuits: Multiplexer and Demultiplexer operations, Adder and Digital comparator circuits. Parity generator /chekers, Code convertors BCD to binary , Binary to BCD, BCD to Excess-3 ,Binary to gray.	8
4	Sequential Logic Design: 1 Bit memory cell, clocked S-R flip-flop, master slave J-K flip flop, D and T types of flip flops, Excitation tables of flip flop, Conversion of one type of flip flop into another type, Registers, classifications, shift registers, counters, synchronous, asynchronous, Analysis of clocked sequential circuits, state table, state diagram, next state equation and state reduction.	8

5	Convertor circuits and digital storage devices: Digital to analog converter, weighted register D/A converter, R/2R ladder D/A converter, Analog to digital conveter, parallel comparator, A/D converter, successive approximation A/D converter, dual slope A/D converter, Digital storage devices such as ROM, RAM, EPROM, EEPROM, CAM (content addressable memory), CCD, ROM as PLD and PLA, PAL, field programmable gate arrays (FPGA), ERA (Electrically reconfigurable arrays)	8
	REFERENCES: Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003. Thomas L Floyd, Digital Fundamentals, Pearson Education, 8th edition, 2003. Donald P Leach, Albert Paul Malvino, Digital Principles and Applications, TMH, 2006.	

BTINC 402. FEEDBACK CONTROL SYSTEM

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Pre requisite	Laplace Transform, Differential Equations	
Course Objective	• To understand the use of transfer function models for analysis physical systems and introduce the control system components. • To provide adequate knowledge in the time response of systems and steady state error analysis. • To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems. • To introduce stability analysis and design of compensators • To introduce state variable representation of physical systems and study the effect of state feedback.	
Course Outcome	Develop TF models of physical systems	
Unit	Contents	Contact Hrs
1	Introduction: Concept of open & closed loop control system, Servomechanism, Multivariable control system, Applications in non-engineering field	7
2	Physical Systems and Transfer Function: a) Concept of system: physical system, Physical model, Linear and nonlinear systems, Time variant and invariant system. b) Equations of physical systems (Mass-Spring-Dashpot system, R-L-C series & parallel circuit) transfer function, Procedure of obtaining transfer function Control system components: Derivation of transfer functions of following components a)DC servomotors (Armature and field control) b) AC servomotors c) Amplidyne generators d),Synchros e) DC and AC tacho generators f) Potentiometer error detectors	9
3	Block diagrams and Signal flow graphs: a) Block diagram algebra, Diagram reduction, Numerical examples. b) Signal flow graph; Masons gain formula for deriving overall transfer function of systems. Feedback characteristics of control system: Concept of negative and positive feedback, Sensitivity of the system to parameter variation, using negative and positive feedback	8
4	Time domain analysis: Typical test signals, Time domain specifications, Steady state response, Types of system, Steady state error constants and steady state error, (With different input), Numerical examples, transient response, Numericals, Concept of stability, Determination of stability by Routh - Hurwitz criterion	8
5	Frequency domain analysis: Introduction to frequency response, Advantages of frequency domain analysis, Polar plots, Numericals, Bode plots, Principle of argument, Nyquist criterion, Relative stability from Nyquist criterion, Numericals. Definition of Root Locus, Construction of root locus, Stability from root locus plots, Root counters, Effect of addition of poles & zeros on root locus plots.	8

	REFERENCES: 1. K. Ogata – Modern Control Engineering (Prentice Hall Of India). 2. Kuo B. C.– Automatic Control System.(Prentice Hall Of India). 3. I. J. Nagarath & M. Gopal – Control System(Willey Earstern) 4. Gopal .M.– Control System.(Prentice Hall Of India).	

BTHM403. Industrial Management and Economics

Teaching scheme:
Theory: 3 hrs

Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Pre requisite	Basic Knowledge of Management	
Course Objective	To study concept of time value of money, demand To study Market concept	
Course Outcome	To understand Meaning of Production and factors of Production	
Unit	Contents	Contact Hrs
1	Principles of Management a. Basic Concepts: Definition, Nature, Importance, Management: Art and Science & as a Profession, Management Vs Administration, Evolution of Management: Introduction to Scientific Management by Taylor, Administrative, Management by Fayol, Contribution of Peter Drucker, Levels & Functions of Management, Forms of Business Organization. b. Approaches to Management: Decision Theory Approach, Contingency Approach, Systems Approach. c. Organization: Formal & Informal, Line & Staff relationship, Centralization vs. Decentralization, Span of Management, Departmentation, MBO.	8
2	Economics a. Introduction: Meaning & Scope of Economics, Basic Theories, Law of Demand & Supply, Elasticity of Demand & Supply. b. Consumer Theories: Meaning of Utility & Law of Diminishing Utility. c. Cost Concepts: Opportunity Costs, Sunk Costs, Marginal Cost, Total & Variable Costs, Fixed Costs, Contribution, Law of Diminishing Return.	6
3	Economic appraisal techniques a. Economic appraisal techniques: Long- Range and Short range Budgeting, b. Criteria for Project Appraisal, c. Social benefit-cost analysis, d. Depreciation: concepts and Techniques.	6
4	Marketing Management a. Introduction to Marketing: Concept of Market, b. Types of Market, Definition, Nature & Scope of Marketing, c. Marketing Approaches, Marketing Process, Functions of Marketing Management, d. 4 P's of Marketing. Advertising media of advertising market forecasting	8
5	Financial Management a. Introduction to Financial Management: Meaning, Nature & Scope of Financial Management, b. Capital Structure, Types & Sources of Finance. c. Money Market & Capital Market,	7
	Reference Books: 1. O P Khanna, "Industrial Engineering Managements" 2. L.M.Prasad, "Principles of Management", Himalaya Publications Ltd 3. D.N. Dwivedi, "Managerial Economics", Vikas Publications 4. Engineering Economics : Degramo.	

	5. A Text Book of Economic Theory : Sammuelson 6. Philip Kotler, "Marketing Management", Tata McGraw Hill 7. Ravi M. Kishor, "Financial Management", Taxmann Publication	

BTINBS 404 ELECTRICAL AND ELECTRONICS MEASUREMENT

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Pre requisite	Basic electrical engineering	
Course Objective	To familiarize with different measurement and instrumentation devices.	
Course Outcome	To understand philosophy of measurement. To understand different methods analog and digital measurement. To study principle of construction and operation of different transducer and dismay methods.	
Unit	Contents	Contact Hrs
1	Introduction: Static and Dynamic characteristics of instruments, dead zone, hysteresis, threshold, resolution, input & output impedance, loading effects, fundamentals of measurements, Types of Error, Statistical Analysis, Probability of Errors, Limiting Errors, calibration of instruments, Traceability, calibration report & certification.	8
2	Analog Indicating Instrumentation: DC galvanometer, PMMC and Moving Iron instruments, voltmeters, ammeters, ohmmeters, multimeters and extension of range of instruments, AC indicating instruments, Potential and current transformers, wattmeters, energy meters, DC Potentiometers, self-balancing potentiometers, standardization, application	8
3	Bridge Circuits: DC bridges: Wheatstone bridge and Kelvin bridge design, bridge sensitivity, errors in bridge circuits, null type and deflection type bridges, current sensitive and voltage sensitive bridges, applications of DC bridges AC bridges: General equations for bridge balance, Maxwell bridge, Hey bridge, Schering bridge, Wein bridge, phasor diagrams, storage and dissipation factor, applications of AC bridges	8
4	Oscilloscope: Introduction, Oscilloscope Block Diagram, Cathode Ray Tube, CRT Circuits, Vertical Deflection System, Delay Line, Multiple Trace, Horizontal Deflection System, front panel controls, deflection sensitivity, dual trace CRO, Oscilloscope Probes ,measurement of electrical parameters like voltage, current, frequency, phase, Z-modulation, Digital Storage Oscilloscope.	8
5	Digital Instruments: Block diagram, principle of operation, Accuracy of measurement Digital Multimeter, Kilo Watt Hour meter, Phase meter, Digital Tachometer, Ultrasonic Distance meter, Digital Thermometer, Recording Instruments and Waveform Generation: Principle and working of strip chart and X-Y recorders, single and multi-channel recorders, driving systems for pen and chart, chart speed and their applications, Waveform generation methods, Function generator.	8

	REFERENCES: 1. Electrical and Electronics Measurements and Instruments , Sahwaney A K 2. W. D. Cooper & A. D. Helfrick, 'Electronic Instrumentation And Measurement Techniques', PHI,4th e/d, 1987 3. David Bell, 'Electronic Instrumentation and Measurements', PHI, 2e/d, 4. Anand M. M. S., 'Electronic Instruments and Instrumentation Technology', PHI, 2004 5. Kalsi H. S., 'Electronic Instrumentation', TMH, 2nd e/d, 2004 6. R. Subburaj, 'The foundation for ISO 9000 and TQM', 7. Bouwens A. J., 'Digital Instrumentation'	

BTINPE405A. MICROPROCESSOR BASED SYSTEM

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Pre requisite	Digital electronics	
Course Objective	To introduce architecture of microprocessor and its programming skill	
Course Outcome	Understands principles of architecture of microprocessor. Apply programming skill to different day to day applications.	
Unit	Contents	Contact Hrs
1	**Architecture of 8085 Microprocessor:** Functional Block Diagram, Registers, ALU, Bus systems, Timing and control signals, Machine cycles and timing diagrams	7
2	**Programming :**Instruction formats, Addressing modes, Instruction set, Need for Assembly language, Development of Assembly language programs	8
3	**Interfacing:** Memory Interfacing: Interface requirements, Address space partitioning,Buffering of Buses, timing constraints, Memory control signals, Read and write cycles, interfacing SRAM, EPROM and DRAM sections	8
4	**I/O Interfacing:** Memory mapped I/O Scheme, I/O mapped I/O scheme, Input and Output cycles, Simple I/O ports, Programmable peripheral interface (8255). Data transfer schemes: Programmable data transfer, DMA data transfer, Synchronous, Asynchronous and interrupt driven data transfer schemes, Interfacing, Simple keyboards and LED displays	8
5	**Interrupts and DMA:** Interrupt feature, Need for interrupts, Characteristics of Interrupts, Types of Interrupts, Interrupt structure, Methods of servicing interrupts, Development of Interrupt service subroutines, Multiple interrupt request and their handling, need for direct memory access, Devices for Handling DMA, Programmable DMA controller 8237. **Applications:** Interfacing of A/D converters (ADC 0800/ADC 0808/ADC 0809), Interfacing of D/A converters (DAC 0800), Waveform generators, Multiplexed seven segment LED display systems, Measurement of frequency, phase angle and power factor- Traffic light controller, Stepper motor control	9
	REFERENCES: 1. Goankar, R.S., "Microprocessor Architecture Programming and Applications withthe 8085/8080A", 3rd Edition, Penram International Publishing House, 1997. 2. Singh. I.P., "Microprocessor Systems", Module 9 : Microcontrollers and their Applications", IMPACT Learning Material Series IIT, New Delhi, 1997. 3. Douglas, V.Hall., "Microprocessor and Interfacing Programming and Hardware",2ndEdition, McGraw Hill Inc., 1992. 4. Kenneth, L.Short., "Microprocessors and Programmed Logic", Prentice Hall of India, 2nd Edition, 1987	

BTINPE405B. INDUSTRIAL SAFETY

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Course Objective	To understand various techniques and methods of analysis which occur in the variousregions of the spectrum. To study important methods of analysis of industrial gases. To understand the important radio chemical methods of analysis	
Course Outcome	Ability to understand and analyze Instrumentation systems and their applications to various industries.	
Unit	Contents	Contact Hrs
1	**Safety and Health Management : i.** Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety. ii. Ergonomics - Introduction, Definition, Objectives, Advantages. Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders. iii. Importance of Industrial safety, role of safety department, Safety committee and National safety council Function Understanding basic safety Terms , Hazard definition , classification , What is Risk , Hazzard –Risk-Accident matrix. Personal Protective Equipments: Need, selection, supply, use, care and maintenance, Personal protective devices for head, ear, face, eye, foot, knee and body protection, Respiratory personal protective devices.	8
2	**Industrial Hazzards,** Risk and Prevention: Industrial noise: -Sources, and its control, Effects of noise on the auditory system and health, Measurement of noise , Different air pollutants in industries: Effect of different gases and particulate matter ,acid fumes ,smoke, fog on human health. Vibration : effects, measurement and control measures, Machine and Plant layouts , ii. Machine guards and its types, automation. High pressure hazards, emptying, inspecting, repairing, hydraulic and nondestructive testing, hazards and control in mines.	8
3	**Electrical Hazards :** i. Safe limits of amperages, voltages, distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthling standards and earth fault protection , Protection against voltage fluctuations, Effects of shock on human body , Hazards from Borrowed neutrals, Electrical equipment in hazardous atmosphere, Criteria in their selection, installation, maintenance and use, Control of hazards due to static electricity, Importance of Insulation ,Introduction to CEA Safety Regulation 2010 Static Electricity and associated hazards , Hazards in Electronics and Instrumentation manufacturing industry	8
4	**Fire Safety :** General causes and classification of fire, Detection of fire, extinguishing methods, fire-fighting installations with and without water., Type of Fire extinguishers, Use, hands on experience, Evacuation procedures, Mock drills introduction to Maharashtra Fire Prevention & Life Safety Measure Act, 2006 , Maharashtra Fire Prevention and Life Safety Measures Rules, 2009	8
5	**First aid and Emergency Procedures :** Body structure and Functions, Position of causality, the unconscious casualty, fracture and dislocation, Injuries in muscles and	8

	joints, Bleeding, Burns, Scalds and accidents caused by electricity, Respiratory problems, Rescue and Transport of Casualty. CPR, poisoning, wounds	
	REFERENCES: 1. NPTEL course material	

BTINPE405C. SIGNALS AND SYSTEMS

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit: 4

Examination Scheme:
Mid-term test: 20 Marks
Internal Assessment: 20 Marks
End semester exam: 60 Marks

Pre requisite	Basic electrical engineering	
Course Objective	To familiarize the students with elements of signals and systems.	
Course Outcome	Understand standard concepts and tools that will serve as building blocks towards signal and system analysis	
Unit		Contact Hrs
1	**Classification of signals:** Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and periodic, random signals, representation of signals.	5
2	**Classification of systems:** CT systems and DT systems, Basic properties of systems - Linear Time invariant Systems and properties	5
3	**Analysis of continuous time signals:** Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis	7
4	**Linear time invariant –continuous time systems** Differential equation, Block diagram representation, Impulse response, Convolution integral, frequency response , Fourier and Laplace transforms in analysis, State variable equations and matrix representation of system. **Linear time invariant - discrete time systems** Difference equations, Block diagram representation, Impulse response, Convolution sum, State variable equations and matrix representation of systems.	9
5	**Analysis of discrete time signals** Sampling of CT signals and aliasing, DTFT andproperties, Z-transform and properties of Z transform.	6
	REFERENCES: 1.Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Pearson Education, 2007. 2. Edward W Kamen& Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007 3. H P Hsu, RakeshRanjan" Signals and Systems", Schaum's Outlines, Tata McGraw Hill, Indian Reprint, 2007 4. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007. 5. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc,2004. 6. Robert A. Gabel and Richard A.Roberts, Signals & Linear Systems, John Willy	

BTINL406. DIGITAL ELECTRONICS LAB

Teaching scheme:
Lab work : 2 hrs

Total credit: 1

Examination Scheme:

Continuous Assessment (T/W): 60 Marks

Pr/oral: 40 Marks

Pre requisite	Digital electronics theory	
Course Objective	Understands designing of various digital circuits	
Course Outcome	Design and verifies various digital circuits	
Expt. No	Title of Expt.	
1	Verification of truth table of various TTL logic gates.	
2	Verification of Boolean algebra laws.	
3	Verification of given logical expression using universal gates.	
4	To Design and test adder circuits (half and full adder) using K-map.	
5	To Design and test binary to gray code converter circuits and test using IC7486.	
6	To Design and test BCD to Exess-3 code converter circuit.	
7	To Design and test one bit comparator circuit using K-map.	
8	Verification of truth table of multiplexer using IC74153.	
9	Verification of truth table of De-multiplexer using IC74155.	
10	Verification of BCD to 7-segment display using IC7447.	
11	Verification of ring counter using IC7493.	

BTINL407. FEEDBACK CONTROL SYSTEM LAB

Teaching scheme:

Lab work : 2 hrs

Total credit: 1

Examination Scheme:

Continuous Assessment (T/W): 60Marks

Pr/oral: 40 Marks

Pre requisite	Basics of Feedback control System	
Course Objective	To understand characteristics of second order system, To understand behavior of different compensation networks	
Course Outcome	Design various compensation networks. Design feedback controller and observer	
Expt. No	Title of Expt.	
1	Study of Open loop and Closed loop.	
2	Time response Characteristic of a First order system	
3	Time response Characteristic of a second order system	
4	Frequency response Characteristic of a first order system	
5	Frequency response Characteristic of a second order system	
6	To draw Root Locus for a given transfer function.	
7	To draw Bode plot for a given transfer function.	
8	Design of lead compensation networks	
9	Design of lag compensation networks	
10	Design of compensation lead-lag networks	

BTINM 408. MINI PROJECT

Teaching scheme:
Lab work : 2 hrs
Total credit: 1

Examination Scheme:
Continuous Assessment (T/W): 60 Marks
Pr/oral: 40 Marks

Objective	To provide platform to apply engineering knowledge
Outcome	1. Able to simulate hardware for verification of engineering principles 2. Demonstration of sensor circuits, extraction of signals and signal conditioning, measurement of various parametersincluding electrical, thermal, Mechanical communication parameters etc.