

# PhD in Energy; Energy & Environment (Regular)

Year 2018



## Pre PhD Syllabus

School of Energy & Environmental Studies  
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**SCHOOL OF ENERGY AND ENVIRONMENTAL STUDIES  
DAVV INDORE**

**PhD in Energy; Energy & Environment (Regular)**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits</b>
Ph.D-701	Research Methodology	4
Ph.D-702	Review of Published Research	3
Ph. D -703	Computer Applications	3
Ph. D -704	Advancement in Energy & Environment Systems & Technologies	3
	Comprehensive Viva-Voice	3
<b>Total</b>		<b>16</b>

## Ph D 701: Research Methodology

4 Credits (64 Hrs)

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### UNIT I

Foundation of Research : Motivation and objectives – Research methods Vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.

### UNIT II

Research Formulation – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

### UNIT III

Theory of Sampling - Population and sample Preliminary Ideas of Random, Stratifies, Systematic and Multistage including allocation of resources- Parameter and statistics – Sampling distribution and standard Error.

### UNIT IV

Theory of Testing Hypothesis: Meaning, Basic concepts, Null hypothesis – Alternate Hypothesis – Two types of errors levels of significance of a test – power of a Test. Limitations of Tests of hypothesis. Student T test, F test, Z test, ANOVA Table, Chi Square test est.

### UNIT VI

Correlation and Regression – Persons Coefficient for Raw and frequency. Data - Spearman's Rank Correlation Coefficient – Regression lines and their use – curve fitting – principle of Least squares- fitting of straight line – length – weight Relationship and Bertrand Growth equation – operational Research and its application, Measurement in Research.

### UNIT VII

Modeling Ecosystems- Population Dynamics, Models for single and interlinking, populations, stable points, Limit cycles, chaos, competition, prey predation.

### UNIT VIII

Research Modeling: Types of Models, Model building and stages, Data consideration and testing, Heuristic and Simulation modeling. Energy and Environmental System modeling

Report Writing: Pre writing considerations, Thesis writing, Formats of report writing, formats of publications in Research journals.

**Recommended Books:**

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1. Environmental systems- Benett R.J.
  2. Studies in Environmental Mathematics- Sinha D.K. Mishra A.
  3. Mathematical Modeling- Kapur S.N.
  4. Research methodology Methods & Techniques - C R Kothari
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**Ph.D-702: Review of Published Research**

**Credits 3 (48 Hours)**

Students suppose to prepare a Review Paper. Title of the review paper may be mutually decided by student and concern Supervisor. At the end of the Semester Review Paper needs to be presented in front of DRC.

## **Ph D – 703: Computer Applications: Energy Software**

**Credits 3 (48 Hours)**

### **UNIT I: ENERGY MANAGEMENT INFORMATION SYSTEM (EMIS)**

Introduction, Components, Design and Development issues, Concept of Energy Data, Energy Reporting, role of metering and measurement.

### **UNIT –II: USE AND APPLICATION OF OFFICE AUTOMATION TOOLS**

MS office (MS Word, MS Excel, MS Power Point, MS Access), simulation of statistical models.

### **UNIT – III: TRNSYS & MATLAB**

Introduction, use and application of various energy systems, designing and simulation Programs such as: PREBID, BIDWIN, PRESIM, TRNSHELL & TRNSED, Introduction, use and application of MATLAB.

### **UNIT – IV : DESIGN BUILDER & ENERGY PLUS**

Introduction, DesignBuilder Interface, Create Building Geometry, Drawing Option ,Modal Options, Introduction to Modal Datas, Data Management, Exerciser on Geometry and Modal Data., Heating & Cooling Design Calculation, Simulation using Hourly Weather data, timing-schedules, profiles, Holidays. Glazing & Solar Shading, Delighting, Natural ventilation, Simple HVAC, Design Builder Compact HVAC.

### **UNIT – V : RET Screen & ECOTECH**

Introduction and Modal Flow Chart, Energy Modal, Cost analysis, GHG Emission Reduction Analysis, Sensitivity and Risk Analysis.

#### **Recommended Books**

1. Turba, Information Technology, Wiley & Sons
2. Dennis P Curtin, Information Technology, TMH
3. Whitten, System Analysis & Design, TMH
4. A Handbook to EMIS, Published by the Office of Energy Efficiency of Natural
5. Resources Canada
6. Manuals of TRNSYS
7. Manuals of Design Builder
8. Computer and common sense- Roger Hunt and John Shelly.
9. Using MS –office 2000-Woody Leonhard.
10. The computer guide to MS –office-Ron Monsfield.
11. The complete ref, office 2000- Stephen L Nelson.
12. Learn DOS in a Day- Stulz

**UNIT I: Design of the Renewable energy conversion systems**

Solar energy system, Bio-energy system, Introduction to wind energy system and its design aspect, Sterling engine, Green IC engine, Low wind machine, ETP plant

**UNIT II: Process**

Solar Energy: Solar cooker, solar concentrator, solar water heater, solar distillation

Biomass: Biomass to bio-methanation, Biomass to gasification, Biomass to Pyrolysis, Biomass to bio-diesel, Biomass to bio-alcohol, stabilization

Algae to alcohol, Algae to biodiesel, Algae to alcohol, Algae to bio hydrogen, Algae to biogas.

**UNIT III: Mathematical Modeling**

Thermal comfort conditions, Green building, components of buildings Cooling system, heating system, ventilation system, energy efficiency in building, Techno economic model

**UNIT IV: System and Technology Development and Testing**

Solar water heating, solar cooking system, Solar Distillation. Biomass gasifier, bio-gas plant, biodiesel Plant, Bio-alcohol Plant (thermal mode), ETP Plant

**Reference Books:**

1. Arceivala S.J., and Asolekar S.R "Wastewater Treatment for Pollution Control and reuse "McGraw Hill , third Edition, New Delhi, 2007.
2. Kaup and Goss (1984) "Small Scale Gas Producer Engine System" Published by Friedr, Vieweg & Sohn Braunschweig/ Wiesbaden.
3. Klaus von Mitzlaff, "Engines for biogas- theory, modification & economic operation" Published by friedr. Vieweg & Sohn Braunschweig/ Wiesbaden
4. K M Mital, Biogas System - Principles & Applications Published by new Age international (p) Ltd, New Delhi
5. Manual on "Sewerage and Sewage Treatment" CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
6. Metcalf & Eddy, INC, Waste water Engineering – Treatment and Reuse, Fourth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.
7. N.C. Cheremisenoff, P.N. Cheremisenoff & F. Ellurbrush, Biomass- Application, technology & production, Marcel Dekker, New York, 1980
8. Reed, T. B. and Das, A. (1988) "Hand book of biomass down draft gasifier engine systems". Published by Solar Energy Research Institute, U.S. Dept. of Energy