

# GAUTAM BUDDHA UNIVERSITY, GREATER NOIDA

## SYLLABUS FOR Ph.D. ELECTRICAL ENGINEERING: GBU-ET

### RESEARCH METHODOLOGY

**Nature and Purpose of Research:** Meaning of research, aim, Nature and scope of research, Prerequisites of research, Types of research: Exploratory, Descriptive and Experimental.

**Research Problem:** Types of research problems, Characteristics of a good research problem, Hypothesis: Meaning and types of hypothesis, Research proposal or synopsis.

**Research Methods:** Qualitative and Quantitative

**Review of Literature:** Purpose of the review, Identification of the literature, organizing the literature.

**Data Collection and Analysis:** Types of data, Methods of data collection, Sample and Population, Sampling Techniques, Characteristics of a good sample, Tools of Data Collection: Observation method, Interview, Questionnaire, various rating scales, Characteristics of good research tools.

**Descriptive Statistics:** Tabulation, Organization, and Tabulation and Graphical Representation of Quantitative data, Measures of Central Tendencies: Mean, Median, Mode Measures of Variability: Range, Quartile Deviation, Standard Deviation, and Coefficient of variation. Normal Probability Distribution: Properties of normal probability curve, Skewness and Kurtosis, Data analysis with Statistical Packages (MS-Excel, SPSS), Hypothesis Testing, Generalization and Interpretation.

**Research Report:** Structure and Components of Research Report, Types of Report, Characteristics of Good Research Report, Bibliographical Entries, Research Ethics.

## ELECTRICAL ENGINEERING

**Circuits and Networks:** Circuit's Elements and Theorems, Transient Response and Steady State Response for Sinusoidal and Arbitrary Inputs, Properties of Networks, Resonant Circuits, Three-phase Circuits, Transfer Function, Two-port Networks, Network Synthesis.

**Power Electronics, Electrical Machines & Drives:** Electric and magnetic fields and associated laws, DC machines Separately Excited, Series and Compound Machines, Induction Machines – Squirrel Cage and Wound Rotor, Synchronous Machines, Methods of Speed Control of DC and Induction Machines, Transformers, Testing of Machines, AC/DC Drives, Thyristor controlled reactors, characteristics and applications of power semiconductor devices. PWM techniques, UPS and SMPS, Power semi-conductor devices, Inverters, Converters and choppers.

**Power Systems:** Analysis of Transmission lines, Excitation System, Load Flow analysis, Economic Operation of Power System, Power System Stability and control, Automatic Generation Control, Fault Analysis, Power System Protection, Relays & Circuit breakers, FACTS Devices, power quality, HVDC & HVAC transmission, Electric Power Generation, Power Stations, Renewable Energy Sources and their applications, Energy management systems. Genetic Algorithms, Fuzzy Logic Algorithms, Neural Networks.

**Instrumentation and Control:** Units, Standards, Electrical measurements, Measurement of resistance, capacitance and frequency, Errors and analysis, Analog and Digital Measuring Instruments, Bridges and Potentiometers, Sensors and Transducers, Electronic measuring instruments, Data Acquisition Systems, Mathematical Modeling of Control Systems, Control System Components-electromechanical, hydraulic and pneumatic components, Transfer Function, Block Diagrams, Signal Flow Graphs, Stability analysis of Linear Systems using Routh array, Nyquist plot, Bode plot and Root locus. State Space Model. P, PI, PID Controllers, Basic concepts of compensator design, Discrete Data Systems, State Variable representation, Digital & Optimal Control systems.

**Analog, Digital Circuits and Micro-processors:** Semiconductor physics, diodes and transistors, various electronic devices and applications, switching behavior, biasing circuits, frequency response, small signal and large signal amplifiers, multi-stage and feed-back amplifiers, Oscillators. Coupling methods push pull and OPAMs, wave shaping circuits. Multi-vibrators and flip-flops, Digital logic and gates, universal gates, combinational circuits, sequential logic circuits, Counters, registers, ADC/DAC Converters. RAM and ROMs, 80 family Micro-processor architecture, Instruction set and assembly language programming, Interfacing for memory and I/O, Applications of Micro-processors in electrical engineering.