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)

P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra

Telephone and Fax. : 02140 -275142

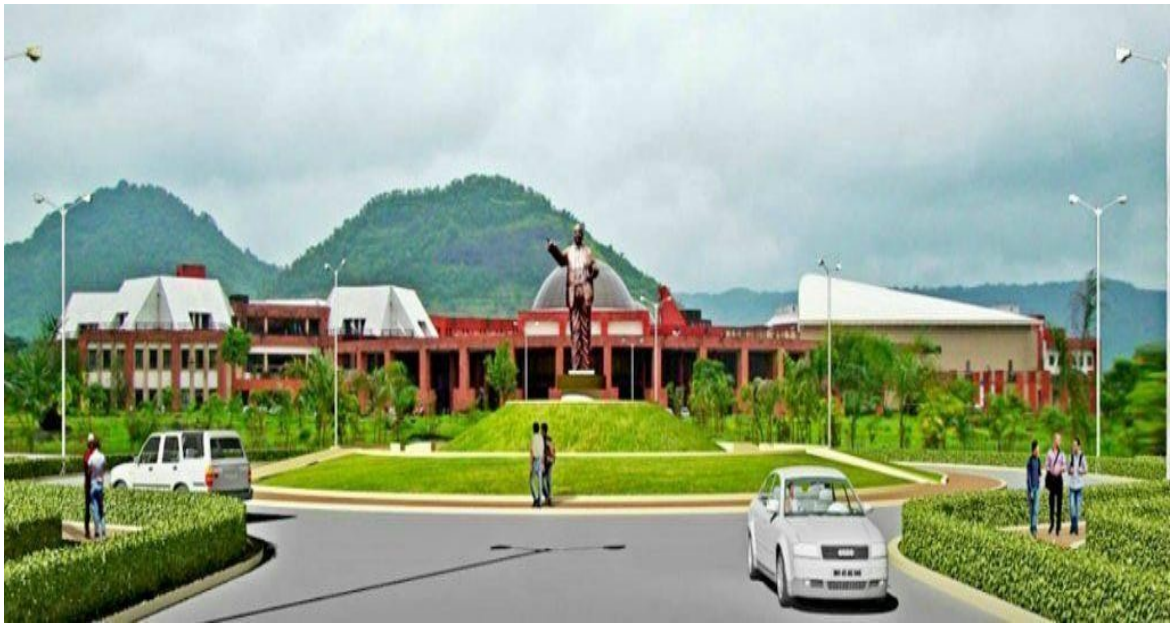
www.dbatu.ac.in

COURSE STRUCTURE AND SYLLABUS

for

Second Year B. Tech. Electrical Engineering / Electrical Engineering (Electronics and Power)/ Electrical & Electronics Engg / Electrical & Power Engineering

With effect from the Academic Year 2021-2022



Dr. Babasaheb Ambedkar Technological University, Lonere.

B.Tech (Electrical Engineering / Electrical Engineering (Electronics and Power)/ Electrical & Electronics Engg / Electrical & Power Engineering)

Basic Sciences Courses(BSC)		
BTBS101	Engineering Mathematics - I	(3-1-0)4
BTBS102	Engineering Physics	(3-1-0)4
BTBS107L	Engineering Physics Lab	(0-0-2)1
BTBS201	Engineering Mathematics - II	(3-1-0)4
BTBS202	Engineering Chemistry	(3-1-0)4
BTBS207L	Engineering Chemistry Lab	(0-0-2)1
BTBS301	Engineering Mathematics-III	(3-1-0)4
BTBS404	Analog and Digital Electronics	(3-0-0)3
BTBSL409	Analog and Digital Electronics Lab	(0-0-2)1

Engineering Sciences Courses(BSC)		
BTES103	Engineering Graphics	(2-0-0)2
BTES105	Energy and Environment Engineering	(2-0-0)2
BTES106	Basic Civil and Mechanical Engineering	(2-0-0)
BTES108L	Engineering Graphics Lab	(0-0-4)2
BTES203	Engineering Mechanics	(2-1-0)3
BTES204	Computer Programming	(3-0-0)3
BTES205	Workshop Practice	(0-0-4)2
BTES206	Basic Electrical and Electronics Engineering	(2-0-0)
BTES208L	Engineering Mechanics Lab	(0-0-2)1
BTES305	Engineering Material Science	(3-0-0)

Humanities and Social Science Including Management Courses(HSSMC)		
BTHM104	Communication Skills	(2-0-0)2
BTHM109L	Communication Skills Lab	(0-0-2)1
BTHM304	Basic Human Rights	Audit
BTHM506	Foreign Languages (A) Japanese Language (B) German Language	Audit
BTHM706	Engineering Operations and Project Management	Audit

Professional Core Course (PCC)		
BTEEC302	Electrical Machines-I	(3-1-0)4
BTEEC303	Electrical and Electronics Measurement	(3-1-0)4
BTEEL306	Electrical Machines Lab	(0-0-2)1
BTEEL307	Electrical and Electronics Measurement Lab	(0-0-2)1
BTEEC401	Network Theory	(3-1-0)4
BTEEC402	Power System	(3-1-0)4
BTEEC403	Electrical Machines-II	(3-1-0)4
BTEEL406	Network Theory Lab	(0-0-2)1
BTEEL407	Power System Lab	(0-0-2)1
BTEEL408	Electrical Machines-II Lab	(0-0-2)1
BTEEC501	Power System Analysis	(3-1-0)4
BTEEC502	Microprocessor and Microcontroller	(3-0-0)3
BTEEC503	Power Electronics	(3-1-0)4
BTEEL507	Power System Analysis Lab	(0-0-2)1
BTEEL508	Microprocessor and Microcontroller Lab	(0-0-2)1
BTEEL509	Power Electronics Lab	(0-0-2)1
BTEEC601	Switchgear Protection	(3-0-0)3
BTEEC602	Electrical Machine Design	(3-1-0)4
BTEEC603	Control System Engineering	(3-1-0)4

BTEEL606	Switchgear Protection Lab	(0-0-2)1
BTEEL607	Electrical Machine Design Lab	(0-0-2)1
BTEEL608	Control System Engineering Lab	(0-0-2)1
BTEEC701	High Voltage Engineering	(3-1-0)4
BTEEC702	Power System Operation and Control	(3-1-0)4
BTEEL707	High Voltage Engineering Lab	(0-0-2)1

Professional Elective Course (PEC)		
BTEEPE405	(A)Electromagnetic Field Theory	(3-0-0)3
	(B)Signals and System	
	©Advance Renewable Energy Sources	
	(D)Electronic Devices and Circuits	
BTEEPE504	(A)Industrial Automation	(3-0-0)3
	(B)Power Quality Issues	
	©HVDC	
BTEEPE604	**(A)Application of Power Electronics in Power System**	(3-0-0)3
	(B)Smart Grid Technology	
	©Modeling, Simulation and Control of Electric Drives	
BTEEPE703	(A)Energy Audit and Conservation	(3-0-0)3
	(B)Electrical System Design for Building	
	©Flexible AC Transmission System	
	(D)Electrical Utilization	

Open Elective Course (OEC)		
BTEEOE505	(A)Embedded System	(3-0-0)3
	(B)Electrical Safety	
	©Condition Monitoring of Electric Apparatus	
BTEEOE605	**(A)E-waste Management**	(3-0-0)3
	(B)Power Plant Engineering	
	©Sensor Technology	
	(D)Lightning Interaction with Power System	
BTEEOE704	(A)Process Control Instrumentation	(3-0-0)3
	(B)Biomedical Instrumentation	
	©Mechatronics	
BTEEOE705	(A)Testing, Maintenance and Commissioning of Electrical Equipment	(3-0-0)3
	(B)Electric and Hybrid Electric Vehicles	
	©Internet of Things (IoT)	

Seminar / Mini Project / Internship		
BTES209S	Seminar	(0-0-2)1
BTES211P	(Internship – I) Field Training / Internship/Industrial Training (minimum of 4 weeks which can be completed partially in first semester and second Semester or in at one time).	1
BTEEM308	Miniproject-I	(0-0-4)2
BTEEP410	(Internship – II)	1
BTEEM509	Miniproject-II	(0-0-2)1
BTEES609	Seminar	(0-0-4)2
BTEEP610	(Internship – III)	
BTEEM708	In house project-I / Mini project-III	(0-0-4)2

Project(MP)		
BTEEP802	In house project-I / Internship & Project in Industry	(0-0-26) 13

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Plan of Study:

No.of Courses								
1	I	II	III	IV	V	VI	VII	VIII
2	BTBS101	BTBS201	BTBS301	BTEEC401	BTEEC501	BTEEC601	BTEEC701	BTEEPE801
3	BTBS102	BTBS202	BTEEC302	BTEEC402	BTEEC502	BTEEC602	BTEEC702	BTEEP802
4	BTES103	BTES203	BTEEC303	BTEEC403	BTEEC503	BTEEC603	BTEEPE703	
5	BTHM104	BTES204	BTHM304	BTBS404	BTEEPLE504	BTEEPE604	BTEEOE704	
6	BTES105	BTES205	BTES305	BTEEPE405	BTEEOE505	BTEEOE605	BTEEOE705	
7	BTES106	BTES206	BTEEL306	BTEEL406	BTHM506	BTEEL606	BTHM706	
8	BTBS107L	BTBS207L	BTEEL307	BTEEL407	BTEEL507	BTEEL607	BTEEL707	
9	BTES108L	BTES208L	BTEEP308	BTEEL408	BTEEL508	BTEEM608	BTEEM708	
10	BTHM109L	BTES209S	BTES211P	BTEEL409	BTEEPE509	BTEEP609	BTEEP609	
11		BTES211		BTEEP410	BTEEP409			

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A. Program Educational Objectives (PEOs)

Graduates will able to–

1.To equip graduates with a strong foundation in engineering sciences and Electrical Engineering fundamentals to become effective collaborators, researchers and real-time problem solver with technical competencies.

2.Perceive the limitation and impact of engineering solutions in social, legal, environmental, economical and multidisciplinary contexts.

3.Excel in Industry/technical profession, higher studies, and entrepreneurship exhibiting global competitiveness.

B. Program Outcomes (POs)

Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Curriculum of Second Year

Semester III

Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	CA	MSE	ESE	Total	
BSC	BTBS301	Engineering Mathematics-III	3	1	-	20	20	60	100	**4**
PCC1	BTEEC302	**Electrical Machines-I**	3	1	-	20	20	60	100	**4**
PCC2	BTEEC303	Electrical and Electronics Measurement	3	1	-	20	20	60	100	**4**
HSSMC	BTHM304	Basic Human Rights	2	-	-					**Audit**
ESC	BTES305	**Engineering Material Science**	3	-	-	20	20	60	100	**3**
LC	BTEEL306	Electrical Machines-I Lab			2	60		40	100	**1**
LC	BTEEL307	Electrical and Electronics Measurement Lab			2	60		40	100	**1**
Project	BTEEP308	Mini Project-I			4	60		40	100	**2**
Internship	BTES211P	Internship-I Evaluation						50	50	**1**
			14	3	8	260	80	410	750	**20**

Semester IV

Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	CA	MSE	ESE	Total	
PCC3	BTEEC401	**Network Theory**	3	1	-	20	20	60	100	**4**
PCC4	BTEEC402	**Power System**	3	1	-	20	20	60	100	**4**
PCC5	BTEEC403	Electrical Machine-II	3	1	-	20	20	60	100	**4**
BSC	BTBS404	Analog and Digital Electronics	3	-	-	20	20	60	100	**3**
PEC1	BTEEPE405	Group A	3	-	--	20	20	60	100	**3**
LC	BTEEL406	Network Theory Lab	-	-	2	30		20	50	**1**
LC	BTEEL407	Power System Lab	-	-	2	30		20	50	**1**
LC	BTEEL408	Electrical Machine-II Lab	-	-	2	30		20	50	**1**
LC	BTEEL409	Analog and Digital Electronics lab	-	-	2	30		20	50	**1**
Internship	BTEEP410	Internship-II (minimum of 4 weeks which can be completed partially in third or fourth semester or in at one time)	-	-	-	-	-	-	-	-
						220	100	380	700	**22**

Group-A

(A)Electromagnetic Field Theory

(B) **Signals and System**

(C) Advance Renewable Energy Sources

(D) **Electronic Devices and Circuits**

Semester III

(BTBS301) ENGINEERING MATHEMATICS 04 Credits

Unit 1: Vector Calculus 9 Hours

Vector Algebra, Cartesian, Cylindrical and Spherical Co-ordinate System. Transformation of Variables from Cartesian to Cylindrical and Spherical Coordinate System and Vice-Versa Coulomb‘s Law, Electric Field Intensity, Field of _N‘ Point Charges, Field of Line and Sheet of Charge, Electric Flux Density, Gauss‘s Law and Its Applications, Divergence and Divergence Theorem

Unit 2: Complex Numbers 9 Hours

Complex Numbers, geometric representation, powers and roots of complex numbers, Functions of a complex variable, Analytic functions, Cauchy-Riemann equations; elementary functions, Conformal mapping (for linear transformation); Contours and contour integration, Cauchy‘s theorem, Cauchy integral formula; Power Series and properties

Unit 3: Fourier Series 9 Hours

Introduction, Dirichlet Conditions, Fourier Series and its Coefficients for a given range, Even, odd functions and Fourier Series, Half-range Series, problems, Parseval Identity, Complex form of Fourier Series.

Unit 4: Differential Eqns., First Order ODE, 9 Hours

Differential Eqns., First Order ODE, y‘=f(x,y)- geometrical interpretation of solution, Eqns. reducible to separable form, Exact Eqns., integrating factor, Linear Eqns., Orthogonal trajectories,

Unit 5: Bessel functions 9 Hours

Fourier Method for IBV problem for wave and heat equation, rectangular region, Fourier method for Laplace equation in 3 dimensions, Numerical Methods for Laplace and Poisson‘s equation. Biot-Savart, Amperes Circuital Laws and their Applications, Curl, Stoke‘s Theorem, Magnetic Flux Density, Scalar and Vector Magnetic Potential, Maxwell‘s Equations in Steady Electric and Magnetic Fields 30 ,FOURIER TRANSFORMS: Fourier Integral representation, Fourier integrals, Fourier transforms, Sine, Cosine transforms, inverse transforms, Illustrations, Properties, Parseval Identity, evaluation of certain real integrals.

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.

(BTEEC302)ELECTRICAL MACHINE-I **04 Credits**

Unit 1: Single Phase Transformer **7 Hours**

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

Unit 2: Three Phase Transformers **8 Hours**

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.

Unit 3: Electromechanical Energy Conversion Principles **6 Hours**

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.

Unit 4: DC Generators **9 Hours**

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: 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,

Unit 5: D.C. Motors **9 Hours**

Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and Selection of DC Motors, Starting of DC Motors, Speed Control, Losses and Efficiency, Condition for Maximum Efficiency, Braking of DC Motors, Effect of saturation and armature reaction on losses; Applications, Permanent Magnet DC Motors, Type and Routine test

Unit 6: Special Machines **6 Hours**

Constructional details of reluctance machine, variable-reluctance machines, basic VRM analysis, practical VRM analysis, stepper motors and their analysis, Brushless DC motors.

Text Books :

1. J. B. Gupta," Theory and Performance of Electrical Machines," S. K. Kataria& Sons, New Delhi
2. P. S .Bimbra," Electrical Machinery", Khanna Publishers
3. B. L. Theraja, A. K. Theraja," A text book of Electrical Technology," S. Chand Publishers
4. Asfaq Hussein," Electric Machines," Danpat Rai Publisher

Reference Books :

1. Bhattacharya S. K, “Electrical Machines”,(Tata McGraw Hill Publications)
2. Kothari Nagrath, “Electrical Machines”, (Tata McGraw Hill Publications)
3. M. N. Bandopadhyay, “Electrical Machines”, (Tata McGraw Hill Publications)
4. Fitzaralda, “Electrical Machines”, (Tata McGraw Hill Publications)

BTEEC303 ELECTRICAL & ELECTRONICS MEASUREMENT 04 Credits

Unit 1: Philosophy of Measurement 4 Hours

Introduction to Measurement, Methods of Measurements, Measurement System, Instruments, Classification of Instruments, Characteristics of Instruments & Measurement System, Errors in Measurement, Types of Errors, Calibration, Standards and their classifications.

Unit 2: Analog Measurement of Electrical Quantities 8 Hours

Classification of Analog Instruments, Principle of Operation, Operating Torques, Different types of Damping and Control Systems, Types of Instrument: PMMC, Extension of Range of PMMC Instruments, Moving Iron, Electro-dynamometer, Hot wire, Thermocouple, Induction, Electrostatic, Rectifier.

Power Measurement: Power measurement in AC and DC circuits, Power and Power Factor, Electrodynamometer-type Wattmeter, Induction-type Wattmeter, Power measurement in Poly-phase systems, Power measurement in Three-Phase systems, Reactive Power measurements, Power measurement with Instrument Transformers - Potentiometer and Current Transformer.

Measurement of Energy: Induction-type Energy Meter, Errors in Induction-type Energy Meters and their compensation, Testing of Energy Meters.

Unit 3: A.C. and D.C. Bridges 8 Hours

Measurement Resistance: Wheatstone Bridge, Kelvin Bridge Method, Kelvin Double Bridge Method, Ammeter-Voltmeter Method, Direct deflection method**,** Loss of charge method**,** Megohm Bridge**,** Megger.

Measurement of Inductance and Capacitance: Maxwell Bridge, Hays Bridge, Anderson Bridge, De-Sauty Bridge, Schering Bridge, Wien Bridge.

Localisation of Cable Faults: Murray Loop Test, Varley Loop Test.

Magnetic Measurements: Ballistic Galvanometer, Flux Meter, Maxwell's Bridge Method, AC Potentiometer Method.

Unit 4: Digital Measurement of Electrical Quantities 7 Hours

Concept of Digital Measurement, Block diagram of Digital Instrumentation System, Digital versus Analog Instrument, Digital Voltmeter, Types of Digital Voltmeter, Digital Multi-meter Digital Counter, Digital Frequency Meter, **Power Analyzer &** Harmonic Analyzer, Spectrum & Wave analyzer, Oscilloscopes, Cathode Ray Oscilloscope (CRO), Digital Storage Oscilloscopes (DSO), Signal Generator, Q-Meter.

Unit 5: Transducers 8 Hours

Definition, Classification & selection of transducers, **Characteristics, Transducers for measurement of Displacement (RVDT & LVDT), Speed, Angular Rotation, Altitude, Force, Torque, Humidity and Moisture, Pressure, Strain and Temperature (Thermocouple and RTD method), Position, Hall Effect transducer and applications. Instrumentation amplifiers,** Signal Conditioning, **Data Transmission and Telemetry,** Data Acquisition Systems.

Displays and Recorders: Different types of Display – Different types of Recorder: Graphic Recorder, Strip Chart Recorder, G**alvanometric and** Potentiometer type R**ecorders,** X-Y Recorder, Circular Chart Recorder, Magnetic Tape Recorder, D**igital Recorders,** Printer and Plotter **(Block Diagram, theory and applications only)**

Reference Books/ Text Books:

1. E.W. Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", A.H. Wheeler & Co. India.
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons.
3. Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India.
4. M.B. Stout, "Basic Electrical Measurement" Prentice hall of India.
5. W.D. Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International.
6. J.B. Gupta, "Electrical Measurements and Measuring Instruments", S.K. Kataria & Sons.
7. Prithwiraj Purkait, Budhaditya Biswas , Santanu Das and Chiranjib Koley, "Electrical and Electronics Measurements and Instrumentation", McGraw Hill.

BTHM304 BASIC HUMAN RIGHTS **Audit Course**

Unit 1: The Basic Concepts **6Hrs**

Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

Unit 2: Human Rights and Human Duties: **6 Hrs**

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

Unit 3: Society, Religion, Culture, and their Inter-Relationship **6 Hrs**

Impact of Social Structure on Human behaviour, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

Unit 4: Social Structure and Social Problems **6 Hrs**

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.

Unit 5: State, Individual Liberty, Freedom and Democracy **6 Hrs**

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.

Unit 6: Human Rights in Indian Constitution and Law **6 Hrs**

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

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.

(BTES 305) ENGINEERING MATERIAL SCIENCE 04 Credits

Unit: 1 Electrical Conducting Materials 7 Hours

Introduction,Crsytal structure, atomic bonding,Electronic and Ionic Conduction , Conductivity in Metals , Ohm‘s Law , Relaxation Time , Collision Time , Mean Free Path of an Electron , Electron Scattering , Resistivity of Metals , Effect of Temperature and Impurity on Conductivity , Joule‘s Law , High Conductivity And Resistivity Materials , Superconductivity and Applications Conducting materials: quantum free electron theory- Fermi-Dirac distribution - Materials for electric resistances.

Unit 2: Dielectric Materials 7 Hours

Crystalline structure-perfection/imperfection, Dielectric as Electric Field Medium, Dielectric constant and polarizability, types of polarization,leakage currents, dielectric loss, dielectric strength,breakdown voltage,temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials

Unit 3: Semiconductor Materials 7 Hours

Semiconductors: Mechanism of conduction in semiconductors. Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI). Properties of Semiconductors: Electron-hole concentration, Fermi level, Generation and recombination, carrier life-time, diffusion length. Scattering and mobility of carriers. Einstein relation.LASER Plain carbon steels and their applications. Alloy steels: High speed steels, stainless steels,HSLA; Non Ferrous alloys: Al alloys, Cu alloys, applications of these alloys

Unit 4: Magnetic Materials 7 Hours

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. factors effecting permeability and hysteresis, Ferromagnetic materials, properties of ferromagnetic materials in static fields,curie point, anti-ferromagnetic materials, piezoelectric materials ,pyro electric materials Magnetic Properties of Materials: Atomic Interpretation of Diamagnetic, Paramagnetic, Anti-Ferromagnetic and Ferromagnetic Materials. Ferromagnetic Domain, Magnetic Materials for Ferromagnetic Tape And Memory Devices, Magnetic materials: magnetic materials used in electrical machines instruments.

Unit 5: Special Purpose Materials 05 Hours

Refractory Materials, Structural Material‘s, Radioactive Materials, Galvanization and Impregnation of materials, Non Destructive Testing: Ultrasonic Radiography, X-ray diffraction- Bragg‘s law.

Text Books:

1. Material Science and Engineering – V. Raghavan

Reference Books

1. Electrical Engineering Materials – A.J. Dekker
2. Science of Engineering Materials and Carbon Nanotubes - C.M. Srivastava and C. Srinivasan
3. Solid State Physics – A.J. Dekker.

(BTEEL306)ELECTRICAL MACHINE-I LABORATORY 01 Credits

Perform Any eight experiment from given list as a part of practical submission

List of Experiments

1. To perform the polarity test on single phase transformer
2. To perform the transformation ratio test on single phase transformer
3. To perform the following three phase transformer connections:
   1) Star-star 2) Star-Delta
   3) Delta – Delta 4) Delta –Star
   5)Open Delta 6) Scott Connection
4. To perform the direct loading test on three phase transformer to calculate efficiency and regulation
5. To perform the indirect loading test on three phase transformer to calculate efficiency
6. To perform the parallel operation of two single phase transformers.
7. To study D. C. Machine
8. To draw the speed characteristics of DC shunt motor by- (1) Armature Control method (2) Field Control method
9. To perform the load test on DC Shunt motor.
10. To study the load characteristics of DC generator
    I) Cumulative compound generator.
    II) Differential compound Generator
11. To study the magnetization ,internal and External characteristics of a D. C. generator
12. To Study Starters for DC Shunt Motor.

BTEEL307 ELECTRICAL & ELECTRONICS MEASUREMENTS LABORATORY 1 Credit

List of Experiments: (Perform minimum 8-10 experiments from following list)

1) Measurement of Low resistance by Kelvin Double bridge.
2) Measurement of High resistance and Insulation resistance using Megger.
3) Measurement of Inductance by Maxwell bridge, Hays bridge, Anderson bridge.
4) Measurement of Capacitance by De Sauty bridge, Schering bridge.
5) Measurement of Earth resistance using Earth Tester.
6) Study the extension of Voltmeter, Ammeter and Wattmeter.
7) Measurement of three phase power by Two Wattmeter and One Wattmeter method.
8) Study of types of instrument: PMMC, Moving Iron, Electro-dynamometer, Hot wire, Thermocouple, Induction, Electrostatic, Rectifier.
9) Study of Energy Meter.
10) Study of Instrument T/F and its types.
11) Characterize the temperature sensor (RTD):
    a) Static Characteristics of RTD: Study the change in resistance of RTD probe depending on the process temperature.
    b) Dynamic characteristics: Study the dynamic response of RTD probe
12) Characterize the Thermocouple:
    a) Static Characteristics of Thermocouple: Study the change in EMF of a thermocouple in response to the process temperature.
    b) Dynamic characteristics of Thermocouple: Study the dynamic response of Thermocouple.
13) Characterize of LVDT: To find the effect of various parameters like change in supply voltage, change in supply frequency on output of given LVDT
14) Characterize the strain gauge sensor:
    a) Study of Strain Gauge: To study the working principle of strain gauge.
    b) Study of effect of change in position of weight applied on Strain Gauge performance.
    c) Study of effect of change in temperature on the performance of Strain Gauge.
15) Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
16) Study of storage oscilloscope and determination of transient response of RLC circuit.

BTEEP308 Miniproject-I **2 Credits**

Guidelines:

Stages	Work to be carried	Time
I	• Selection of a mini viable project idea (Hardware or Software Based) on recent trends in Electrical Engineering.	**4 hours**
II	• Study various resources and components in electrical engineering projects • Application of those components in Selected Project	**6 hours**
III	• Study of Circuit Diagram • Study datasheet of basic circuit components of a project • Study various software in building of project like SCILAB, MATLAB or other circuit Simulator	**6 hours**
IV	• Designing of PCB for selected Project once tested on breadboard	**4 hours**
V	• Verification of the results obtained of the working model or the simulation results. • Compare with desired results and take corrective action	**4 hours**
VI	• Completion of project by developing the Project Report and submitting the report to the concerned to receive the final credits.	**6 hours**

Semester IV

BTEEC401 NETWORK THEORY **04 Credits**

Unit 1:Active & Passive Circuit Element **7 Hours**

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.

Unit 2: Network theorems **12Hours**

Kirchhoff‘s laws (KCL and KVL), Mesh analysis, nodal analysis, Solution of D.C. resistive network, writing loop equations, Node equations directly in matrices form, 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.

Unit 3: Transient Response Analysis in circuit **7 Hours**

Initial and final condition of circuit, procedure for evaluating initial conditions, solution of first and Second order differential equations of series & parallel R-L, R-C, R-L-C circuits, Time constant, General & particular solutions, Particular integral & complimentary functions, Numerical

Unit 4: Application of Laplace’s Transform **7 Hours**

Standard test input signal- Unit step, Impulse & ramp functions and their Laplace transform, Solution of differential equation using Laplace transform, solve of R-L, R-C, R-L-C circuits using Laplace transform, Transient and steady state response of RL and RC circuit to various functions using Laplace transform.

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.

Unit 5: Sinusoidal Steady State A. C. Circuit **7 Hours**

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.

Text/Reference Books:

1. N Balabanian and T.A. Bickart, “Linear Network Theory: Analysis, Properties, Design andSynthesis”, Matrix Publishers, Inc. 1981.
2. L.O. Chua, C.A. Desoer, E.S. Kuh, “Linear and Nonlinear Circuits”, McGraw – HillInternational Edition 1987.

3. Van Valkenburg, “Network Analysis”, Third Edition, 2009, Prentice Hall of India.
4. Sudhakar, A.Shyammohan, “Circuits and Network”, Third Edition, 2006, Tata McGrawHill
5. D. Roy Choudhury, “Networks and systems”.New Age International Publishers
6. Kelkar and Pandit, “Linear Network Theory”, Pratibha Publication.
7. Mahmood Nahvi, Joseph AEdminister, “Schaum's Outline of Electric Circuits”, 6th edition,Tata McGraw-Hill.

(BTEEC402) POWER SYSTEM 04 Credits

Unit 1: Electrical Power Generation 9 Hours

Evolution of Power Systems, Typical Layout of an Electrical Power System–Introduction to different sources of energy. Construction and working of thermal power plants, Hydro power station, Nuclear Power Plant with neat block diagram of main parts. Descriptive treatment of alternator exciter & excitation systems, major electrical equipments in generating stations.

Unit 2: Electrical Design of Overhead Transmission Lines 9 Hours

Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, concept of GMD and GMR, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance. skin effect, proximity effect, Ferranti Effect.

Corona: Introduction, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona.

Unit 3: Mechanical Design of Transmission Lines 8 Hours

Types of conductors, Choice of conductor materials, Stranded copper & ACSR conductor, Insulation consideration, Different types of insulator, supports, distribution of voltage across the insulator string, String efficiency, Effect of wind & ice coating on transmission line, sag due to equal & unequal supports, with their derivation, Numericals.

Unit 4: Performance of Transmission Lines 8 Hours

Classification of overhead transmission lines, important terms, performance of single phase short transmission lines, three phase short transmission lines, effect of load power factor on regulation and efficiency, different types of medium transmission line, Analysis of long transmission lines, generalized constant of transmission line, determination of generalized constant of transmission lines, percentage regulation, Transmission efficiency, numerical based on above.

Unit 5: AC & DC Distribution 8 Hours

Classification of Distribution system, Requirement of distribution system, design consideration in distribution system. AC Distribution: Calculations, method of Solving AC Distribution problem, three phase unbalanced load, four wire unbalanced star connected load, ground detector, DC Distribution: types, DC distribution calculation, three wire DC system.

Text/References :

REFERENCES:

1. V.K Mehta & Rohit Mehta. “ Principles of Power System” S Chand Publications
2. Gupta B. R. ” Power Plant Engineering”.(Eurasia publications)
3. Nag P. K. “ Power Plant Engineering”,(Tata McGraw Hill Publications)
4. Kothari Nagrath, “Electric Power System”, (Tata McGraw Hill Publications)
5. Wadhva S. L.,“Electric Power System”,(Tata McGraw Hill Publications)
6. Stevension W. B., “Power System”, (English Language Book Society publications)

(BTEEC403)ELECTRICAL MACHINE-II 04 Credits

Unit 1: Basic Concepts in A.C. Machines 5 Hours

Classification of A.C. Machines, principle of operation and constructional features of synchronous and induction machines, rotating mmf waves in A.C. Machines

Unit 2: Constructional Armature windings 5 Hours

Introduction, ac machine windings, winding factors, the emf equation, harmonics in generated emf, causes of harmonics and their suppressions

Unit 3: Synchronous Machines 9 Hours

Synchronous Machines : Construction, types, armature reaction, circuit model of synchronous machine, determination of synchronous reactance, phasor diagram, power angle characteristics, parallel operation of synchronous generators, synchronizing to infinite bus bars, two axis theory, synchronous motor operation, characteristic curves, synchronous condenser, dynamics.

Unit 4: Three phase Induction (Asynchronous) Motor 9 Hours

Types of induction motor, flux and mmf waves, development of circuit model, power across air gap, torque and power output, oc and sc tests, circle diagram, starting methods, cogging and crawling, speed control, deep bar/ double cage rotor, induction generator, induction machine dynamics, high efficiency induction motors

Unit 5: Fractional Kilowatt Motors 6 Hours

Introduction, single phase induction motors, double revolving field theory, circuit model of single phase induction motor, determination of circuit parameters

Unit 6: Special Machines 6 Hours

Single phase synchronous motors, permanent magnet ac motors, ac servomotors, linear induction motor

Text Books :

1. J. B. Gupta," Theory and Performance of Electrical Machines," S. K. Kataria& Sons, New Delhi
2. P. S .Bimbra," Electrical Machinery", Khanna Publishers
3. B. L. Theraja, A. K. Theraja," A text book of Electrical Technology," S. Chand Publishers
4. Asfaq Hussein," Electric Machines," Danpat Rai Publisher

Reference Books :

1. 1.Say M. G., "Design & performance of A.C. Machines", (Book Publications,3rd edition)
2. 2..Bhimra P. S., "Electric Machines", (South Ex Publications, New Delhi)
3. D. P. Kothari, I. J. Nagrath,"Electric Machines ", Tata McGraw Hill Publication, Fourth edition, reprint 2012.
4. A. F. Puchstein, T.C. Lloyd, A.G. Conrad, "Alternating current machines", John Wiley and Sons, New York 1954.
5. 5.A.E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans ,"Electric Machinery ", Tata McGraw Hill Publication, sixth edition 2002 4. Fitzaralda, "Electrical Machines", (Tata McGraw Hill Publications))

BTBS404 ANALOG AND DIGITAL ELECTRONICS 04 Hours

Unit 1: Transistor as an Amplifier 5 Hours

Load line, Small signal low frequency analysis of single stage amplifier in different configuration, High frequency equivalent circuit of transistor (hybrid pi), Cascade amplifier, High input resistance circuits- C coupled amplifier Frequency response, Definition of 3 dB bandwidth, Effect of cascading on gain & BW, Classification of amplifiers

Unit 2: operational amplifier 6 Hours

Block diagram of operational amplifier, Properties of ideal operational amplifier, Explanation of different terms appearing in OP-Amp application (offset, bias, quantities, PSRR, CMRR, Ad, AC, Slew rate etc.), Operation of circuit diagram of OP-Amp using discrete components & I.C. diagram, Different types of current of current sources in I.C. technology, frequency response of OP-Amp, OP-Amp parameters & minimization technique of temperature effect, Inverting & Non-inverting operation of Op-Amp & analysis for AG, RI, RO, Linear & non-linear circuit application of OP-Amp

Unit 3: Number Systems 6 Hours

Basic Logic Gates & Boolean Algebra: Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and Vica-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion.

Unit 4: Digital Logic Gate Characteristics 6 Hours

TTL logic gate characteristics: Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, and C-MOS & MOSFET. Interfacing logic families to one another. Sequential Systems: Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops Counters: Synchronous & asynchronous ripple and decade counters, Modulus counter, skipping state counter, counter design, state diagrams and state reduction techniques. Ring counter. Counter applications. Registers: buffer register, shift register

Unit 5: Minimization Techniques 7 Hours

Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic Conversion of truth tables in POS and SOP form Incomplete specified functions. Variable mapping Quinn-McKlusky minimization techniques c functions with K-map

Unit 6: Combinational Systems 6Hours

Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders BCD adder Binary multiplier Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7- segment decoder‘ Multiplexer, DE multiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode Switching matrix. Design of logic circuits by multiplexers, encoders, decoders and DE multiplexers.

Text/Reference Books:

1. Mandal, Digital Electronics: Principles and Applications, TMH 2009

2. Leach, Digital Principles and Applications, ed. 7, TMH 2008

3. M. Morris Mano, Digital Logic and Computer Design, Pearson Edu. 2014

(BTEEPE405A)ELECTROMAGNETIC FIELD THEORY 03credits Credits

Unit 1: vector calculus 7 Hours

Scalars and vectors, Vector algebra, Vector components and unit vectors, Vector field Vector field Dot, cross products circular, cylindrical and spherical coordinate systems Coulomb's Law and electric field intensity Electric field due to a continuous Volume Charge Distribution field of a line charge field of a Sheet of a charge streamlines and sketches of fields

Unit 2: Electromagnetic field 1 8 Hours

Constructional Gauss's Law and its Applications: to some symmetrical charge distribution and differential volume element divergence Maxwell's first equation (electrostatics), the vector operator and the Divergence theorem Energy and Potential Energy expended in moving a point charge in an electric field line integral, potential difference potential, potential gradient, potential field of a point charge and system of charges dipole, energy density in electrostatic field

Unit 3: Electromagnetic field 2 6 Hours

Current and current density, continuity of current, metallic conductors conductor properties and boundary conditions method of images, semiconductors, nature of dielectric, boundary conditions for perfect dielectric capacitance, and capacitance of two-wire line. Poisson's and Laplace Equations Uniqueness theorem examples in rectangular, spherical and cylindrical coordinates, product solutions of Laplace equations, and solutions of Poisson's equations

Unit 4: Magneto statics 1 8 Hours

Biot-Savart's law Amperes circuital law curls strokes theorem magnetic flux and magnetic flux density scalar and vector magnetic potentials

Unit 5: Magneto statics 2 7 Hours

Force on moving charge, differential current element force between differential current element and torque on a closed circuit nature of magnetic materials, magnetization permeability, magnetic boundary conditions, magnetic circuit, potential energy and forces on magnetic materials, self and mutual inductance

Unit 6: Maxwell's equations 4 Hours

Faradays law, Maxwell's equations in point form, Maxwell's equations in integral form, Retarded potentials.

Text Books :

1) "William H. Hayt & John. A. Buck, "Engineering Electromagnetics" Mc. Graw-Hill Companies, 7th Editon.2006.
2) "Sadiku- "Electromagnetic Fields" , Oxford Publications**.**

Reference:

3) D. J. Griffiths, _Introduction to Electrodynamics', Addison Wesley, 1999.
4) D. K. Cheng, _Field and Wave Electromagnetics', Addison Wesley, 1999.
5) N. N. Rao, _Elements of Engineering Electromagnetics', Pearson Education, Inc, 2004.
6) Mathew N.O. Sadiku,Elements of Electromagnetics,Oxford Univ Press
7) N.N. Rao, Basic electromagnetic and applications, McGraw Hill

BTEEPE405BSignals and System **03 Credits**

Unit 1: Elements of Signal Space Theory **7 Hours**

Objective and overview, signal and system types and classifications, Different types of signals; Linearity, time invariance and causality; Impulse sequence, impulse functions and other singularity functions

Unit 2: Classification of System **9 Hours**

CT and DT system, basic properties of system – linear time invariant system and properties, LTI system: Causality, stability, step response, impulse response.

Unit 3: Convolution **7 Hours**

Convolution sum, convolution integral and their evaluation; Time-domain representation and analysis of LTI systems based on convolution and differential equations. Convolution for CT & DT signals and systems; Necessity of representations of Signals & Systems in Time- and Transformed-domains

Unit 4: Transform domain considerations **7 Hours**

Laplace transforms, inverse Laplace transforms and Z-transforms; Applications of transforms to discrete and continuous systems-analysis; Transfer function, block diagram representation.

Unit 5: Fourier series and Fourier Transform **7 Hours**

Sampling theorem, Discrete Fourier transform (DFT), estimating Fourier transform using DFT Analysis of discrete time signal: sampling of CT signals and aliasing, DTFT and properties.

Reference Books:

1. Signals and Linear Systems, Gabel R.A. and Robert R.A, John Wiley and Sons, New York
2. Signals and Systems , Oppenheim, Wilsky and Nawab, Prentice Hall, New Delhi
3. Systems and Signal Analysis, C.T.Chen, Oxford University Press, New Delhi
4. Probabilistic Methods of Signals and System Analysis, Cooper G.R and McGillem C.D, Oxford University Press, Cambridge.
5. Signals and Systems, Ziemer R.E., Tranter W.H., and Fannin D.R., Pearson Education Asia, Singapore

(BTEEPE405C) ADVANCED RENEWABLE ENERGY SOURCES 04 Credits

Unit 1: Introduction 7 Hours

Renewable Sources of Energy- Introduction to renewable energy, various aspects of energy conversion, principle of renewable energy systems, Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics-Calculation of Electricity Generation Costs –Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems.

Fuel Cells: The Fuel Cell-Low and High Temperature Fuel Cells-Commercial and Manufacturing Issues-Constructional Features of Proton Exchange-Membrane Fuel Cells –Reformers-Electrolyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit-Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

Unit 2: Wind Power Plants 7 Hours

Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, windspeed monitoring, Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose ofthe Energy Generated -General Classification of Wind Turbines-Rotor Turbines-Multiple-BladeTurbines -Drag Turbines -Lifting Turbines-Generators and Speed Control used in Wind PowerEnergy -Analysis of Small Generating Systems. Aerodynamics of wind turbine rotor, site selection,wind resource assessment, wind energy conversion devices: classification, characteristics, andapplications. Hybrid systems, safety and environmental aspects.

Unit 3: Photovoltaic Power Plants 7 Hours

Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV CellCharacteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parametersfor Photovoltaic Panels-Photovoltaic Systems-Applications of Photovoltaic Solar EnergyEconomical.

Analysis of Solar Energy. environment and social implications Solar Energy: Solarradiation its measurements and prediction, solar thermal flat plate collectors, concentratingcollectors, applications, heating, cooling, desalination, power generation, drying, cooking etc,principle of photovoltaic conversion of solar energy, types of solar cells and fabrication.

Photovoltaic applications: battery charger, domestic lighting, street lighting, and water pumping,power generation schemes.

Unit 4: Bio-Energy 8 Hours

Biomass resources and their classification, chemical constituents and physicochemical characteristics of biomass, biomass conversion processes, thermo chemical conversion: direct combustion, gasification, pyrolysis and liquefaction. Biochemical conversion: anaerobic digestion, alcohol production from biomass. Chemical conversion process: hydrolysis and hydrogenation.

Biogas: generation, types of Biogas Plants, applications

Induction Generators: Principles of Operation-Representation of Steady-State Operation-Power andLosses Generated-Self-Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation Speed and Voltage Control-Economical Aspects.

Unit 5: Storage Systems **8 Hours**

Energy Storage Parameters-Lead–Acid Batteries-Ultra Capacitors-Flywheels - SuperconductingMagnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage-Storage Heat -Energy Storage as an Economic Resource.Integration of Alternative Sources of Energy: Principles of Power Injection-Instantaneous Activeand Reactive Power Control Approach-Integration of Multiple Renewable Energy SourcesIslandingandInterconnectionControl-DGControlandPowerInjection.

Interconnectionof Alternative Energy Sources with the Grid: Interconnection Technologies Standardsand Codes for Interconnection-Interconnection Considerations -InterconnectionExamples for Alternative Energy Sources.

Text/Reference Books :

1. Rao and Parulekar, Energy Technology, Khanna Publishers, New Delhi, Second reprint 2002
2. G.D Rai, Non-conventional Energy Sources,Khanna Publishers, New Delhi, tenth reprint 2002
3. C. S. Solanki, ―Solar Photovoltaics Fundamentals, Technologies and Applications‖, PHI, 2011
4. B. H. Khan,―Non-conventional Energy Resources‖,TataMcGrawhill Publishing Co.Ltd.,2006
5. S.P. Sukhatme, J.K. Nayak, ―Solar Energy-Principals of Thermal Collection and Storage,Tata Mc Graw hill Publishing Co. Ltd., New Delhi 2008
6. J. Twidell and T. Weir, ―Renewable Energy Resources‖, E & F N Spon Ltd, London, 1999
7. Thomas Ackermann, ―Wind Power in Power System‖, John Willey &Sons.

BTEEL406 NETWORK THEORY LAB 1 Credits

Any Eight Experiments from the following list

Expt. No.	Title of Experiment
1	Verification of Kirchhoff's Laws
2	Verification of Superposition Theorem
3	Verification of Thevenin's Theorem
4	Verification of Norton's Theorem
5	Verification of Maximum Power Transfer Theorem
6	Verification of Reciprocity Theorem
7	Determination of transient response of RL & RC series circuits
8	To study Resonance in RLC series Circuit.
9	To study Resonance in parallel RLC Circuit.
10	Determination of driving point and transfer functions of a two port ladder network and verifywith theoretical values
11	To calculate and verify 'Z'Parameters of a Two-Port Network.
12	To calculate and verify 'Y' parameters of Two-Port Network.

BTEEL407 : Power System Lab **1 Credit**

Sr. No	Experiment Title
1	To study the layout of a Thermal Power Plant with its components.
2	To study the layout, classification and components of a Hydro Power Plant.
3	To study the alternator excitation system
4	To study the types and properties of various Overhead insulators
5	To study the types and properties of various Overhead Conductors.
6	To study the Power cable and its various components and types.
7	To study the layout of a substation along with its components
8	To determine the ABCD parameters of a medium and long transmission line.
9	To Visit a Thermal Power plant and write a technical report on the observations

(BTEEL408)ELECTRICAL MACHINE-II LABORATORY 01 Credits

Perform Any Eight experiment from given list as a part of practical submission

List of Experiment

1. Determination of sequence impedances of salient pole synchronous machine To perform
2. Determination of Xd and Xq of a salient pole synchronous machine from slip test.
3. V and inverted V curves of a3-phasesynchronous motor 1
4. Regulation of alternator by Direct loading method (R,L,C load)
5. Regulation of alternator by synchronous impedance method
6. Regulation of alternator by MMF method
7. Parallel operation of Synchronous generator
8. To study different types of starters for three phase Squirrel cage induction motor
9. Rotor resistance starter for slip ring induction motor.
10. To conduct no load and blocked rotor test and to determine performance characteristics of three phase induction motor from circle diagram
11. Load and block rotor tests on squirrel cage induction motor
12. Brake test on slip ring induction motor
13. To control speed of wound rotor induction motor by rotor resistance control method
14. To control speed of induction motor by V/F
15. To control speed of induction motor by i) star-delta ii) autotransformer

(BTEEL409) ANALOG AND DIGITAL ELECTRONICS LAB 01 Credits

Perform Any Eight experiment from given list as a part of practical submission

List of Experiment

1. To plot input characteristics and Output characteristics of common emitter configuration.
2. To plot frequency response of RC coupled and Transformed coupled amplifier
3. To measurement of OP-AMP parameter
4. To verify the operation of op amp in Inverting & Non-inverting mode on AC input
5. Verify truth table of following basic and derived gates
    a. AND, OR, AND
    b. Ex-OR, NAND, NOR
6. Verification of truth table of flipflop
7. Design and implementation of 3-bit synchronous up/down counter
8. Design and implementation of half and full adder using logic gates
9. Design and implementation of Multiplexer and De-multiplexer and study of IC74150 and IC 74154
10. Design and implementation of code converters
    a. Binary to gray code converter
    b. BCD to Excess 3