

M.Sc.

**ENVIRONMENTAL SCIENCE**

COURSE - I

**COMPUTER PROGRAMMING**

# CONTENTS

Page No.

## **BLOCK - I : INTRODUCTION**

Unit - 1 : Introduction to Computers	3
Unit - 2 : Computer Software	35
Unit - 3 : Programme Development and Cycle of Development	54
Unit - 4 : Algorithm, Problem, Solving and Flow Chart Representation	63

## **BLOCK - II : 'C' PROGRAMMING**

Unit - 5 : Compiling and Linking to 'C' Program	83
Unit - 6 : Introduction to 'C' Programming	89
Unit - 7 : Basic Data Types and Operators	96
Unit - 8 : Basic Input / Output, Expressions and Declarations	103

## **BLOCK - III : FUNCTIONS IN 'C' PROGRAMMING**

Unit - 9 : Statement and Iteration	115
Unit - 10 : Conditional Statements and Control Flow	122
Unit - 11 : Functions and Program Structure	126
Unit - 12 : Arrays	133
Unit - 13 : Strings and Files	140
Unit - 14 : The 'C' Preprocessor	148
Unit - 15 : Structures and Unions	155

## **BLOCK - IV : 'C++' PROGRAMMING**

Unit - 16 : Introduction to C++ Programming	187
Unit - 17 : Data Types and Calculations	192
Unit - 18 : C++ Classes	205
Unit - 19 : Function Overloading and Inheritance in C++	218
Unit - 20 : Memory Allocation	227

## **BLOCK - V : ENVIRONMENTAL SCIENCES WITH COMPUTERS**

Unit - 21 : Computer Applications in Environmental Sciences	235
---	-----

M.Sc.

# ENVIRONMENTAL SCIENCE

COURSE - II

ECOLOGY AND NATURAL RESOURCE  
MANAGEMENT

# CONTENTS

Page No.

## **BLOCK - I : ECOLOGY AND ECOSYSTEM**

Unit - 1	: Concept of Ecosystem, Structure and Function	3
Unit - 2	: Components of Ecosystem, Food Chain and Food Web	16
Unit - 3	: Ecological Succession	25
Unit - 4	: Aquatic and Forest Ecosystem	39
Unit - 5	: Environmental and Development : India's and Global	51

## **BLOCK - II : NATURAL RESOURCES**

Unit - 6	: Natural Resources - Forests	69
Unit - 7	: Water Resources, Multi-Purpose River Valley Projects, Water Resources Management	82
Unit - 8	: Mineral Resources, Uses and Hazards	93
Unit - 9	: Food Resources and Food Security	104
Unit - 10	: Energy Resources, Types and Management	116
Unit - 11	: Land Resources - Soils	125
Unit - 12	: Animal Resources	146

## **BLOCK - III : BIODIVERSITY AND CONSERVATION**

Unit - 13	: Biodiversity in India, Types of Diversity	173
Unit - 14	: Values of Biodiversity	182
Unit - 15	: Biodiversity - Rights and Obligations	193
Unit - 16	: Biodiversity Threats - Protection, Biodiversity Bill - 2000	208
Unit - 17	: Conservation of Biodiversity and Biotechnology	231

## **BLOCK - IV : ENVIRONMENTAL PROTECTION LAWS**

Unit - 18	: Statutory Law, Judicial Trends and Administrative Law	247
Unit - 19	: Environmental Protection Laws - Indian Scenario	255
Unit - 20	: Politico-Administrative Agencies, Legal Aspects, Intellectual Property Rights	263
Unit - 21	: International Treaties and Conventions	273

**M.Sc.**

**ENVIRONMENTAL SCIENCE**

**COURSE – III**

**ENVIRONMENTAL REMOTE SENSING  
AND GIS**



# CONTENTS

Page No.

## **BLOCK - I : INTRODUCTION TO REMOTE SENSING**

Unit - 1	: Fundamental Concepts of Remote Sensing	3
Unit - 2	: Energy Sources and Nature of EMR	9
Unit - 3	: Atmospheric Interactions with Electromagnetic Radiation	18
Unit - 4	: Energy Interactions with Earth Surface Materials	23

## **BLOCK - II : REMOTE SENSING PLATFORMS AND SENSORS**

Unit - 5	: Satellite Orbits and Instrumentation	35
Unit - 6	: Satellite System Parameters	56
Unit - 7	: Sensor Parameters	60
Unit - 8	: Resolution of Remotely Sensed Data	67

## **BLOCK - III : REMOTE SENSING DATA ANALYSIS**

Unit - 9	: Visual Image Interpret	83
Unit - 10	: Digital Data Formats and Data Processing	94
Unit - 11	: Digital Image Interpretation	102
Unit - 12	: Digital Image Classification	113

## **BLOCK - IV : GEOGRAPHICAL INFORMATION SYSTEMS AND GPS**

Unit - 13	: Components of GIS and GPS	123
Unit - 14	: GIS Database Creation	132
Unit - 15	: GIS Data Editing and Data Quality	139
Unit - 16	: GIS Data Analysis	149
Unit - 17	: Integration of Remote Sensing, GPS and GIS, Modelling	161

## **BLOCK - V : RS & GIS FOR ENVIRONMENTAL MANAGEMENT**

Unit - 18	: Land Resources	171
Unit - 19	: Geo-Sciences Applications	193
Unit - 20	: Water Resources	211
Unit - 21	: Oceanographic Applications	232
Unit - 22	: Forestry and Ecology	257

M.Sc.

# ENVIRONMENTAL SCIENCE

COURSE – IV

ENVIRONMENTAL HEALTH AND  
NATURAL HAZARDS



## **BLOCK - I : HEALTH CONCEPTS**

Unit - 1 : Health - Environment

Unit - 2 : Population Growth

Unit - 3 : Epidemiology

Unit - 4 : Community Health

## **BLOCK - II : HEALTH HAZARDS**

Unit - 5 : Radiation Hazards

Unit - 6 : Chemical Hazards - Air

Unit - 7 : Chemical Hazards - Water

Unit - 8 : Public Health and Environmental Toxicology

## **BLOCK - III : HAZARDS CONTROL, MITIGATION AND POLICY**

Unit - 9 : Air Quality Issues

Unit - 10 : Water Sanitation

Unit - 11 : Public Health Issues

Unit - 12 : Occupational Health Issues

Unit - 13 : Industrial Accidents

Unit - 14 : Toxic and Chemical Waste

Unit - 15 : Vector Control

## **BLOCK - IV : NATURAL HAZARDS**

Unit - 16 : Volcanoes

Unit - 17 : Earth Quakes and Tsunamis

Unit - 18 : Hill Slopes, Land Slides, Snowy Mountains

Unit - 19 : Floods, Cyclones, Droughts

## **BLOCK - V : ENVIRONMENTAL EDUCATION AND AWARENESS**

Unit - 20 : Need and Scope of Environmental Education

Unit - 21 : Need and Scope of Environmental Awareness

Unit - 22 : Environmental Awareness Programmes

3

10

16

26

39

47

60

66

79

86

97

102

109

114

124

137

150

165

177

189

196

201



M.Sc.

**ENVIRONMENTAL SCIENCE**

COURSE – V

**AIR POLLUTION AND CONTROL  
TECHNOLOGIES**



# CONTENTS

Page No.

## **BLOCK - I : INTRODUCTION**

- Unit - 1 : Air Pollution - Sources 3  
Unit - 2 : Global Sources - Importance of Anthropogenic Sources 15  
Unit - 3 : Behaviour and Fate of Air Pollutants 32  
Unit - 4 : Effects of Air Pollution 43  
Unit - 5 : Indoor Air Pollution 55  
Unit - 6 : Air Pollution Laws and Standards 66

## **BLOCK - II : METEOROLOGICAL ASPECTS**

- Unit - 7 : Air Pollution Dispersions - Temperature Laps Rates and Stability 83  
Unit - 8 : Plume Behaviour, Dispersion of Air Pollutants and Gaussian Plume Model 100  
Unit - 9 : Air Pollution Sampling and Measurement 113

## **BLOCK - III : AIR POLLUTION CONTROL TECHNOLOGIES**

- Unit - 10 : Control Methods - Sources, Correction Methods 129  
Unit - 11 : Emission Control Techniques 137  
Unit - 12 : Control of Specific Air Pollutants - Sources Wise 149

## **BLOCK - IV : AIR POLLUTION FROM AUTOMOBILES**

- Unit - 13 : Genesis of Vehicular Emissions - Origin and Mechanism 165  
Unit - 14 : Classification of Vehicles - Point Sources of Air Pollution from Automobiles 177  
Unit - 15 : Automobile Air Pollution - Indian Scenario 191  
Unit - 16 : Automobile Emission Control - Legal Measures 201

## **BLOCK - V : AIR POLLUTION FROM SPECIFIC INDUSTRIES**

- Unit - 17 : Thermal Power Plants 213  
Unit - 18 : Cement Industry 221  
Unit - 19 : Steel Industry 232  
Unit - 20 : Oil Refineries 241  
Unit - 21 : Paper Industry 249

## **BLOCK - VI : NOISE POLLUTION**

- Unit - 22 : Characterization of Sound and its Nature of Propagation 259  
Unit - 23 : Noise Sources, Control Measures and Health Effects 270  
Unit - 24 : Industrial Noise Control 270

**M.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**COURSE - VI**  
**ENVIRONMENTAL IMPACT ASSESSMENT**  
**AND**  
**HAZARDOUS WASTE MANAGEMENT**



# Contents

Page No.

## **Block-I : Environmental Impact Assessment - I**

Unit : 1	Basic Concepts of EIA	1
Unit : 2	EIA Methodologies	21
Unit : 3	EIA of Soil and Ground Water Enviroments	36
Unit : 4	EIA of Surface Water Environment	49

## **Block-II : Environmental Impact Assessment - II**

Unit : 5	EIA of Air Environment	63
Unit : 6	EIA of Noise Environment	80
Unit : 7	EIA of Biological Environment	96
Unit : 8	EIA of Socio-economic Environment	113
Unit : 9	EIA of Human health Environment	127
Unit : 10	Environmental Audit	137

## **Block-III : Solid Waste Management**

Unit : 11	ISO - 14001	151
Unit : 12	Solid wase Management	160

## **Block-IV : Hazardous Wastes**

Unit : 13	Sources, Characterstics and classification	176
Unit : 14	Sampling of hazardous waste	192
Unit : 15	Classification, storage and transportation	198
Unit : 16	Hazardous waste Management and Handling rules, 1989	210
Unit : 17	National hazardous waste Management strategy	229

## **Block-V : Hazardous Waste Management**

Unit : 18	Hazardous waste Management Practices	239
Unit : 19	Physical, Chemical and Biological treatment methods	253
Unit : 20	Thermal Process	265
Unit : 21	Disposal Methods of Hazardous Wastes	276

**M.Sc.**  
**ENVIRONMENTAL SCIENCE**

**COURSE – VII**

**WATER AND WASTE WATER  
TREATMENT TECHNOLOGIES**



# CONTENTS

Page No.

## **BLOCK - I : INTRODUCTION**

Unit - 1 : Sources of Water	3
Unit - 2 : Conveyance of Water	10
Unit - 3 : Quality of Water	25
Unit - 4 : Various Stages of Treatment	32

## **BLOCK - II : WATER TREATMENT PROCESSES**

Unit - 5 : Aeration	43
Unit - 6 : Sedimentation	55
Unit - 7 : Filtration - Rapid Sand Filters	66
Unit - 8 : Filtration - Slow Sand Filters	79
Unit - 9 : Disinfection	86

## **BLOCK - III : SEWAGE**

Unit - 10 : Sewage and Analysis	95
Unit - 11 : Sewage Treatment and Analysis	105
Unit - 12 : Solid Waste Disposal	125

## **BLOCK - IV : WASTE WATER**

Unit - 13 : Characterisation and Degree of Treatment	135
Unit - 14 : Primary Treatment	144
Unit - 15 : Secondary (Biological) Treatment	156
Unit - 16 : Conventional Biological Treatment	168

## **BLOCK - V : TREATMENT PROCESSES - I**

Unit - 17 : Sludge Treatment and Disposal	187
Unit - 18 : Low Cost Waste Treatment	200
Unit - 19 : Experimental Studies in Biological Waste Treatment	213
Unit - 20 : New Concepts in Biological Waste Treatment	221

## **BLOCK - VI : TREATMENT PROCESSES - II**

Unit - 21 : Removal of Odour and Colour	239
Unit - 22 : Industrial Waste Audit	249
Unit - 23 : Cleaner Technologies	267
Unit - 24 : Industrial Waste Treatment - Some Industries	282

**M.Sc.**  
**ENVIRONMENTAL SCIENCE**

**COURSE - VIII**

**GLOBAL ENVIRONMENTAL ISSUES**



# Contents

	Page No.
<b>BLOCK-I : GLOBAL WARMING</b>	<b>1</b>
Unit :1 Earth Radiation Budget	2
Unit :2 Sea Level rise	11
Unit :3 Global Warming and Green house gases	19
Unit :4 Impacts of Global Warming	26
Unit :5 Green solutions to global warming control	32
<b>BLOCK-II : OZONE DEPLETION</b>	<b>46</b>
Unit :6 Stratospheric Ozone depletion	47
Unit :7 Consequences of Ozone depletion	60
Unit :8 Green solutions for the protection of Ozone layer	72
<b>BLOCK-III : CLIMATE CHANGE</b>	<b>83</b>
Unit :9 Weather and Climate	84
Unit :10 Consequences of climate change	95
Unit :11 Green solutions to climate change	104
Unit :12 Climate change - India	114
Unit :13 Climate change - Agriculture	124
<b>BLOCK-IV : ACID RAIN</b>	<b>133</b>
Unit :14 Acid Rain - Impacts	134
Unit :15 Green solutions for Acid Rain	144
<b>BLOCK-V : NUCLEAR RADIATION</b>	<b>151</b>
Unit :16 Nuclear disasters	152
Unit :17 Consequences of Nuclear accidents	162
Unit :18 Green Technology for nuclear energy	175
<b>BLOCK-VI : GLOBALISATION - ENVIRONMENT</b>	<b>183</b>
Unit :19 Globalisation	184
Unit :20 Impacts of globalisation on Environment	192
Unit :21 Sustainability	201



**M.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**COMPUTER PROGRAMMING**  
**Practical Manual cum Record-1**  
**First Year**



# Contents

		Page No.
UNIT 1	MY FIRST PROGRAM	1
UNIT 2	VARIABLES, DATA TYPES AND OPERATORS	8
UNIT 3	BASIC INPUT AND OUTPUT	15
UNIT 4	CONDITIONAL STATEMENTS AND CONTROL FLOW	19
UNIT 5	REPETITION & LOOPING	26
UNIT 6	ARRAYS	34
UNIT 7	STRINGS	39
UNIT 8	FUNCTIONS	44
UNIT 9	THE C PREPROCESSOR	47
UNIT 10	FILES	52
UNIT 11	BASIC CONCEPTS ON C++	54
UNIT 12	DATA TYPES AND OPERATORS	60
UNIT 13	CLASSES	65
UNIT 14	FUNCTION OVERLOADING AND INHERITANCE	73
UNIT 15	MEMORY ALLOCATION	79

**M.Sc.**  
**ENVIRONMENTAL SCIENCE**

**C and C++ PROGRAMMING**

**Practical Manual cum Record-2**

**First Year**



# Contents

Page No.

<b>BLOCK 1 - WINDOWS XP</b>	
UNIT 1	1
UNIT 2	8
UNIT 3	15
UNIT 4	24

<b>BLOCK 2 - MS OFFICE</b>	
UNIT 5	29
UNIT 6	42
UNIT 7	56

<b>BLOCK 3 - INTERNET AND WWW</b>	
UNIT 8	68
UNIT 9	78
UNIT 10	

<b>BLOCK 4 - INTRODUCTION TO PROGRAMMING</b>	
UNIT 11	91
UNIT 12	96

M.Sc.  
**ENVIRONMENTAL SCIENCE**  
**REMOTE SENSING**

**Practical Manual cum Record-3**

**First Year**



# Contents

Page No.

<b>UNIT-1</b>	<b>VISUAL INTERPRETATION</b>	<b>1</b>
<b>UNIT-2</b>	<b>BASE MAP</b>	<b>11</b>
<b>UNIT-3</b>	<b>DRAINAGE MAP</b>	<b>15</b>
<b>UNIT-4</b>	<b>TRANSPORT NETWORK MAP</b>	<b>22</b>
<b>UNIT-5</b>	<b>SLOPE MAP</b>	<b>26</b>
<b>UNIT-6</b>	<b>WATERSHED MAP</b>	<b>30</b>
<b>UNIT-7</b>	<b>PHYSIOGRAPHIC MAP</b>	<b>35</b>
<b>UNIT-8</b>	<b>LAND USE/LAND COVER</b>	<b>38</b>
<b>UNIT-9</b>	<b>GEOLOGICAL MAPPING</b>	<b>43</b>
<b>UNIT-10</b>	<b>STRUCTURAL MAP</b>	<b>49</b>
<b>UNIT-11</b>	<b>GEOMORPHOLOGY MAP</b>	<b>54</b>
<b>UNIT-12</b>	<b>GROUNDWATER POTENTIAL MAP</b>	<b>62</b>

**M.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**GEOGRAPHIC INFORMATION SYSTEMS (GIS)**  
**Practical Manual cum Record-4**  
**First Year**



# Contents

	Page No.
<b>UNIT-1</b> <b>PROCEDURE OF SCANNING</b>	<b>1</b>
<b>UNIT-2</b> <b>DIGITIZATION OF MAPS</b>	<b>4</b>
<b>UNIT-3</b> <b>DATA BASE EDITING AND ANALYSIS</b>	<b>11</b>
<b>UNIT-4</b> <b>INTRODUCING ARC INFO DESKTOP APPLICATIONS</b>	<b>18</b>
<b>UNIT-5</b> <b>EXPLORING DATA WITH ARC CATALOG</b>	<b>25</b>
<b>UNIT-6</b> <b>USING MAPS 41</b>	<b>32</b>
<b>UNIT-7</b> <b>CREATING INDEXES AND GRATICULES</b>	<b>46</b>
<b>UNIT-8</b> <b>CREATING AND DESIGNING MAPS</b>	<b>55</b>
<b>UNIT-9</b> <b>ADDING LABELS</b>	<b>64</b>
<b>UNIT-10</b> <b>USING ARC TOOL BOX</b>	<b>76</b>
<b>UNIT-11</b> <b>BUILDING A GEODATA BASE</b>	<b>86</b>
<b>UNIT-12</b> <b>GEOREFERENCING RASTERS AND CREATING DATABASE</b>	<b>92</b>



**M.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**WATER ANALYSIS-I**  
**Practical Manual cum Record-5**

**Second Year**



# Contents

	Page No.
UNIT -1 WATER	1
UNIT -2 COLOUR	8
UNIT -3 ODOUR AND TASTE	11
UNIT -4 pH	15
UNIT -5 ELECTRICAL CONDUCTIVITY	19
UNIT-6 TOTAL DISSOLVED SOLIDS	23
UNIT-7 ALKALINITY	26
UNIT -8 HARDNESS BY EDTA METHOD	31
UNIT-9 CALCIUM	36
UNIT-10 MAGNESIUM	40
UNIT-11 SODIUM	43
UNIT-12 POTASSIUM	47

**M.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**WATER ANALYSIS-II**  
**Practical Manual cum Record-6**  
**Second Year**



# Contents

		Page No.
UNIT -1	TURBIDITY	1
UNIT-2	CHLORIDE	5
UNIT-3	BICARBONATES	9
UNIT-4	FLOURIDE	12
UNIT-5	SULPHATE	16
UNIT-6	NITRATE	20
UNIT-7	AMMONIA - NITROGEN	24
UNIT-8	NITRITE-NITROGEN	28
UNIT-9	PHOSPHATES	32
UNIT-10	RESIDUAL CHLORINE	38
UNIT-11	HEAVY METALS	44
UNIT-12	METALS DETERMINED BY ATOMIC ABSORPTION SPECTROPHOTOMETRY (AAS)	49

**M.Sc.**  
**ENVIRONMENTAL SCIENCE**  
**WASTE WATER AND AIR ANALYSIS**  
**Practical Manual-cum Record-7**

**Second Year**



# Contents

	Page No.
<b>INTRODUCTION</b>	<b>1</b>
<b>UNIT-1 CHLORINE DEMAND</b>	<b>2</b>
<b>UNIT-2 DISSOLVED OXYGEN (DO)</b>	<b>7</b>
<b>UNIT-3 BIOCHEMICAL OXYGEN DEMAND (BOD)</b>	<b>11</b>
<b>UNIT-4 CHEMICAL OXYGEN DEMAND (COD)</b>	<b>16</b>
<b>UNIT -5 COAGULATION WITH JAR TEST</b>	<b>21</b>
<b>UNIT -6 ACTIVATED SLUDGE PROCESS</b>	<b>25</b>
<b>UNIT -7 ANAEROBIC DIGESTION</b>	<b>29</b>
<b>UNIT -8 TOTAL ORGANIC CARBON</b>	<b>33</b>
<b>UNIT -9 ADSORPTION</b>	<b>36</b>
<b>UNIT- 10 PERMANGANATE VALUE</b>	<b>39</b>
<b>UNIT-11 DEFLUORIDATION WITH NALGONDA TECHNIQUE</b>	<b>43</b>
<b>UNIT -12 AIR</b>	<b>46</b>
<b>UNIT -13 ESTIMATION OF SULPHUR DIOXIDE</b>	<b>49</b>
<b>UNIT -14 ESTIMATION OF OXIDES OF NITROGEN</b>	<b>57</b>
<b>UNIT -15 ESTIMATION OF RSPM &amp; SPM</b>	<b>63</b>

M.Sc.  
**ENVIRONMENTAL SCIENCE**

**SOIL ANALYSIS**

**Practical Manual cum Record-8**

Second Year



# Contents

	Page No.
UNIT -1 SOIL	1
<b>PHYSICAL PARAMETERS</b>	
UNIT -2a MOISTURE CONTENT	11
UNIT -2b WATER HOLDING CAPACITY	16
UNIT -3a BULK DENSITY OF SOIL	17
UNIT - 3b SPECIFIC GRAVITY	20
UNIT -4 ELECTRICAL CONDUCTIVITY	23
UNIT -5 pH	27
UNIT -6 ALKALINITY	31
UNIT -7 CHLORIDE	34
UNIT -8 SULPHATE	37
UNIT -9 NITROGEN (KJELDAHL NITROGEN)	40
UNIT -10 NITRATE	44
UNIT -11 TOTAL PHOSPHOROUS	48
UNIT -12 CALCIUM	55
UNIT-13 MAGNESIUM	59
UNIT -14 SODIUM	63
UNIT -15 POTASSIUM	67
UNIT -16 ORGANIC MATTER	71