Dr. Babasaheb Ambedkar Technological University Lonere.

ELECTRICAL ENGINEERING

Structure and
Syllabus of
B. Tech.Second Year
(Electrical & Instrumentation Engineering)

With effect from July 2018

PROGRAM EDUCATIONAL OBJECTIVES:

1. Toprovidestrongfoundationinbasicscienceandmathematicsnecessarytoformulate,solveandanalyze Control,Electrical and Instrumentationproblems.
2. Toprovidestrongfoundationincircuittheory,controltheoryandsignalprocessingconcepts.
3. To provide good knowledge of Electrical &Instrumentation systems and theirapplications.
4. To provide knowledge of advanced control theory and its applications to engineeringproblems.
5. Toprovideanopportunitytoworkininterdisciplinarygroups
6. To promote student awareness for lifelong learning and inculcate professionalethics
7. Toprovidenecessaryfoundationoncomputationalplatformsandsoftwareapplicationsrelatedtothe Electrical, Control and Instrumentationengineering.
8. Topreparethestudentstohavesuccessfulcareerinindustryandmotivateforhighereducation

PROGRAM OUTCOMES:

1. Ability to understand and apply basic science, circuit theory, control theory signal processing and apply them to engineeringproblems
2. Abilitytounderstandandapplydifferentialequations,integrals,matrixtheory,probabilitytheoryand Laplace,FourierandZtransformationsforengineeringproblems
3. Abilitytounderstandandanalyzelinearanddigitalelectroniccircuits.
4. AbilitytounderstandandanalyzeElectrical &Instrumentationsystemsandtheirapplicationstovariousindustries.
5. Abilitytoapplyadvancedcontroltheorytopracticalengineeringproblems.
6. Ability to form groups and develop or solve engineering hardware andproblems
7. Tounderstandandapplycomputingplatformandsoftwareforengineeringproblems.
8. Tounderstandethicalissuesenvironmentalimpactandacquiremanagementskills
9. Ability to review, prepare and present technologicaldevelopments

TEACHING & EVALUATION SCHEME ELECTRICAL &INSTRUMENTATION ENGINEERING

III SEMESTER.

Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credits
		L	T	P	MSE	CA	ESE	Total	
BTBSC301	Engineering Mathematics-III	3	1	0	20	20	60	100	4
BTEEC302	Network Analysis and Synthesis	2	1	0	20	20	60	100	3
BTEEC303	Fluid Mechanics and Thermal Engineering	2	1	0	20	20	60	100	3
BTEIEC304	Elements of Measurement Systems	2	1	0	20	20	60	100	3
BTINC304	Analog Electronics	2	1	0	20	20	60	100	3
BTHM3401	Basic Human Rights	2	0	0	-	50	-	50	Audit
BTEEL307	Network Analysis and SynthesisLaboratory	0	0	2	-	60	40	100	1
BTEIEL308	Elements of Measurement Systems Laboratory	0	0	2	-	60	40	100	1
BTINL308	Analog Electronics Laboratory	0	0	2	-	60	40	100	1
BTEIEM309	Electrical Workshop/ Mini Project	0	0	2	-	60	40	100	1
[BTEIEF310]	Field Training/ Internship/ Industrial Training Evaluation	-	-	-	-	-	100	100	1
	TOTAL	13	05	08	100	390	560	1050	21

IV SEMESTER.

Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credits
		L	T	P	MSE	CA	ESE	Total	
BTEIEC401	Basic Instrumentation	2	1	0	20	20	60	100	3
BTEEC401	Electrical Machine-I	2	1	0	20	20	60	100	3
BTINC401	Digital Electronics	2	1	0	20	20	60	100	3
BTEEC404	Numerical Methods and Programming	2	1	0	20	20	60	100	3
BTEEOE407A BTEEOE407-B BTINOE406C	Elective – I Industrial safety (B). Introduction to Non-Conventional energy sources (C). Professional Communication	3	0	0	20	20	60	100	3
BTID405	Product Design Engineering	2	0	0	20	20	60	100	2
BTEIEL407	Basic Instrumentation Laboratory	0	0	2	-	60	40	100	1
BTEEL408	Electrical Machine-I Laboratory	0	0	2	-	60	40	100	1
BTINL408	Digital ElectronicsLaboratory	0	0	2	-	60	40	100	1
BTEEL410	Numerical Methods and Programming Laboratory	0	0	2	-	60	40	100	1
	Field Training/ Internship/ Industrial Training Evaluation(minimum 4 weeks whichcan be completed partially in Thirdsemester and Fourth Semester or in atone time.)	-	-	-	-	-	-	-	Creditsto be evaluated in V Semester
	TOTAL	13	04	08	120	360	520	1000	22

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Semester III

BTBSC301. Engineering Mathematics III

Teaching Scheme	**Examination Scheme**
Theory : 03 Hrs/Week	Mid-term Test : 20 Marks
Tutorial : 01 Hr/Week	Internal Assessment: 20 Marks
	End Semester Exam: 60 Marks
	Duration: 03 Hrs.

Course Contents:

Unit 1: Laplace Transform

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.

[07 Hours]

Unit 2: Inverse Laplace Transform

Introductory remarks ; 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 the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

[07 Hours]

Unit 3: Fourier Transform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms.

[07 Hours]

Unit 4: Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\left(\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}\right)$, and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$).

[07 Hours]

Unit 5: Functions of Complex Variables (Differential calculus)

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; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

[07 Hours]

Unit 6: Functions of Complex Variables (Integral calculus)

Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

[07 Hours]

Text Books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy . Knowledge ware, Mumbai.
5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

General Instructions:

1. The tutorial classes in Engineering Mathematics-III are to be conducted batchwise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.

BTEEC302- Network Analysis and Synthesis

Teaching scheme:
Theory: 2 hrs
Tutorial: 1hr
Total credit: 3

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

Pre requisite	Basic Electrical Engineering	
Course Objective	To analyze different electric networks	
Course Outcome	To understand 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 performance.	
Unit	Contents	Contact Hrs
1	Active & Passive Circuit Element: Independent & dependent voltage & current sources, R, L, C & mutual inductance circuit parameters, Their mathematical modes, Voltage current power relations. Classification of element: Lumped distributed, Linear & non-linear, Unilateral, Bilateral, Time invariant & variant, Pace invariant & variant, Super position, Thevenin's, Norton's Reciprocity, Maximum power transfer, Substitution, Tellegen's theorem.	8
2	Network Equations: Network topology, Graph, Tree, Branches, Chords, Equilibrium equationonloopbasis&nodebasis,Numberofnetworkequationrequired,Choicebetween nodal&loopanalysis,Sourcetransformation,Networkmutualinductance,Dotconventions,Concept of super mesh, Super node Concept of duality & dual networks.	6
3	Solution of Network Equations: Classification solution of first, Second order differential equations of series & parallel R-L, R-C, R-L-C circuits, General & particular solutions, Particular integral & complimentary functions, Time constant, Mathematical analysis of circuit transients, initial conditions in network, Procedure of evaluality, Conditions in network problems, Solution of D.C. resistive network & A. C. sinusoidal steady state networks, Writing loop equations, Node equations directly in matrices form. Numericals.	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 transform networks.	6
5	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

6	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.	7
	Reference 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 andAnalysis", 4. Mac.E Van Valkenburg, "Network Synthesis", 5. Joseph A. Edminister, Mahmood Maqvi, "Theory and Problems of Electric Circuits", Schaum's Outline Series,	

BTEEC303- Fluid Mechanics and Thermal Engineering

Teaching scheme:
Theory: 3 hrs
Total credit: 3

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

Pre requisite	Basic elements of Mechanical engineering	
Course Objective	To introduce principles of fluid mechanics, IC engines, Refrigeration and air-conditioning	
Course Outcome	1. Understand concepts f fluid flow and hydraulic measurements. 2. Understand principles of ICengines. 3. Understand operation principles of air compressor, refrigerator and airconditioners	
Unit	Contents	Contact Hrs
1	Introduction to properties of fluids & hydraulic measurements (pressure at plane & curved Surfaces, criteria of pressure), Fluid kinematics and dynamics & simple numerical.	5
2	Flow through pipe Laminar flow, Haugen Poisellie's equation Turbulent flow, Darcy Weisbach formula, Friction factor, use of Moddys Diagramonly, Pipes in series & parallel, minor losses. Introduction to reciprocating and centrifugal pumps, their characteristics and applications	7
3	Internal Combustion Engines: Introduction to First Law & second Law of Thermodynamics, Concept of Entropy & Enthalpy Classification Otto, Diesel & air-fuel cycles, Constructional details of two stroke, four stroke engines, study of various systems such as fuel supply, ignition cycle, overheating, cooling, lubrication, calculation of IP, BP, MEP, efficiencies, heat balance, engine trial, performance, gas turbine, classification, cycles, performance improvement.	8
4	Air compressors: Classification, principle of operation of reciprocating & rotary compressors, Constructional details of single & multi stage compressor, work input, P-V diagram, efficiencies, improving compressor performance, reciprocating type only, use of compressed air	7
5	Refrigeration and Air conditioning : Refrigeration: Different systems, principle of cycles of operations of vapour compression & vapour absorption systems, COP calculations of vapour compression refrigeration system, refrigerants, desirable & undesirable properties, application of refrigeration	6
6	Air conditioning: Psychrometry, DBT, WBT, RH, Psychometric chart, air conditioning Processes such as heating, cooling, humidification, dehumidification, study of central air conditioning plant & its control, application of air conditioning.	6

	Reference Books 1. Joel Reyner, "Engineering Thermodynamics",(Longman Publications) 2. Nag P. K., "Engineering Thermodynamics", (Tata McGraw HillPublications) 3. Arora C.P, "Refrigeration & Air Conditioning", (Tata McGraw HillPublications) 4. EastopT. D. & Mcconkey A., "Applied Thermodynamics For Engineering Technologists" (LongmanPublications) 5. ModiP.N&SethS.M,"HydraulicFluidMechanics",(StandardBookHousePublications) 6. Lewitt W., "Hydraulic & Fluid Mechanics",(Sir Issac Pitman Publications),10thEdition	

BTEIEC304 - Elements of Measurement Systems

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit:3

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	Philosophy Of Measurement- Methods of Measurement, Measurement System, static and dynamic characteristics of a measurement system, Classification of instrument system, Errors in Measurement & its analysis, Standards and transducer classification.	8
2	AnalogMeasurementofElectricalQuantities–Electrodynamic,Thermocouple,Electrostatic& Rectifier type Ammeters & Voltmeters, Electro dynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors & remedies in wattmeter and energy meter. Instrument Transformerandtheirapplicationsintheextensionofinstrumentrange,Introductionto measurement of speed, frequency and power factor	6
3	MeasurementofParameters-Differentmethodsofmeasuringlow,mediumandhighresistances, Measurement of inductance & capacitance with the help of AC Bridges, Q Meter	6
4	Digital Measurement of Electrical Quantities-Concept of digital measurement, block diagram Studyofdigitalvoltmeter,frequencymeterPowerAnalyzerandHarmonicsAnalyzer;Electronic Multimeter.	6
5	Display methods, recorders: Display methods and devices – different types of recorders – galvanometric recorders – pen driving system– magnetic recorders – digital recorders, digital storage oscilloscope (Block Diagram, theory and applications only)	6
6	Displacement Transducers: i) Resistive: Potentiometer, strain Gauge, types of strain gauge, Derivation of gauge factor, Bridge configurations, compensation. ii) Inductive: Self-inductance, Mutual inductance, LVDT, RVDT. iii) Capacitive transducer. Digital Transducers: Encoders - Translational and Rotary.	7
	Reference Books: 1. A.K. Sawhney, A course in Elect. & Electronic Measurement and Instrumentation,	

	Dhapat Rai & Co. 2. Golding &Widis, Electrical Measurement and Measurement instrument, Wheelar Books 3. H.S. Kalsi, Electronic Instruments, Tata Mc-Graw hill 4. Carr, Elements of Electronic Instrumentation and Measurement, PearsonEducation. 5. D. Patranabis, Sensors & Transducers, PHI. 6. A.J. Bouwens, Digital Instrumentation, Tata Mc-Grawhill. 7. A.D. Heltric & W.C. Copper, Modern Electronic instrumentation & Measuring instruments, Wheeler Publication. 8. H.K.P. Neubert, Instrument transducers, Oxford Universitypress.	

BTINC304- Analog Electronics

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit:3

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

Pre requisite	Basic Electronics Engineering	
Course Objective	To understand operational and performance characteristics of analog electronic devices To design and analyze transistor circuits	
Course Outcome	At the end of the course, students will be able to: 1. Analyze transistor circuit using h parameter model. 2. Design and analyze different op-amp circuits for variousapplications. 3. Describe characteristics of various power devices and powerconverters.	
Unit	Contents	Contact Hrs
1	Transistor: Transistor biasing , Hybrid parameter model and two port model applied to BJT, Analysis of common emitter, common collector and common base configurations- voltage and current gain, input and output impedance, comparison of properties; Current Mirrors Circuit, Class A, B and AB amplifiers, Class C amplifier, Power amplifiers, Servo amplifiers, Applications of Amplifiers.	7
2	Operational Amplifiers: Op-Amp parameters, frequency response, effect of temperature on Op-Amp parameters, differential versus single input amplifiers, instrumentation amplifier, bridge amplifier,addingversatilitytothebridgeamplifier,differentiator,integrator,Comparators,Vto I and I to V Converters, Miller circuits, Voltage controlled oscillators, PLL and itsapplications,Signal conditioning circuits for temperature transmitter using Op-Amp	7
3	Signal Generators and filters: Multi vibrators, triangular wave generator, saw tooth wave generator, square wave generator, sine wave generator, Bootstrap Sweep generator, basic low passfilters,lowpassandhighpassButterworthfilters,bandpass,bandrejectfilters,applicationsof filters.	6
4	Power devices and Applications: SCR, Triac, DIAC, UJT, MOSFET, IGBT – Characteristics and principal of operation, Switching Characteristics, triggering requirement, protections, and applications	6
5	Regulators: Line and load regulation, characteristics of regulators, voltage multipliers, three terminal regulators, current boosters, protection circuits for regulators, power supply design, battery charging circuits	5
6	Power Converters: SMPS, working principles, performance parameters, DC-DC converters: different types, working principles and analysis, applications	5
	Reference Books : 1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and CircuitTheory" PearsonEducation, Tenth edition., 2009. 2. RamakantGayakwad, "Op-Amp and Linear Integrated Circuits", PHI,Fourthedition.,2000 3. M. Rashid, "Power Electronics Circuit, Devices and Applications "Pearson Education,Third edition .2004	

BTHM3401 - Basic Human Rights

Teaching scheme: Examination Scheme:
Theory: 2 hrs
Total credit: Audit Continuous Assessment: 50 Marks

Pre requisite		
Course Objective		
Course Outcome	To study concept of time value of money To study about demand in detail To understand Meaning of Production and factors of production, To understand dif. Concept about market	
Unit	Contents	Contact Hrs
1	The Basic Concepts: Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.	6
2	Human Rights and Human Duties: Origin, Civil and Political Rights, Contribution of American Bill of Rights, French Revolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India's Charter of freedom	6
3	Society, Religion, Culture, and their Inter-Relationship: Impact of Social Structure on Human behaviour, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.	6
4	Social Structure and Social Problems: Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.	6
5	State, Individual Liberty, Freedom and Democracy: The changing of state with special reference to developing countries, Concept of development under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.	6
6	Human Rights in Indian Constitution and Law: The constitution of India: (i) Preamble (ii) Fundamental Rights (iii) Directive principles of state policy (iv) Fundamental Duties (v) Some other provisions Universal declaration of Human Rights and Provisions of India, Constitution and Law, National Human Rights Commission and State Human Rights Commission	6
	Reference Books: 1. Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005. 2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.	

BTEEL307 - Network Analysis and Synthesis Laboratory

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

Examination Scheme:
Continuous Assessment: 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 Experiment	
1	Verification of Superposition Theorem	
2	Verification of Thevinins Theorem	
3	Verification of Nortons Theorem	
4	Verification of Maximum power transfer theorem	
5	Determination of transient response of current in RL & RC circuits with step voltage input	
6	Analysis of RL/ RC and RLC circuits	
7	Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases	
8	Determination of frequency response of current in RLC circuit with sinusoidal ac input	
9	Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values	
10	Determine characters tics of filter	

BTEIEL308 –Elements of Measurement Systems Laboratory

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

Examination Scheme:
Continuous Assessment: 60 Marks
Pr/oral: 40 Marks

Pre requisite	Basic Electrical Engineering	
Course Objective	To study the functioning of various measuring instruments	
Course Outcome	Understand usage of various electrical measuring instruments	
Expt No	Title of Experiment	
1	Study of Reyleigh's current balance method	
2	To study AC bridges	
3	Study of different types of ohm meter	
4	Study of megger	
5	Study of instrument T/F and it's types	
6	Study of wattmeter	
7	Construction of ammeter and voltmeter	
8	To study different types of transducers	
9	Study digital frequency meter and digital voltmeter	
10	To study linear variable differential transformer	
11	Study of encoder as displacement sensor	

BTINEL309 - Analog Electronics Laboratory

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

Examination Scheme:
Continuous Assessment (T/W): 25 Marks
Pr/oral: 25 Marks

Pre requisite	Basic Electrical Engineering	
Course Objective	Practical implementation of analog circuits using components and understand its characteristics.	
Course Outcome	1. Able to implement different analog circuits and observe characteristics. 2. Able to study characteristics of power devices. 3. Able to design small analog measurement circuits.	
Expt No	Title of Experiment	
1	Transistor Characteristics and biasing	
2	Op Amp configuration	
3	Characteristics of Diode, SCR, and Triac	
4	Regulators	
5	Operation of DC to DC Converter	
6	Conversion and extension of PMMC type instruments.	
7	Design and implementation of Resistance measurement using Wheatstone bridge	
8	Design and implementation of Series and Shunt Ohmmeters and evaluate its performance.	
9	Design of Schering and Maxwell bridges for measurement of inductance and capacitance and validation using LCR - Q meter.	
10	Study of DSO control panel and its specifications. Implement applications of DSO, Function generator	

BTEIEM309 - Electrical Workshop/ Mini Project

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 provide hands on experience towards building of prototype.	
Course Outcome	Build and verifies basic scientific principle.	
Expt No	Title of Experiment	
1	Study various resources and components in electrical engineering projects	
2	Study datasheet of basic circuit components of a project	
3-5	Study various software in building of project like: Electric Circuit, X-Circuit, Electrician app, Electronic Tutorials, Logisim, Circuit simulator, Free PCB, Ki CAD EDA software suit, SYC labs, Tina-TI etc	
6	Preparation of PCB for a given project	
7	Verification and analysis of project	
8	Report writing.	

SEMESTER IV

BTEIEC401 – Basic Instrumentation

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit:3

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

Pre requisite	Basic Electrical Engineering	
Course Objective	To familiarize the students with Sensors and Transducer	
Course Outcome	1. To expose the students to various sensors and transducers for measuringmechanical quantities. 2. To understand the specifications of sensors andtransducers. 3. To learn the basic conditioning circuits for various sensors andtransducers. 4. To introduce advances in sensortechnology.	
Unit	Contents	Contact Hrs
1	Velocity Transducers: Terminology, Translational velocity transducers (Moving coil, Moving Magnet), Magnetic pickup, photoelectric pickup, AC and DC tachometers. Acceleration Measurement: Terminology, Seismic, Strain gauge, Piezoelectric.	6
2	Temperature Transducers: Units and relations, Classification, Mechanical: Bimetallic. Electrical: RTD – Principle, Construction, Working, Lead wire compensation, Thermistors - principle, types, characteristics and Measuring Circuits. Thermocouple - Terminology, Types (S, R, T, J, K, E,), Characteristics, Laws of thermoelectricity, Thermocouple table, Cold junction compensation techniques, Introduction to pyrometers and temperature IC's.	8
3	Liquid Level Transducers: Float, Bubbler, Diaphragm box, DP cell, Resistive, Capacitive, Ultrasonic, and Radioactive. Liquid Density Transducers: Hydrometer – Using LVDT, Using Photoelectric Transducer, Air bubbler, DP Cell.	6
4	Pressure Transducers: Units and relations, Manometers: U tube, Well type, inclined tube, Elastic: Bourdon, Diaphragm, Bellows and their types. Electronic: LVDT, Strain gauge, Capacitive, Piezoelectric, Bridgeman gauge (High Pressure), Vacuum pressure measurements: McLeod gauge, Thermal Conductivity (Pirani, Thermocouple), Knudsen gauge, Dead-Weight Tester.	7
5	Flow Transducers: Units and Classification, Orifice (Eccentric, Segmental, concentric), Different pressure taps, Venturi, Flow nozzle, Pitot tube, Rotameter, Turbine, Electromagnetic, Ultrasonic (Doppler and Transit time methods).	6
6	Humidity Transducers: Terminology, Hygrometer – Resistive, Crystal, Hair, Dew point meter, Piezoelectric, Infrared absorption. Viscosity Transducers: Terminology, Units, Types -Capillary, Saybolt, Searle's,rotating cylinder, Falling ball, Rotameter. Sound Measurement: Basics, Sound level meter, Microphones (Capacitive, Piezoelectric, Electrodynamics, Carbon granule types).	6

	Reference Books: 1. D. Patranabis, Sensor & transducers, 2nd edition, PHI 2. H.K.P. Neubert, Instrument transducers, Oxford Universitypress. 3. John P. Bentley, Principles of measurement Systems, PearsonEducation. 4. E. A. Doebelin, Measurement systems: application & design, McGrawHill. 5. S. M. Sze, Semiconductor sensors, John Wiley & SonsInc. 6. A. K. Sawhney, PuneetSawhney, A Course in Mechanical Measurements and Instrumentation & Control, DhanpatRai& Company	

BTEEC401 - Electrical Machines – I

Teaching scheme:

Theory: 2 hrs

Tutorial: 1 hr

Total credit: 3

Examination Scheme:

Mid-term test: 20 Marks

Continuous Assessment: 20 Marks

End semester exam: 60 Marks

Pre requisite	Basic Electrical Engineering,	
Course outcome	1. To understand the working of principle and construction of machines and transformers. 2. To understand basic electromachanical energy conversion principles.	
Course Outcome	To study diff. types, construction and operating principle of diff. types of electrical machines	
Unit	Contents	Contact Hrs
1	Single Phase Transformer: Transformer construction, Ideal and practical transformer, exact and approximate equivalent circuits, no load and on load operation, phasor diagrams, power and energy efficiency, voltage regulation, parallel operation, effect of load on power factor, Per Unit system, excitation phenomenon in transformers, switching transients, Auto transformers, Variable frequency transformer, voltage and current Transformers, welding transformers, Pulse transformer and applications.	7
2	Three Phase Transformers: Constructional features of three phase transformers, Cooling methodology, Standard and special transformer connections, Phase conversion, Parallel operation of three phase transformers, three winding transformers and its equivalent circuit, On load tap changing of transformers, Modern trends in Transformers, Type and routine tests, Standards.	7
3	Electromechanical Energy Conversion Principles: Energy in a magnetic systems, field energy and mechanical force, energy in singly and multiply excited magnetic systems, determination of magnetic force and torque from energy and coenergy, Forces and torques in magnetic field systems, dynamic equations of electromechanical systems and analytical techniques	6
4	DC Generators: Construction of armature and field systems, Working, types, emf equation, Armature windings, Characteristics and applications, Building of emf, Armature reaction - Demagnetizing and Cross magnetizing mmfs and their estimation; Remedies to overcome the armature reaction; Commutation process, Causes of bad commutation and remedies	7
5	D.C. Motors: Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and SelectionofDCMotors,StartingofDCMotors,SpeedControl,LossesandEfficiency,ConditionforMaximum Efficiency,BrakingofDCMotors,Effectofsaturationandarmaturereactiononlosses;Applications,Permanen t Magnet DC Motors, Type and Routine tests.	7
6	Special Machines: Constructional details of reluctance machine, variable-reluctance machines, basic VRManalysis, practical VRM analysis, stepper motors and their analysis, Brushless DC motors.	5
	Reference books: 1. Bhattacharya S. K, “Electrical Machines”,(Tata McGraw HillPublications) 2. Kothari Nagrath, “Electrical Machines”, (Tata McGraw HillPublications) 3. M. N. Bandopadhyay, “Electrical Machines”, (Tata McGraw HillPublications) 4. Fitzaralda, “Electrical Machines”, (Tata McGraw HillPublications)	

BTINC401 - Digital Electronics

Teaching scheme:
Theory: 2 hrs
Tutorial: 1 hr
Total credit:3

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

Pre requisite	Basic Electrical Engineering	
Course Objective	To familiarize the students with Digital Electronics.	
Course Outcome	To Work with a variety of number systems and numeric representations, including signed and unsigned binary, hexadecimal, 2's complement. To introduce basic postulates of Boolean algebra and show the correlation between Boolean expression. To introduce the methods for simplifying Boolean expressions. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.	
Unit	Contents	Contact Hrs
1	Positional Number System: Binary, Octal, Decimal, Hexadecimal number system, Number base conversions, complements - signed magnitude binary numbers - Binary Arithmetic- addition, subtraction - Binary codes- Weighted, BCD, 8421, Gray code, Excess 3 code, ASCII, Error detecting and correcting code, parity, hamming code. Boolean postulates and laws with proof, De-Morgan's Theorems, Principle of Duality, Minimization of Boolean expressions, Sum of Products (SOP), Product of Sums (POS), Canonical forms, Karnaugh map Minimization, Don't care conditions	8
2	Digital Circuits: Positive and Negative logic, Transistor logic, TTL with totempole, open collector and tri state output, Emitter coupled logic – basic ECL inverter, NMOS NOR gate, CMOS inverter, NAND and NOR, Gate performance parameters – fan in, fan out, propagation delay, noise margin, power dissipation for each logic, characteristics of TTL and CMOS, subfamilies of TTL and CMOS.	8
3	Introduction to Combinational Circuits: Basic logic gates, Universal gates, Realization of Boolean functions using universal gates, Realization of combinational functions: addition – half and full adder – n bit adder – carry look ahead adder, subtraction, comparison, code Conversion and decoder, encoder, multiplexer, de-multiplexer, parity checkers, and parity generator.	4
4	Use of Multiplexers in logic design Multiplexer, de- multiplexers, decoders, encoders, Designing using multiplexer, de-multiplexers, encoders. ICs of MUX, DEMUX, Decoders. Hazards in combinational circuits.	4
5	Application of flip-flops as bounce elimination switch, register, counter and RAM, Binary ripple counter, synchronous binary counter, Design of modulo'n' synchronous counter, up/down counters, Shift registers – SISO, SIPO, PISO, PIPO, bidirectional shift register and universal register, counters based on shift registers. Analysis of clocked sequential circuits, Design with state equation, Moore and Mealy graphs, State reduction and assignment,sequenceDetection,Hazardsincombinationalcircuits:Statichazard, dynamic hazard, essential hazards, hazard free combinational circuits	10
6	Introduction to programmable logic devices: PLA- block diagram, PAL – block diagram, registered PAL, Configurable PAL, GAL - architecture, CPLD – classification internal architecture, FPGA - architecture, ASIC – categories , full custom and semi-custom.	5

	Reference Books: 1. Donald D Givone, Digital Principles and Design, Tata McGraw Hill,2003. 2. Thomas L Floyd, Digital Fundamentals, Pearson Education, 8th edition,2003. 3. Donald P Leach, Albert Paul Malvino, Digital Principles and Applications, Tata McGraw Hill 6th edition, 2006.6	

BTEEC404 - Numerical Methods and Programming

Teaching scheme:
Theory: 2 hrs
Total credit: 2

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

Pre requisite	Mathematics 1, mathematics 2, mathematics 3, C programming	
Course objective	To study and understand the need and details of numerical methods in engineering.	
Course Outcome	To study and understand MATLAB programming. To review mathematical concepts. To develop computer program for linear and nonlinear equations.	
Unit	Contents	Contact Hrs
1	Introduction to MATLAB Programming: Array operations, Loops and execution control Lecture. Working with files: Scripts and Functions , Plotting and program output	8
2	Approximations and Errors: Defining errors and precision in numerical methods Taylor's / Maclaurin series, Truncation and round-off errors, Error propagation, Global and local truncation errors.	4
3	Numerical Differentiation and Integration: Methods of numerical differentiation and integration, trade-off between truncation and round-off errors, error propagation and MATLAB functions for integration	6
4	Linear and Nonlinear Equations: numerical methods in linear algebra, and use of MATLAB to solve practical problems. Gauss Elimination ,LU decomposition and partial pivoting, Iterative methods: Gauss Siedel and Special Matrices: Tri-diagonal matrix algorithm, Nonlinear equations: NewtonRaphson method and MATLAB routines fzero and fsolve., Nonlinear equations in single variable , MATLAB function fzero in single variable, Fixed-point iteration in single variable , Newton- Raphson in single variable , MATLAB function fsolve in single and multiple variables, Newton-Raphson in multiple variab	8
5	Regression and Interpolation: Linear least squares regression(including lsqcurvefit function) , Functional and nonlinear regression (including lsqnonlin function), Interpolation in MATLAB using spline and p chip	4
6	Ordinary Differential Equations (ODE) – 1 Explicit ODE solving techniques in single variable, Introduction to ODEs; Implicit and explicit Euler's methods, Second-Order Runge-Kutta Methods, Higher order Runge-Kutta methods, Error analysis of Runge-Kutta method. Stiff ODEs and MATLAB ode15s algorithm ,Practical example for ODE-IVP ,Solving transient PDE using Method of Lines	6
	Reference Books: 1. Fausett L.V. (2007) Applied Numerical Analysis Using MATLAB, 2nd Ed., and PearsonEducation. 2. Chapra S.C. and Canale R.P. (2006) Numerical Methods for Engineers, 5th Ed., and McGrawHill. 3. NPTEL notes.http://nptel.ac.in/courses/122106033/	

Elective - I

BTEEOE407A: Industrial Safety.

Teaching scheme:
Theory: 3 hrs

Total credit:3

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

Pre requisite		
Course Objective	To introduce exposure towards different aspects of industrial operational management.	
Course Outcome	Understands safety and health management issues like fire safety health safety Develop awareness about various standards and procedures of industrial health and safety	
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.	5
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.	5
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.	7
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	7
5	Occupational Health and Safety Assessment: OHSAS 18001, Introduction, Origin, Development, How the standard works, Case studies.	6
6	First aid and Emergency Procedures: Body structure and Functions, Position of causality, the unconscious casualty, fracture and dislocation, Injuries in muscles and joints, Bleeding, Burns, Scalds and accidents caused by electricity, Respiratory problems, Rescue and Transport of Casualty. CPR, poisoning, wounds.	7
	REFERENCES: NPTEL course material	

BTEEOE407B: Introduction to Nonconventional Energy Sources.

Teaching scheme:
Theory: 3 hrs

Total credit:3

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

Pre requisite	Energy and environmental engineering, basic electrical engineering	
Course Objective		
Course Outcome	To review energy scenario. To understand basic concepts, construction and operational features of different non-conventional sources.	
Unit	Contents	Contact Hrs
1	Introduction: World energy situation, conventional and non-conventional energy sources, Indian energy scene.	2
2	Solar Energy: Solar radiation, solar radiation geometry, solar radiation on tilted surface. Solar energy collector. Flat- plate collector, concentrating collector - parabolidal and heliostat. Solar pond. Basic solar power plant. Solar cell, solar cell array, basic photo-voltaic power generating system	4
3	Wind Energy: Basic principle of wind energy conversion, efficiency of conversion, site selection. Electricpower generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators,control and monitoring components. Basic electric generation schemes- constant speed constant frequency,variable speed constant frequency and variable speed variable frequency schemes. Applications of windenergy	6
4	Geothermal Energy: Geothermal fields, estimates of geothermal power. Basic geothermal steam powerplant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages anddisadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India. Tidal Energy: Introduction to tidal power. Components of tidal power plants, double basin arrangement.Power generation. Advantages and limitations of tidal power generation. Prospects of tidal energy in India	5
5	Nuclear Fusion Energy: Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasma confinement – magnetic confinement and inertial confinement. Basic Tokamak reactor, laser fusionreactor. Advantages of nuclear fusion. Fusion hybridand cold fusion	4
6	Biomass Energy: Introduction, biomass categories, bio-fuels. Introduction to biomass conversiontechnologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, DeenBandhu biogas plant,Pragati design biogas plant. Utilization of bio gas. Energy plantation. Pyrolysis scheme. Alternative liquidfuels –ethanol and methanol. Ethanol production	4
	Reference Books: 1. A. N. Mathur: Non-Conventional Resources of Energy. 2010 2. V. V. N. Kishore: Renewable Energy Engineering and Technology, TERI. 2006	

BTINOE406C – Professional Communication

Teaching scheme:
Theory: 3 hrs

Total credit:3

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

Pre requisite	Communication Skill	
Course Objective	To enhance professional communication and report writing and presentation skill	
Course Outcome	Develop good communication, presentation and report writing skill	
Unit	Contents	Contact Hrs
1	Introduction: Meaning & Definition, Role, Classification – Purpose of communication – Communication Process – Characteristics of successful communication – Importance ofcommunication in management – Communication structure in organization – Communication in conflict resolution - Communication in crisis. Communication andnegotiation. Communication in a cross-cultural setting	8
2	Oral Communication: Meaning – Principles of successful oral communication – Barriersto communication – Conversation control – Reflection and Empathy: two sides of effectiveoral communication. Modes of Oral Communication. Listening as a Communication Skill,Nonverbal communication	6
3	Written Communication: Purpose of writing – Clarity in writing – Principles of effectivewriting – Approaching the writing process systematically: The 3X3 writing process forbusiness communication: Pre writing – Writing – Revising – Specific writing features –Coherence – Electronic writing process.	6
4	Business Letters and Reports: Introduction to business letters – Types of Business Letters-Writing routine and persuasive letters – Positive and Negative messages Writing Reports:Purpose, Kinds and Objectives of reports – Organization & Preparing reports, short andlong reports Writing Proposals: Structure & preparation. Writing memos Mediamanagement: The press release – Press conference – Media interviews Group Communication: Meetings – Planning meetings – objectives – participants – timing –venue of meetings. Meeting Documentation: Notice, Agenda, and Resolution & Minutes.	6
5	Presentation skills: What is a presentation – Elements of presentation – Designing &Delivering Business Presentations – Advanced Visual Support for Managers Negotiationskills: What is negotiation – Nature and need for negotiation – Factors affectingnegotiation – Stages of negotiation process – Negotiation strategies.	7
6	Employment communication: Introduction – Composing Application Messages – WritingCVs – Group discussions – Interview skills Impact of Technological Advancement onBusiness Communication – Technology enabled Communication – Communicationnetworks – Intranet – Internet – e mails – SMS – teleconferencing – videoconferencing	8
	References: 1. Effective Technical Communication - Ashraf Rizvi M, TMH, 2005. 2. Business Communication - Sehgal M. K &Khetrapal V, Excel BOOKS. 3. Business Communication – Krizan, Merrier, Jones, 8/e, Cengage Learning, 2012. 4. Basic Business Communication – Raj Kumar, Excel BOOKS, 2010.	

BTID405–Product Design Engineering

Teaching scheme:
Theory: 2 hrs
Total credit: 2

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

Pre requisite		
Course Objectives		
Course Outcome	1. Understands modeling of product 2. Able to work in team 3. Understand importance of documentation 4. Understand basic principles of health and safety in project management	
Unit	Contents	Contact Hrs
1	Creating Simple Products and Modules.	4
2	Document Creation and Knowledge Sharing.	4
3	Self and Work Management.	4
4	Team Work and Communication.	4
5	Managing Health and Safety.	4
6	Data and Information Management.	4
	Reference Books: 1. Model Curriculum for "Product Design Engineer – Mechanical", NASSCOM (Ref. ID: SSC/Q4201, Version 1.0, NSQF Level: 7) 2. Eppinger, S., & Ulrich, K.(2015). Product design and development. McGraw - Hill Higher Education. 3. Green, W., & Jordan, P. W. (Eds.). (1999).Human factors in product design: current practice and future trends. CRC Press. 4. Sanders, M. S., & McCormick, E. J. (1993). Human factors in engineering and design Mc- GRAW-HILL book company. 5. Roozenburg, N. F., &Eekels, J. (1995). Product design: fundamentals and methods (Vol. 2). John Wiley & Sons Inc. 6. Lidwell, W., Holden, K., & Butler, J.(2010). Universal principles of designs revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design. Rockport Pub.	

BTEIEL407 - Basic Instrumentation Laboratory

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

Examination Scheme:
Continuous Assessment: 60 Marks
Pr/oral: 40 Marks

Pre requisite	Basic Electrical Engineering	
Course Objective	To study the working principle of various transducers. To study the measurement of various parameters.	
Course Outcome	Understand different transducers to use in corresponding parameter measurement.	
Expt No	Title of Experiments	
1	Study and Measurement of Velocity Using Magnetic pickup and photo pickup methods.	
2	Study and measurement of Acceleration.	
3	Study and plot the characteristic of Thermocouples.	
4	Study and plot the characteristic of RTD.	
5	Study and plot the characteristic of Thermistor.	
6	Study and Measurement of liquid Level.	
7	Study and Measurement of Pressure using Bellows, Bourdon gauge, Diaphragm.	
8	Study and Measurement of flow using Orifice.	
9	Study and Measurement of flow using Venturi.	
10	Study of Rotameter.	
11	Study and Measurement of Humidity	

BTEEL408 - Electrical Machine-I Laboratory

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

Examination Scheme:
Continuous Assessment: 60 Marks
Pr/oral: 40 Marks

Pre requisite	Basic Electrical Engineering	
Course Objective	To analyses the performance of AC machines used in the laboratory	
Course Outcome	Understand and analyze performance characteristics of various AC machines in the laboratory	
Expt No	Title of Experiment	
1	To verify V-I relation & to draw phasor diagram of i) star-star ii) star-delta iii) delta-star iv) delta-delta connection of 3 phase transformer	
2	To verify relation in i) star connection ii) open delta connection	
3	To study the parallel operation of 3 phase transformer	
4	To study construction of stator and rotor of DC machine	
5	To determine magnetization, internal and external characteristics of a series generator	
6	To determine internal and external characteristics of dc machine	
7	To control the speed of dc shunt motor a) Flux control b) Armature control	
8	To control the speed of dc series motor a) Field tapping method	
9	To study the electrical breaking a) Rheostatic b) regenerative c) Plugging	
10	To study 3 and 4 point starter of DC shunt motor	
11	To study break test on DC motor	
12	To conduct Retardation test on DC motor	

BTINL408 - Digital Electronics Laboratory

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

Examination Scheme:
Continuous Assessment: 60 Marks
Pr/oral: 40 Marks

Pre requisite	Digital Electronics	
Course Objective	Understands designing of various digital circuits.	
Course Outcome	Design and verifies various digital circuits.	
Expt No	Title of Experiments	
1	Measurement of IC's parameters like rise time, fall time, propagation delays, and current and voltage parameters	
2	Design and implementation of arithmetic circuits.	
3	Design and implementation of various code converters and its applications.	
4	Design and implementation of multiplexer and de-multiplexer and its applications.	
5	Design and implementation of encoders and decoders and its applications.	
6	Design and implementation of synchronous and asynchronous counters and its applications.	
7	Design and implementation of non-sequential counters.	
8	Design and implementation of shift registers and its applications.	
9	Implementation and verifications of Combinational circuits on programmable logic devices.	
10	Implementation and verifications of sequential circuits on programmable logic devices.	

BTEEL410 -.Numerical Methods and Programming Laboratory

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

Examination Scheme:
Continuous Assessment: 60 Marks
Pr/oral: 40 Marks

Pre requisite	Numerical Methods	
Course Objective		
Course Outcome		
Expt No	Title	
1	Program for scan conversion of a straight line	
2	2 Program for scan conversion of a circle	
3	3 Program for scan conversion of an ellipse	
4	4 Program for scan conversion of a rectangle	
5	5 Program for scan conversion of an arc	
6	6 Program for scan conversion of a sector	
7	7 Program for finding roots of f(x)=0 by Newton Raphson method	
8	8 Program for finding roots of f(x)=0 by bisection method	
9	9 Program for solving numerical integration by Simpson's 1/3 rule	
10	10 Program for solving ordinary differential equation by Runge Kutta method	
11	Program for scan conversion of a straight line	