

BTEE-801 POWER SYSTEM ANALYSIS

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

SYSTEM MODELLING: System modelling of synchronous machines, transformers, loads etc, per unit system, single line diagram of electrical networks, single phase impedance diagrams. Formulation of impedance and admittance matrices for the electrical networks.

LOAD FLOW STUDIES: Data for the load flow studies, Swing Bus, Formulation of simultaneous equations, Iterative solutions by the Gauss-Seidal method and Newton Raphson Method.

FAULT ANALYSIS: Transients on transmission line, short circuit of synchronous machine, selection of circuit breakers, Algorithm for short circuit studies, Symmetrical Component transformation, construction of sequence networks of power systems. Symmetrical Analysis of Unsymmetrical Line-to-ground (LG), Line-to line (LL), double line to ground (LLG) faults using symmetrical components.

POWER SYSTEM STABILITY: Steady state stability, Dynamics of a synchronous machine , Power angle equations , Transient stability, equal area criterion, Numerical solution of swing equation , factors effecting transient stability.

BOOKS RECOMMENDED:

1. Elgerd O.I., *Electric Energy Systems Theory*, Tata McGraw Hill
2. Nagrath I.J., Kolthari D.P., *Modern Power System Analysis*, Tata McGraw Hill
3. Stevenson W.D., *Elements of Power System Analysis*, McGraw Hill
4. Nagrath I.J. and Kothari D.P., *Power System Engineering*, Tata McGraw Hill
5. Arrillaga J. and Arnold C.P., *Computer Analysis of Power Systems*, John Wiley & Sons
6. Stagg Glenn W. and Ei-Abiad Ahmed H., *Computer Methods in Power System Analysis*, Tata McGraw Hill
7. Kusic G.L., *Computer Aided Power System analysis*, Prentice Hall, India

Note: External question paper shall be set following guidelines to paper setter given at Page 61.

BTEE-802 HIGH VOLTAGE ENGINEERING

Internal Marks:	40	L	T	P
External Marks:	60	4	1	0
Total Marks:	100			

Extra High Voltage (EHV) Transmission and Corona Loss: Need for EHV Transmission. Use of bundled conductors, corona characteristics of smooth bundled conductors with different configurations, Corona loss. Factors affecting the corona loss. Radio interference due to corona. Shunt and series compensation in EHV lines. Tuned power lines. Insulation Co-ordination.

High Voltage Direct Current (HVDC) Transmission: Advantages, disadvantages and economics of HVDC Transmission system. Types of Direct Current (DC) links, converter station equipment, their characteristics.

Insulating materials for High Voltage Applications of insulating materials used in power transformers rotating machines, circuit breakers, cables, power capacitors.

Conduction and breakdown in Gases, Liquids and Solid Dielectrics:

Solids - Intrinsic, electromechanical and thermal breakdown composite dielectrics, solid dielectrics used in practice.

Liquids:- Conduction and breakdown in pure and commercial liquids, suspended particle theory, cavitation and bubble theory, stressed oil volume theory, Liquids used in practice.

Gases:- Ionization process, Townsend's current growth equations, 1st and 2nd ionization coefficients. Townsend's criterion for breakdown. Streamer theory of breakdown, Pashen's law of Gases. Gases used in practice.

Generation of High Voltages: High Voltage Direct Current (HVDC), High Voltage Alternating Current (HVAC), Power frequency and High frequency: Impulse voltage and impulse current Generation, Tripping and contact of Impulse Generator. Measurement of voltage and current: High voltage direct current, Alternating current and Impulse voltage and currents.

BOOKS RECOMMENDED:

1. Bagamudre, Rakesh Das *Extra High Voltage A.C. Transmission Engineering*, New Age International Publishers.
2. Kimbark E.W., *High Voltage Direct Current Transmission*, Wiley-Interscience
3. Kamaraju V. and Naidu M.S., *High Voltage Engineering*, Tata McGraw-Hill Education
4. Jha R.S., *High Voltage Engineering*, Dhanpat Rai
5. Kuffel, E. and Abdullah, M., *High Voltage Engineering*, Pergamon Press
6. Wadhwa C. L., *High Voltage Engineering*, New Age Publications.
7. Padiyar, K.R. *HVDC Power Transmission Systems: Technology and System Interactions*, New Age International

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BTEE-803 NON-CONVENTIONAL ENERGY SOURCES

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

INTRODUCTION: Limitation of conventional energy sources, need and growth of alternative energy source, basic scheme and application of direct energy conservation.

MHD GENERATORS: Basic principles, gaseous, conduction and hall effect, generator and motor effect, different types of Magneto-Hydro-Dynamic (MHD) generator, types of MHD material, conversion effectiveness, analysis of constant area MHD generator, practical MHD generator, application and economic aspects.

THERMO-ELECTRIC GENERATORS: Thermoelectric effects, Seebeck effect, Peltier effect, Thomson effect, thermoelectric converters, figures of merit, properties of thermoelectric material, brief description of the construction of thermoelectric generators, application and economic aspect.

PHOTOVOLTAIC EFFECT AND SOLAR ENERGY: Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency, solar batteries, application, solar radiation analysis, solar energy in India, solar collectors, solar furnaces and applications.

FUEL CELLS: Principle of action, Gibb's free energy, general description of fuel cells, types, construction, operational characteristics and application.

MISCELLANEOUS SOURCES: Geothermal system, hydro-electric plants, wind power, tidal energy, Bio-mass energy

BOOKS RECOMMENDED:

1. Gupta B. R., *Generation of Electrical Energy*, S. Chand.
2. Rai, G.D., *Non Conventional Energy Sources*, Khanna Publishers (2005).
3. Rao, S. and Parulekar, B.B., *Energy Technology: Non Conventional, Renewable and Conventional*, Khanna Publishers (2005).
4. Wadhwa, C.L., *Generation, Distribution and Utilization of Electric Energy*, New Age International (P) Limited, Publishers (2007).
5. Simon, Christopher A., *Alternate Source of Energy*, Rowman and LittleField Publishers Inc.(2007).
6. Venikov, V.A. and Putyain, E.V., *Introduction to Energy Technology*, Mir Publishers (1990).
7. Chakrabarti A., Soni M. L., Gupta P. V. and Bhatnagar U. S., *Power System Engineering*, Dhanpat Rai and Co.
8. Kothari D.P., Singal K.C. and Ranjan R., *Renewable Energy Sources and Emerging Technologies*, Prentice Hall (India)

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BTEE-804A POWER SYSTEM OPERATION AND CONTROL

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Introduction to Power Generation Units: Characteristics and its variations,

Economic Operation of Power Systems: Fuel consumption, Characteristics of thermal unit, Incremental fuel rate and their approximation, minimum and maximum power generation limits.

Economic Dispatch: Economic dispatch problem with and without transmission line losses, Unit Commitment and solution methods. Hydrothermal scheduling: fixed-head and variable head, Short-term and Long-term,

Power System Control: Power system control factors, interconnected operation, tie-line operations, Reactive power requirements, during peak and off peak hours, Elementary ideas of load frequency and voltage, reactive power control; block diagrams of P-f and Q-V controllers, ALFC control, Static and Dynamic performance characteristics of automatic load frequency control (ALFC) and automatic voltage regulator (AVR) controllers, Excitation systems.

Power System Security: Factors affecting security, Contingency analysis, Network sensitivity, correcting the generation dispatch by using sensitivity method and linear programming.

Power flow analysis in AC/DC systems: General, modelling of DC links, solution of DC load flow, discussion, per unit system for DC quantities, solution techniques of AC-DC power flow equations.

BOOKS RECOMMENDED:

1. Nagrath, I.J. and Kothari, D.P., *Power System Engineering*, Tata McGraw Hill (2007).
2. Stevenson W.D. and Grainger J.J., *Power System Analysis*, McGraw Hill (2007).
3. Arrillaga J. and Smith Bruce, *AC-DC Power System Analysis*, IEE Press
4. Elgerd, O.I., *Electric Energy Systems Theory: An Introduction*. 2nd Ed., Tata McGraw Hill, 1983.
6. Dhillon J.S., Kothari D.P., *Power System Optimisation*, 2nd Ed., Prentice Hall India, 2010
7. Kundur P, "*Power System Stability and Control*", Third Reprint, tat McGraw Hill, 2007
8. Murthy, P.S.R., "*Power System Operation and Control*", Tata McGraw Hill, 1984.
9. Saadat Hadi, "*Power System Analysis*", Tata McGraw Hill Edition, 2002.
10. Wood, A.J., and B. Wollenberg, "*Power Generation, Operation and Control*", 2nd Edition, John Wiley, NY, 1996.

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BTEE-804B ENERGY AUDITING AND MANAGEMENT

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Energy Scenario: Energy needs of growing economy, Long term energy scenario, Energy pricing, Energy sector reforms, Energy and environment: Air pollution, Climate change, Energy security, Energy conservation and its importance, Energy strategy for the future, Energy conservation Act-2001 and its features.

Energy Management and Audit: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments

Material and Energy balance: Facility as an energy system, Methods for preparing process flow, Material and energy balance diagrams.

Financial Management: Investment-need, Appraisal and criteria, Financial analysis techniques- Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracts and role of energy savings companies (ESCOs).

Electrical system: Electricity tariff, Load management and maximum demand control, Power factor improvement, Distribution and transformer losses. Losses in induction motors, Motor efficiency, Factors affecting motor performance, Rewinding and motor replacement issues, energy efficient motors. Light source, Choice of lighting, Luminance requirements, and Energy conservation avenues

Compressed air system: Types of air compressors, Compressor efficiency, efficient compressor operation, Compressed air system components, Capacity assessment, Leakage test Factors affecting the performance and efficiency

High Voltage Alternating Current and Refrigeration System: Vapor compression refrigeration cycle, Refrigerants, Coefficient of performance, Capacity, Factors affecting refrigeration and air conditioning system performance and savings opportunities, Vapor absorption refrigeration system: Working principle, Types and comparison with vapor compression system, Saving potential, Fans, Blowers and pumps- Types, Performance evaluation, Efficient system operation, Flow control strategies and energy conservation opportunities.

BOOKS RECOMMENDED:

1. Abbi, Y.P. and Jain, S., *Handbook on Energy Audit and Environment Management*, Teri Bookstore
2. Diwan, P., *Energy Conservation*, Pentagon Press (2008).
3. Younger, W., *Handbook of Energy Audits*, CRC Press (2008)
4. Sawhney and Maheshwari, *Solar Energy and Energy Conservation*, Prentice Hall (India)
5. Rao S. and B. B. Parulkar, *Energy Technology*, Khanna Publishers
6. Sukhatme S. P., *Solar Energy*, Tata McGraw Hill
7. David S., *Hand Book of Industrial Energy Conservation*, Van Nostrand Reinhold Publishing Company.

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BTEE-804C DIGITAL SIGNAL PROCESSING

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Introduction: Signals, Systems and Signal processing, Classification of Signals, Concept of frequency in continuous time and discrete time signals.

Discrete Time Signals and Systems: Discrete time signals, Discrete time systems, Analysis of discrete time linear time-invariant systems, Discrete time systems described by difference equations, Implementation of discrete system, Correlation of discrete time signals.

Z-Transform: The Z-transformation, properties of Z-transformation, Rational Z-transformation, Inversion of Z-transform, Analysis of linear time invariant systems in Zdomain.

Frequency Analysis of Signals and Systems: Frequency analysis of continuous time signals, Frequency analysis of discrete time signals, Properties of Fourier Transform for discrete time signals, Frequency domain characteristics of linear time invariant systems, linear invariant systems as frequency selective filters, Inverse systems and de-convolution.

The Discrete Fourier Transform: Frequency domain sampling, Properties of Discrete Fourier Transform (DFT), Linear filtering methods based on DFT, Frequency analysis of signals using the DFT.

Design of Digital Filters: General considerations, Design of Finite Impulse Response (FIR) filters, Design of Infinite Impulse Response (IIR) filters from analog filters, Frequency transformations, Design of digital filters based on least-square method and window method, Comparison of IIR and FIR filters.

BOOKS RECOMMENDED:

1. Oppenheim A.V. and Schaffer, R.W., *Digital Signal Processing*, Prentice Hall (India)
2. Kuo, Sen-Maw and Gan, Woon-Seng, *Digital Signal Processing architectures, Implementations, and Applications* McGraw Hill
3. Proakis John G., *Digital Signal Processing: Principles, Algorithms, and Applications*, Pearson Education 4th Ed. (2007)
4. Richard G Lyons, *Understanding Digital Signal Processing*, Pearson Education Publications.
5. Mitra K. Sanjit, *Digital Signal Processing*, 3rd ed. Tata McGraw Hill
6. Hayes Mansen, *Schaum's Outline of Digital Signal Processing*, Tata McGraw Hill, (2001)

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BTEE-804D INDUSTRIAL PROCESS CONTROL

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Description And Modeling of Various Industrial Processes: Model Classification, Mathematical Models, Physical Models, Analog Models, Estimation of Model Parameters, System Identification, Experimental Nature of Simulation, Steps Involved in Simulation Studies, Validation of Simulation Models, Computer Simulation of Continuous and Discrete Systems, Examples

Process Control: Types and Description of Processes, Blending, batch processes, compressor and chiller controls, distillation control, steam turbine and water treatment controls, boiler controls, reactor controls

Conventional Controllers: On-off Controllers, Cascade and Feed forward Controllers, Split Range Controllers, ratio controls, Single loop, multi loop and self tuning controllers, set point control (SPC), discrete digital control (DDC)

Intelligent Controllers: Fuzzy logic control, programmable logic controllers, PC based system, conventional and Windows-NT based distributed control system (DCS) systems, artificial intelligence and neural networks, smart and intelligent transmitters.

BOOKS RECOMMENDED:

1. Padmanabhan, Tattamangalam R, *Industrial Process Instrumentation and control* Springer Publishing
2. Andrew W.G. and Williams H.B., *Applied Instrumentation in the Process Industries*, Gulf Publishing, Houston
3. Nolting B.E., *Instrumentation Reference Book*, Elsevier India Pvt, New Delhi
4. Liptak B.G., *Instrument Engineer's Handbook (Process Control)*, Elsevier India Pvt, New Delhi.

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BTEE-804E NETWORKS AND DATA COMMUNICATION

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Introduction: Basic Concepts of analog and digital signals, data transmission concepts, Analog and digital transmission, transmission impairments

Transmission Media: Guided and Un-guided media, Performance, Shannon Capacity, Media Computerization

Encoding and Modulating: Digital-to-Digital conversion, Analog and digital conversion, Digital to Analog conversion, Analog to Analog conversion

Digital Data Communication: Digital data transmission, Data terminal equipment (DTE) - data circuit-terminating equipment (DCE) Interface, Electronic Industries Alliance (EIA)-449, EIA- 530, X.21 (Communication standard), Modems, Cable Modems

Multiplexing And Switching: Frequency-division multiplexing (FDM), wavelength-division multiplexing (WDM), Time-division Multiplexing (TDM) application- telephone systems, Digital subscriber line (DSL), Par Circuit switching , Packet Switching and Message switching virtual circuits

Spread Spectrum: Concept, Frequency hopping spread spectrum, direct sequence spread spectrum, code division Multiple Access

Error Detection and Correction: Types of Errors, Detection, Vertical Redundancy Check (VRC), longitudinal redundancy check (LRC), cyclic redundancy check (CRC), Checksum, Error Correction

Protocol Architecture: Protocols, Standards, OSI (Open Systems Interconnection) model, TCP (Transmission Control Protocol)/ IP (Internet Protocol) Protocol Architecture

BOOKS RECOMMENDED:

1. Ulyers D Balck, *Data Communication and Distributed Networks*, Prentice Hall (India)
2. Andrew S. Teanebaum, *Computer Networks*, Prentice Hall (India)
3. William Stallings, *Data and Computer Communication*, Pearson Education
4. Behrouz A Ferouzan *Data Communications and Networking*, Tata McGraw Hill.

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BTEE-804F DATA MINING AND PATTERN RECOGNITION

Internal Marks:	40	L	T	P
External Marks:	60	3	1	0
Total Marks:	100			

Data Mining: What is data mining, on what kind of data, Data Mining Functionalities

Data Warehouse: Difference Between operational database systems and data warehouses, A multidimensional data model, Data Warehouse architecture, data warehouse architecture, Data Warehouse implementation.

Data preprocessing: Data cleaning, data integration and transformation, data reduction.

Data Mining Query Language: Characterization and Comparison, Generalization, Mining association rules in large databases, constraint based association Mining Classification and prediction Classification by decision Tree Induction, Bayesian classification, classification by Back propagation Cluster analysis Partitioning Methods, Hierarchical methods, and Density and Grid based methods, Mining complex types of data, applications and trends in data mining, Social impacts of data mining.

Pattern recognition: Its importance and applications, applications in Bioinformatics, recognizing important bio-informatics sequences, other applications of pattern discovery.

BOOKS RECOMMENDED:

1. Pal. Sankar K. and Mitra P., *Pattern Recognition Algorithms for Data Mining*, Chapman and Hall/CRC
2. Elden L. *Matrix Methods in Data Mining and Pattern Recognition*. SIAM, 2007.

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BTEE-805A POWER QUALITY MONITORING AND CONDITIONING

Internal Marks:	40	L	T	P
External Marks:	60	3	1	0
Total Marks:	100			

Overview and definition of power quality (PQ): Sources of pollution, and regulations, Power quality problems rapid voltage fluctuations voltage unbalance, Voltage dips and voltage swells, Short duration outages,

Definitions Voltage sag analysis and mitigation: Sag caused by motor starting, Sag caused by utility fault clearing, Sag mitigation, Sag magnitude and duration calculations in single-phase systems, Equipment performance in presence of sag, Computers, Alternating current (AC) and direct current (DC) drives.

Harmonics: Effects-within the power system, Interference with communication Harmonic measurements. Harmonic elimination.

Harmonic distortion: Power system harmonics: harmonic analysis, Harmonic sources-the static converters, Transformer magnetization and non-linearities, Rotating machines, arc furnaces, Fluorescent lighting. Introduction to power converters, Fourier analysis, Total harmonic distortion, rms and average value calculations, Arcing and saturable devices, Effects of harmonic distortion, System response characteristics.

Principles for controlling harmonics: Locating sources of harmonics, Passive and active filters, Harmonic filter design.

Monitoring power quality: Monitoring essentials, Power quality measuring equipment, Current industry trends.

Power Conditioning: Electric power conditioning, Active and passive filters, IEEE, IEC, ANSI standards, Power Acceptability Curves, Various standards

BOOKS RECOMMENDED:

1. Beaty, H. and Santoso, S., *Electrical Power System Quality*, McGraw-Hill (2002).
2. Kennedy, B., *Power Quality Primer*, McGraw Hill (2000).
3. Bollen, M.H.J., *Power Quality Problems: Voltage Sag and Interruptions*, IEEE Press (2007).
4. Mohan, N., *Power Electronics*, New Age International (P) Limited, Publishers (2007).

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BTEE-805B HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

Internal Marks:	40	L	T	P
External Marks:	60	3	1	0
Total Marks:	100			

Direct Current (DC) power transmission technology: Introduction, comparison of Alternating Current (AC) and Direct Current (DC) transmission, application of DC transmission, application of DC transmission, description of DC transmission system, Configurations, planning for High Voltage Direct Current (HVDC) transmission, modern trends in DC transmission. Introduction to Device: Thyristor valve, valve tests, recent trends.

Analysis of High Voltage Direct Current (HVDC) converters: Pulse number, choice of converter configuration, simplified analysis of Graetz circuit, converter bridge characteristics, characteristics of a twelve-pulse converter, detailed analysis of converters with and without overlap.

Converter and HVDC system control: General, principles of DC link control, converter control characteristics, system control hierarchy, firing angle control, current and extinction angle control, starting and stopping of DC link, power control, higher level controllers, telecommunication requirements.

Converter faults and protection: Introduction, converter faults, protection against over-currents, over-voltages in a converter station, surge arresters, protection against over-voltages.

Smoothing reactor and DC line: Introduction, smoothing reactors, DC line, transient over voltages in DC line, protection of DC line, DC breakers, Monopolar operation, effects of proximity of AC and DC transmission lines.

Component models for the analysis of AC/DC systems: General, converter model, converter control, modelling of DC network, modelling of AC networks.

RECOMMENDED BOOKS:

1. Bagamudre, Rakesh Das *Extra High Voltage A.C. Transmission Engineering*, New Age International Publishers.
2. Kimbark E.W., *High Voltage DC Transmission*, Wiley-Interscience
3. Kamaraju V. and Naidu M.S., *High Voltage Engineering*, Tata McGraw-Hill Education
4. Jha R.S., *High Voltage Engineering*, Dhanpat Rai
5. Kuffel, E. and Abdullah, M. *High Voltage Engineering*, Pergamon Press
6. Wadhwa C. L., *High Voltage Engineering*, New Age Publications.
7. Padiyar, K.R. *HVDC Power Transmission Systems: Technology and System Interactions*, New Age International

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BTEE-805C VIRTUAL INSTRUMENTATION

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Introduction: Virtual Instrumentation - Definition, flexibility, Block diagram and Architecture of Virtual Instruments, Virtual Instruments versus Traditional Instruments, Review of LABVIEW software in virtual Instrumentation and programming techniques.

Data Acquisition In Virtual Instrumentation: Analog-to-Digital, Digital-to-Analog converters, plug-in Analog input/output cards, Digital Input/ Output cards, Organization of the Data acquisition (DAQ)-VI system, Opto-isolation, Performing analog input and analog output, Scanning multiple analog channels, Issues involved in selection of data acquisition cards, Data acquisition modules with serial communication.

Communication Networked Modules: Introduction to Personal Computer (PC) Busses, Local busses: Industry Standard Architecture (ISA), Peripheral Component Interconnect (PCI), RS232, RS422, RS485, Interface Busses, Universal Serial Bus (USB), Personal Computer Memory Card International Association (PCMCIA), Virtualization eXperience Infrastructure (VXI), Signal Conditioning eXtensions for Instrumentation (SCXI), PCI eXtensions for Instrumentation (PXI). Instrumentation Buses: Modbus, General Purpose Interface Bus (GPIB) Networked busses, ISO (International Organization for Standardization)/OSI (Open Systems Interconnection) Reference model, Ethernet TCP (Transmission Control Protocol)/ IP (Internet Protocol) protocols.

Real Time Control in Virtual Instrumentation and Applications: Design of ON/OFF controller, simulation of industrial instruments and systems, Virtual Instrumentation functions and objects including signal processing and analysis. Typical instruments and systems -digital storage oscilloscope, spectrum analyzer, waveform generator, Data visualization from multiple locations; Distributed monitoring and control devices.

BOOKS RECOMMENDED:

1. Wells L. K. and Travis J., *Labview for everyone*, Prentice Hall
2. Gupta S. and Gupta J.P., *PC interfacing for data acquisition and process control*, ISA
3. Rahman Jamal and Herbert Picklik, *Labview — Applications and solutions*, National Instruments Release
4. Gary Jhonson, *Labview Graphical programming*, McGraw Hill

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BTEE-805D ENERGY EFFICIENT MACHINES

Internal Marks:	40	L	T	P
External Marks:	60	3	1	0
Total Marks:	100			

INTRODUCTION: Need for energy efficient machines, energy cost and two part tariff, energy conservation in industries and farms -a necessity, introduction to energy management and energy audit system. Review of induction motor characteristics.

ENERGY EFFICIENT MOTORS: Standard motor efficiency, why more efficient motors? An energy efficient motor, efficiency determination methods, Direct Measurement method, Loss segregation method, Comparison, motor efficiency labelling, energy efficient motor standards. Motor life cycle

POWER FACTOR: The power factor in sinusoidal systems, power factor improvement, power factor with nonlinear loads, Harmonics and the power factor

INDUCTION MOTORS AND ADJUSTABLE DRIVE SYSTEMS: Energy Conservation, adjustable speed systems, Application of adjustable speed systems to fans, pumps and constant torque loads.

BOOKS RECOMMENDED:

1. Andreas John C., *Energy efficient electric motors*, Marcel Dekker Inc. 1992.
2. Thuman Albert, *Introduction to Efficient Electric System Design*, The Fairmount Press Prentice Hall.
3. Tripathi S.C. , *Electric Energy Utilization and Conservation*, Tata McGraw-Hill 1991.
4. Belove Charles, *Handbook of Modern Electronics and Electrical Engineering*, John Wiley & Sons.

BTEE-805E EMBEDDED SYSTEMS

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Introduction: Review of Embedded Hardware: Terminology, Gates, Timing Diagram, Memory, Microprocessor Buses, Direct Memory Access, Interrupts, Built instructions on the Microprocessor. Conventions used on Schematic, Interrupts, Microprocessor Architecture, Interrupt Basic, Shared Data Problem, Interrupt Latency.

PIC Micro controller and Interfacing: Introduction, CPU Architecture, Registers, Instruction Sets, Addressing Modes, Programs, Interfacing Methods, Parallel I/O Interface, Parallel Port Interface, Memory Interfacing, High Speed I/O Interfacing, Interrupt, Interrupt Service Routine, features of Interrupts, Interrupt vector and Priority, Timing Generation and Measurements, Input Capture, Output Compare, Frequency Measurement, Serial I/O Device RS232, RS485, Analog Interfacing, Applications.

Software Development and Tools: Embedded System Evolution Trends, Round – Robin, Robin with Interrupts, Function Scheduling architecture, Algorithms, Introduction to assembler, Compiler and Cross compilers and Integrated Development Environment (IDE), Object Oriented Interfacing, Recursion, Debugging Strategies, Simulators.

Real Time Operating Systems (RTOS): Task And Task States, Tasks and Data, Semaphores and shared data, operating system services, Message queues, Timer Function, Events, Memory Management, Interrupt Routines in an RTOS Environment, Basic Design Using RTOS.

BOOKS RECOMMENDED:

1. Gajski D.D., Vahid F., Gong J., Narayan S., *Specification and Design of Embedded Systems*, Prentice Hall.
2. Steve Heath, Newnes *Embedded systems Design*, Prentice Hall.
3. Balarin F., Chiodo, *Hardware Software Co-design of Embedded Systems*, Academic Publishers.

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BTEE-805F VISUAL PROGRAMMING

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100				

Introduction: Visual programming basics, Application framework fundamental, windows programming (Win32 programming), and Visual C++.memory management, Dynamic-link library (DLLs), Win32, Application programming interface (API).

Visual C++ components: Resource compiler, Microsoft Foundation Classes (MFC), modal Dialog, Windows Common Control, the Modeless Dialog and Windows Common Dialogs, ActiveX Control, Bitmap, Reading and Writing Documents, Serial digital interface (SDI), multiple document interface (MDI) applications.

Socket Programming using Win Sock, TCP/IP (TCP (Transmission Control Protocol/Internet Protocol), Document-View Structure, Microsoft Foundation Class (MFC) Libraries viz Cview, Cfile, Cpoint, Cdialog.

WIN32 Programming: WIN32 programming, Difference between a Windows program and a typical DOS program, Windows Programming modal, Windows Memory management, A skeletal Windows Application: WinMain function, Window Function, Components of a Skeletal Application, Windows style, Device context, Creation of LISTBOX class, Dialog Boxes and SCROLLBAR class.

BOOKS RECOMMENDED:

1. David J. Kruglenski *VISUAL C++ programming*, Microsoft Press
2. Newcomer, Addison, *WIN32 Programming*, Wesley
3. Petzold, Charles, *Programming Windows 3.1*, Microsoft press.

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BTEE-806 Laboratory-XIII (Power System Analysis)

Internal Marks:	30	L	T	P
External Marks:	20	0	0	2
Total Marks:	50			

Note: Atleast TEN experiments are to be performed in a semester. List of experiments is given below:

List of Experiments:

1. Design of transmission systems for given power and distance.
2. Short circuit calculations and calculations of circuit breaker ratings for a power system network.
3. Design of substations
4. Design of distribution systems
5. Y-bus formation
6. Z-bus formulation
7. Load flow analysis by Gauss Seidal method
8. Load flow analysis by Newto Raphson method
9. Fault analysis for line-to-line (L-L), Line-to-Ground (L-G) etc
10. Design of underground cabling system for substation.
11. To obtain power system stability on High Voltage Alternating current (HVAC) system with the help of Flexible Alternating Current Transmission Systems (FACTS) devices.
12. Optimal Capacitor placement on a system having variable reactive power and low voltage profile.
13. To obtain relay co-ordination on a power system.
14. To obtain optimal generator pricing on hydro-thermal and renewable energy systems.
15. To find synchronous reactances (Transient, sub-transient) during fault analysis.

BTEE-807 PROJECT WORK

Internal Marks: 60
External Marks: 40
Total Marks: 100

L T P
0 0 6

Design, Fabrication, Simulation, Evaluation, Testing etc. related to Electrical Engineering is to be carried out under the supervision of guide(s).

BTEE-808 SEMINAR

Internal Marks: 100
External Marks:
Total Marks: 100

L	T	P
0	0	2

Students will be required to prepare a report on a given topic related to latest developments in electrical engineering and deliver a seminar on that topic along with seminar report.