

BHARATHIAR UNIVERSITY :COIMBATORE – 641 046

M.Phil./ Ph.D. in Applied Environmental Science

(DRDO-DEBEL)

(w.e.f. 2009-2010 and onwards)



**GOVT. OF INDIA, MINISTRY OF DEFENCE,
DEFENCE RESEARCH & DEVELOPMENT ORGANISATION,
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PART-I SYLLABUS

PAPER I : Research Methodology

PAPER II : Applied Environmental Science

PAPER III : Special Papers

1. Adsorption Studies of Carbon Materials

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M.Phil./ Ph.D. Applied Environmental Science – Syllabus for FT/PT

PAPER – I : RESEARCH METHODOLOGY

Unit – I

Research Material Collection, Preparation & Presentation

Methods of literature collection, experimental design, planning and execution of investigation – preparation of research and review articles for journals, thesis, research proposals – objectives, preparation, presentation and selective evaluation.

Unit – II

Statistical Analysis

Basic elements and tools of statistical analysis – Probability, sampling measurement and distribution of attributes – Approaches to development of models – Test of significance – Analysis of variance – one way and two way ANOVA – Regression and correlation – Linear, simple and multiple regression models – software in statistics – XPSS, design expert.

Unit – III

Spectroscopy – Principle , Instrumentation and Application

UV-Visible NIR spectrophotometer, Inductively Coupled Plasma (ICP) Spectroscopy, Flame Photometry, FTIR and Photoluminescence Spectrophotometer

Unit – IV

Chromatography – Principle, Instrumentation & Application

Paper, thin-layer Chromatography, Gas Chromatography – Mass Spectrometer, High-performance Liquid Chromatography and Ion Exchange Chromatography.

Unit – V

Characterization of Nanomaterials

Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM), X-ray Diffraction (XRD), Differential Scanning Calorimeter (DSC)/TGTA and Surface Area Analyzer.

References:

1. Statistics in Biology, Bliss, G.I.(1970). McGraw Hill, Vol I and II, New delhi.
2. Environmental Instrumentation, Fritschen, L.J. and Gay.L.W. (1979). Springer-Verlag, New york.
3. Analytical Biochemistry. Holme.D.L. and Peck H. (1983). Longman, London.
4. Hawk's Physiological chemistry, 14th Ed, Oser, B.L. (1965), Tata McGraw Hill, New Delhi.

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PAPER– II : Applied Environmental Science

Unit – I

Introduction

Concept and scope of Environmental chemistry – Environmental segments – Types of pollutants - chemical and photochemical reactions in atmosphere – Green house effect – role of microorganism – Soil pollution – wastes and pollutants in soil – Solid waste management.

Unit – II

Air Pollution

Introduction - Sources and classification – Air pollutant accidents - Effects of oxides of carbon, sulfur, nitrogen on Humans. Animals, plants – Economic effects – sampling procedures – Analytical methods – Control of air pollution by settling chamber, filters, electrostatic precipitators, scrubbers.

Unit – III

Water Pollution

Introduction - Sources – organic pollutants - contaminant processes in surface waters – waste water treatment – sampling procedures and preservation – procedures for analyses of water quality parameters.

Unit – IV

Instrumental techniques

Conductivity Meter, pH meter, Chemiluminescence, High performance liquid chromatography, Ion chromatography and Ion selective electrodes.

Unit – V

Legislation and Regulations

The water (Prevention and Control of Pollution) Act, 1974, as amended up to 1988 – The Air (Prevention and Control of Pollution) Act, 1981, as amended by Amendment Act, 1987 – Environment Impact Assessment Act 2006- The Environment (Protection) Act, 1986 – Hazardous Wastes (Management and Handling rules, 1989

References:

- 1.Fundamentals of Environmental Engineering – Danny D. Reible.
2. Air Pollution – M N Rao, H V N Rao.
- 3.Pollution Control Acts, Rules and Notifications
4. Environmental Sciences – A K De

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PAPER– III : ADSORPTION STUDIES OF CARBON MATERIALS

UNIT – I

Preparation of Adsorbent Materials

Activated carbon (AC) – Granular AC, AC Cloth, AC Membranes and AC Aerogels. Determination of factors affecting adsorption: pH, adsorbate concentration, particle size, adsorbent concentration, adsorbent properties, flow rate, bed volume, temperature and pressure.

UNIT – II

Properties of Adsorbent Materials

Structural parameters and models – Physico-chemical, mechanical and surface properties – Adsorption and wetting characteristics.

Unit – III

Adsorptive Removal of Toxic Gases (CO, NO_x, SO_x, H₂S & hydrocarbons)

Material for conventional and non-conventional gas adsorption – catalytic decomposition; Desulphurization methods – Regenerative and non-regenerative alkaline processes – Adsorption by liquids.

Unit IV

Adsorption Analysis

Kinetics of adsorption & Adsorption rate equations, Isotherms – Langmuir, Freundlich and B.E.T., Mechanism of adsorption of cations, anions, organics and surfactants – Electrostatic attraction / Repulsion model, ion exchange model, James-Healy model and surface complex models. Batch & Column dynamics and multisorbate sorption.

Unit – V

Applications

Direct and indirect measurement of adsorption of gases and vapors on active carbon using various techniques - Applications of active carbon based on its reactivity and catalytic properties – Laboratory and various uses – Industrial applications

References:

- 1.Active carbon - Milan Smisek, Slavoj cerny
- 2.Carbon fiber – Jean-Baptiste Donnet and Roop chand Bansal
- 3.Physical chemistry – Atkins
- 4.Adsorption & Adsorption processes by Ruthven.;
- 6.Sorption & Biosorption by B. Volesky.
