



डा बीआरअम्बेडकरराष्ट्रीय प्रौद्योगिकीसंस्थान, जालन्धर
Dr B R AMBEDKAR NATIONAL INSTITUTE OF TECHNOLOGY, JALANDHAR

ऊर्जा एवं पर्यावरण केन्द्र
Centre for Energy and Environment

Exam Syllabus for PhD Admission in Centre for Energy and Environment

I. General Aptitude (GA)

• **Verbal Aptitude**

Basic English grammar: tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other, parts of speech, Basic vocabulary: words, idioms, and phrases in context, Reading and comprehension, Narrative sequencing, verbal analogies, word groups, instructions, critical reasoning and verbal deduction

• **Quantitative Aptitude**

Data interpretation: data graphs (bar graphs, pie charts, and other graphs representing data), 2- and 3-dimensional, plots, maps, and tables, Numerical computation and estimation: ratios, percentages, powers, exponents and logarithms, permutations and combinations, and series, Mensuration and geometry, Elementary statistics and probability, numerical reasoning and data interpretation

II. Course Related

• **Fundamental of Energy Technology.**

Relevant principles of heat transfer, combustion, fluid mechanics, power systems, power grid, power plants, materials, etc.

• **Renewable Sources of Energy.**

Solar Radiation, Solar Thermal Energy collection - Flat Plate and focusing collectors their materials and performance. Solar Thermal Energy Storage, Applications – heating, cooling and Power Generation; Solar Photovoltaic Conversion; Harnessing of Wind Energy, Bio-mass and Tidal Energy – Methods and Applications, Working principles of Fuel Cells.

• **Scope of Renewable Energy and Resource Assessment**

Solar Energy, Wind Energy, Geothermal, Bioenergy, Hybrid systems, Energy planning, Economics, Potential, Assessment etc.



डा बीआरअम्बेडकरराष्ट्रीय प्रौद्योगिकीसंस्थान, जालन्धर
Dr B R AMBEDKAR NATIONAL INSTITUTE OF TECHNOLOGY, JALANDHAR

ऊर्जा एवं पर्यावरण केन्द्र
Centre for Energy and Environment

- **Power Systems.**

Fuels and their properties, Boilers, Steam turbines and other power plant components like condensers, air ejectors, electrostatic precipitators and cooling towers - types and applications, Power factor correction, Circuit breakers, Solar and wind power, environmental implications, Transistors, Thyristors, DC-DC switched mode converters, DC-AC switched mode converters, resonant converters, high frequency inductors and transformers, power supplies.

- **Engineering Materials.**

Alloys and phase diagrams, Ceramic, Magnetic and Insulating materials- properties and applications, Ferrous and Non Ferrous Metals, Non metallic materials, Nano-materials, Mechanical Properties and Testing, Corrosion prevention and control

- **Machines**

Shafts, Gears, Slider, Gyroscopes, Ships and aircrafts, Governors, Single phase transformers, three phase transformers, DC machines - types, windings, generator characteristics, Induction motors - principles, types, performance characteristics, Synchronous machines, Generators, Motor starting, characteristics and applications, servo and stepper motors.

- **Control Systems**

Ideal voltage and current sources, dependent sources, Basic concepts of electrical power generation, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, P, PI and PID controllers; State space model, Solution of state equations of LTI systems, R.M.S. value

- **Heat Transfer**

Steady and unsteady heat conduction, convection and radiation, thermal boundary layer and heat transfer coefficients, boiling, condensation and evaporation; types of heat exchangers and evaporators and their process calculations, Design of double pipe, shell and tube heat exchangers, and single and multiple effect evaporators.

- **Energy and Environment**

Energy impact on environment, Climate change, pollution, Carbon emissions etc., energy planning, economics, assessment, potential etc., Current status of Govt policies on Renewable Energy, India's target in energy sector