# Estd. 1962 "A<sup>+++</sup>" Accredited by NAAC(2021) With CGPA 3.52

#### SHIVAJI UNIVERSITY, KOLHAPUR - 416 004, MAHARASHTRA

www.unishivaji.ac.in, bos@unishivaji.ac.in

शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४,महाराष्ट्र

दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी ०२३१–२६०९०९३/९४



#### SU/BOS/Science/498

#### Date: 10/07/2023

#### To,

The Principal,	The Head/Co-ordinator/Director
All Concerned Affiliated Colleges/Institutions	All Concerned Department (Science)
Shivaji University, Kolhapur	Shivaji University, Kolhapur.

Subject: Regarding syllabi of B.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

#### Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of B.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

	B.ScII (Sem. III & IV) as per NEP-2020						
1.	Computer Science (Opt)	8.	Food Technology & Management (Entire)				
2.	Computer Science (Entire)	9.	Biochemistry				
3.	Animation (Entire)	10.	Biotechnology (Optional/Vocational)				
4.	Information Technology (Entire)	11.	Biotechnology (Entire)				
5.	Food Science and Technology (Entire)	12.	Environmental Science (Entire)				
6.	Food Science	13.	Pollution				
7	Food Science and Quality Control (Entire)						

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website <u>www.unishivaji.ac.in</u>)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Conv to.

**Dy Registrar** 

Dr. S. M. Kubal

Copy			
1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

# SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A' Grade CHOICE BASED CREDIT SYSTEM

Syllabus For

# **B.Sc. Part - II**

# **Environment Science (Entire)**

SEMESTER III AND IV

(Syllabus to be implemented from 2023-24 onwards)

#### **B.Sc. Part - II**

#### **Environment Science (Entire)**

#### SEMESTER III AND IV

#### (Syllabus to be implemented from 2023-2024 onwards.)

- Guidelines shall be as per B. Sc. Regular Programme
- ✤ Rules and Regulations shall be as per B.Sc. Regular Programme .
- Preamble:

This syllabus is framed to give sound knowledge with understanding of Environment science to undergraduate students of B.Sc. Environment Science (Entire) Programme. Students will learnEnvironment Science as a separate course (subject) from B. Sc. I. The goal of the syllabus is to make the study of EnvironmentScience popular, interesting and encouraging students for higher studies including research.

#### Programme Outcome:

- 1. This programme will lay strong foundation of environmental concepts for posts graduate education and research.
- 2. Helps students in capacity building, developing environmental programmes /projects based on sound technical, environmental and policy matters of Government of India.
- 3. Develop ability to carry out experiments and provide efficient conclusions.
- 4. Develop an approach to work for needs of society regarding environment, health, safety considerations.

#### Programme Specific Outcome:

- 1. This programme will make students to understand the concept of sustainable development.
- 2. This programme will provide in-depth knowledge to the students in respect of current environmental and safety problems faced by human society and to develop amongst students' scientific attitude based on interdisciplinary approach to enable them to takeholistic view in decision taking.

# Structure of Program and List of Courses are as follows:

# Structure of B. Sc. Environment Science (Entire) Programme Semester III & IV

#### Structure-II

	S E M E S T E R – III (Duration – 6 Months)															
_			]	TEACHI	NG	SCHE	ME			EXAMINATION SCHEME					1E	
Sr.	ct )	T	HEOR	Y		PI	RACTIC	AL			THE	ORY		PRA	CTICA	L
No.	Cours (Subjec Title	Credits	No. of lectures	Hours		Credits	No. of lectures	Hours		Hours	Max	Total Marks	Min	Hours	Max	Min
1	DSC-C1	2	3	2.4		4	8	64	1	2	50	100	35			
2	DSC-C2	2	3	2.4		-	0	0.4		2	50	100	55			
3	DSC-C3	2	3	2.4		4	8	64		2	50	100	35	PRA	CTICA	L
4	DSC-C4	2	3	2.4		•	0	0.1		2	50	100		EXAMINATION		ON
5	DSC-C5	2	3	2.4		4	8	6.4		2	50	100	35	IS A	NNUA	L
6	DSC-C6	2	3	2.4		•		0.1		2	50	100				
7	AECC-C	4	4	3.2	_				_							
	TOTAL	16	22	17.6		12	24	19.2	L			300				
		1 -	1 -	SEM	E	S T E I	$\mathbf{R} - \mathbf{IV}$	(Durati	ion	1 <b>- 6</b> I	Month	s)	1	T		
1	DSC-D1	2	3	2.4	-	4	8	6.4		2	50	100	35		100	35
2	DSC-D2	2	3	2.4						2	50	1		As per		
3	DSC-D3	2	3	2.4	-	4	8	6.4		2	50	100	35	BOS Guide-	100	35
4	DSC-D4			2.4						2	50			lines		
5	DSC-D5	2	3	2.4	-	4	8	6.4		2	50	100	35		100	35
0	DSC-D6	2	3	2.4			 	 		Z	50	1	05	]		
7	AECC-C									3	70	100	25 10			
		12	18	14.4	-	12	24	19.2	-		30	400				
	TOTAL	28	40	32		24	48	38.4	1			700			300	
0		1		1 20			r• \	<b></b>	1 3	<u>г</u> 1	<u> </u>				1000	
• 5	tudent contact	nours p	er we	ек: 32	$H_0$	ours (M	lin.)	• I ota		Tarks	$\frac{100 \text{ B.S}}{2}$	$\frac{\text{scII}(I)}{\alpha}$	nclud	ing EVS)	: 1000	
• Theory and Practical Lectures : 48 Minutes Each • Total Credits for B.ScII (Semester III & IV) : 52							52									
• DSC : - Discipline Specific Core Course : All papers are compulsory.																
• AECC- Ability Enhancement Compulsory Course (C) :																
Environmental Studies: EVS (Theory – 70 & Project – 30 Marks)																
• Practical Examination will be conducted annually for100 Marks per course (subject).																
• There shall be separate passing for theory and practical courses also for Environmental Studies.																

### Choice based Credit System with Multiple Entry and Multiple Exit Options Academic Year 2023-24 Second Year Bachelor of Science (Level-5) Program Structure (NEP-2020 PATTERN) CBCS B. Sc.: Environment Science (Entire): List of courses: B. Sc. Environment Science:

Sr. No.	Sem III	Sr. No.	Sem IV
DSC- C1	Disaster management -I	DSC- D1	Environmental engineering -I
DSC- C2	Disaster management -II	DSC-D2	Environmental engineering -II
DSC-C3	Environmental Impact Assessment -I	DSC-D3	Computer application & biostatics -I
DSC-C4	Environmental Impact Assessment -II	DSC-D4	Computer application & biostatics -II
DSC- C5	Environmental microbiology-I	DSC-D5	Occupational Health & Safety -I
DSC-C6	Environmental microbiology-II	DSC-D6	Occupational Health & Safety -II
AECC-C	Environmental studies	AECC-D	Environmental studies

#### Part 2 (Sem III & IV)

### **Practical**

DSC-P5	Lab Course V
DSC –P6	Lab Course VI
DSC –P7	Lab Course VII

# **DSC-C1 Disaster Management-I**

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understand the concepts, effects and mitigation measures of natural disasters.
- 2. Get acquainted with assessment of hazards and legal aspects.

Unit	Lecture Hours
Unit I	15
A: Introduction to natural disasters: Definition and types of natural disasters, concept and conditions of hazards, vulnerability, risk Guidelines for hazard assessment and vulnerability analysis, Assessment in sudden onset emergencies, assessment in slow onset emergencies	8
Disaster vulnerability in India and future trends	
<b>B: Flood, Drought, Tsunami, Earthquakes</b> Flood: Flood risk mapping, flood plain management, watershed management, climate variability and change, flood forecasting, flood mitigation Droughts: Definition, causes and types of drought, effects and mitigation of droughts, case studies Tsunami: History and causes of Tsunami, effects of Tsunami, warning and monitoring of Tsunami, mitigation of Tsunami	7
Unit II	15
A: Tornadoes, Hurricanes, Earthquakes Types of hurricanes, Katrina and Rita hurricanes, Effects of winds on buildings, Debris management planning Introduction to tornado, formation of tornado, monitoring and predicting tornadoes, types of tornadoes and mitigation measures Earthquakes: warning and effects of earthquakes, preventive measures of earthquakes	8
<b>B: Natural disaster mitigation and legal aspects</b> National Calamity Management Act, State Disaster Management Act Natural disaster management in national development Disaster management in India Practical and sustainable approaches to disaster recovery	7

#### **SUGGESTED BOOKS:**

1. Talwar A. K. and Juneja Satish (2009). Natural Disaster Management, Commonwealth Publication, New Delhi

2. Kapur Anu, Neeti, Meeta, Deeptima, Roshani, Debanjali., Disasters in India, Rawat Publications, New Delhi

3. Brenda D. Philips (2016). Disaster recovery. CRC press, London.

4. Arvind Kumar (2006). Disaster Management, Amol publications, New Delhi.

5. Prabhas C. Sinha (2006) Disaster Relief, SBS Publishers & Distributers PVT. Ltd., New Delhi.

6. Gupta Manisha (2018), Disaster Management, DND Publications, Jaipur

7. Gaur R.C. (2018), Environmental Engineering and Disaster Management, New Age International Publishers, Delhi

# DSC-C2 Disaster Management-II (Man made)

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understand causes and mitigation measures of man-made disasters.
- 2. Understand various measures of disaster preparedness and disaster management in India.

Unit	Lecture Hours
Unit I	15
A: Introduction to man made disasters:	
Concept and types of man-made disasters,	
road roil and air traffic accident industrial accidents.	7
Case studies: Bhopel gas leakage Chernobylpueleer explosion	/
Riological disasters: Enidemics: causes, offects and management Dangue	
HIV & AIDS, Covid 19, Mad cow disease	
B: Understanding the risk of man-made disasters: Introduction to	8
disaster risk, Key considerations for understanding disaster risk for	
industrial, chemical, nuclear, transport and marinepollution hazards	
Role of stakeholders in man-made disasters	
Unit II	15
A: Enhancing disaster preparedness:	
Key considerations for enhancing disaster preparedness for effectiveresponse of industrial, nuclear and transport hazards, Mock drill Case studies: Chernobyl recovery and development programme, UNECE convention on transboundary	7
effects of industrial accidents,Regional, transboundary early warning system Role of community in disaster management	
B: Introduction to multi hazard approach and Disaster	
Management in India:	
Reducing the risk of hazards, Collaboration, engagement and partnership,	
Multiple dimensions of disaster risk, GIS and remote sensing, Scientific	8
methodologies for monitoring, Innovation and technology, Communication and training	
Role of UNDP and NCDM in disaster management	

- 1. Kapur Anu, Neeti, Meeta, Deeptima, Roshani, Debanjali., Disasters in India, Rawat Publications, New Delhi
- 2. Brenda D. Philips (2016). Disaster recovery. CRC press, London.
- 3. Arvind Kumar (2006). Disaster Management, Amol publications, New Delhi.

# DSC-C3 Environmental Impact Assessment -I

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understand the need and objectives of EIA.
- 2. Understand the impacts of various developmental activities on environment.

Unit	Lecture Hours
Unit I	15
A: Introduction to EIA Definition, concept, objectives and scope of EIA,Elements and components of EIA, Baseline studies in EIA: pre and post monitoring, EIA in developed and developing countries, public participation inEIA, Uncertainties in EIA, EIA protocol and Term of Reference,EIA and legal aspects	7
<b>B: Methodologies and impacts of EIA</b> Impacts of EIA: negative and positive, tangible and intangible, reversible and irreversible, primary and secondary Methodologies of impact prediction: matrix methodology, networkmethodologies, checklist methodizes Public participation in EIA, identification of publics, selection of public participation techniques, Public hearing	8
Unit II	15
<b>C: Prediction of impact on air and water:</b> Identification of types and quantities of air pollutants and their impacts, impact predictions: mass-balance approaches, box modelapproach, air quality dispersion model,Identification and incorporation of mitigation measures Identification of surface water quality, impact predictions: mass balance approach, aquatic ecosystem modelling approach, mitigation measures	7
D: Prediction of impacts on soil, groundwater and socioeconomic	
<b>environment;</b> Identification of impacts on soil and groundwater, qualitative and quantitative approaches, assessment of impact significance, mitigationof impacts Prediction and identification of socio-economic impacts, education service impacts, traffic and transportation system impacts, Human health impacts EIA report writing	8

- 1. Canter L.W. (1996) Environmental Impact Assessment, McGraw-Hill, Inc., New Delhi.
- 2. A.K. Shrivastava (2017) Environmental Impact Assessment, A P H Publishing Corporation, New Delhi.
- 3. R.R. Barthwal (2012) Environmental Impact Assessment, New age international Publishers, New Delhi.

- 4. G. Madan Mohan (2008) Environmental and Sustainable Development, omegaPublication, New Delhi.
- 5. M. Anji Reddy (2019) Environmental Impact Assessment theory and Practice, BS Publication, Hydrabad.
- 6. R.R. Barthwal (2002) Environmental Impact Assessment, New age International publishers, New Delhi.

# **DSC-C4 Environmental Impact Assessment -II**

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understand the scope, objectives and need of environmental auditing.
- 2. Understand the importance of Environment Management System.

Unit	Lecture
 Unit I	Hours 15
Unit 1 Introduction to Environmental Auditing:	15
Preamble, scope and objectives of environmental auditing, Applicability of statutory environmental statement audit, Qualities of an environment auditor, Contents of EA reports. Preparation of documents for consent to establish/ consent to operate / Renewal	8
Frame and Tools of Environmental Auditing:	
Principle elements of an environmental audit: External audit and Internal audit, Need of Environmental Audit, Aims of EnvironmentalAuditing. Framework for a comprehensive audit: Identifying the auditors, Consultants, In- house auditing, Combining the external auditor andin-house staff, Community involvements. Tools for Auditing.	7
Unit II	15
A: Types and Procedure of Environmental Auditing: Background of auditing strategy, type of audit: Approach A & B, Environmental audit in India: Background of environmental audit,onjectives and advantages of environmental audit, Environmental audit procedure: Pre audit activities, activities at site, Post audit activities.	8
B: Environment Management System:	
Introduction, definition and need of Environment ManagementSystem, Scope, application and benefits of ISO certification, principles of ISO series Requirement of Environment Management System, Deming cycle of continuous improvement	7

- 1. Environmental audit by Mhaskar AK
- 2. Environmental audit by Mhaskar AK
- 3. Environmental Assessment and Statements by Harr and Hagerty (1977)
- 4. Environmental Auditing by Central Pollution Control Board.
- 5. Stoner, Freeman, Gilbert Management Prentice Hall of India Ltd., New Delhi VI<sup>th</sup>Edition
- 6. Environmental Auditing by Central Pollution Control Board

# DSC-C5 Environmental Microbiology-I

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understand the basic concepts and scope of environmental microbiology.
- 2. Study the mechanism of various waterborne and airborne diseases.

Unit	Lecture Hours
Unit I	15
A: Introduction to Microbiology Definition, Scope and history of Microbiology, Types of Microbiology: Medical, Agricultural, Industrial, Food Microbiology, Preservation and Maintenance of Microbial culture, Terms used in Microbiology: Uni cellular and Multi cellular organisms, Types of Microorganisms: Algae, Fungi, Protozoa, Viruses, Bacteria. Environmental microbiology, interrelations with other fields of microbiology and applications	7
<b>B: Water Microbiology</b> Introduction, Human diseases associated with water and their classification, Microbial agents associated with water borne diseases,Prevention and control of water borne diseases, Role of micro- organisms for the treatment of waste water Most probable number	8
Unit II	15
A: Air Microbiology Introduction to aerial microbiology, Transport and deposition of micro- organisms in air, Types of air borne microbial diseases and their causal agents, Mode of transmission, Allergic disorders by airmicro-flora, Indoor and outdoor air microbiology, Air sanitation:Ventilation, safety cabinets, disinfectants, sprays, Electro staticprecipitation, Bio-aerosol control in laboratory	8
<b>B: Soil Microbiology</b> Introduction to soil microbiology: Micro flora of soil, their functions and factors affecting their population Methods of studying Ecology of Soil microflora: Sample collection, Sample processing, Isolation of culture Biofertilizers study	7

- 1. Mark Coyne (1999), Soil Microbiology, Delmar Thomson lerning, New York.
- 2. K. Vijaya Ramesh (2004), Environmental microbiology, MJP Publishers, Chennai.
- 3. I Edward Alcamo (1998), Microbiology, Schaum's outline series, McGRAW- Hill, New Delhi.
- 4. G. Rangaswami (1993), Agricultural Microbiology, Prentice- Hall of India Ptv. Ltd., New Delhi.
- 5. P.D. Sharma (2005), Environmental Microbiology, Narosa Publishing House, New Delhi.
- 6. RG Buckley 2016), Environmental Microbiology, CBS Publishers, New Delhi.

# **DSC-C6 Environmental Microbiology-II**

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understand the need and importance of biofuels, biopesticides and vermicomposting.
- 2. Inculcation of biotechnology approaches to solve environmental problems.

Unit	Lecture
	Hours
Unit I	15
A: Introduction to environmental biotechnology:	
Introduction to environmental biotechnology, scope and objectives of	
environmental biotechnology,	
Vermicomposting: introduction, composting process, factors affectingcomposting,	7
characteristics of vermicompost and benefits	
Biofuels: Hazards due to fossil fuels, biofuels as alternative to fossil	
fuels, ethanol, biodiesel, biogas	
B: Biopesticides and biotechnology in forestry	
Biopesticides: introduction and approaches of biological control of pest,	
various bacterial insecticides, advantages and disadvantages of microbial	
insecticides, Use of pheromones for pest management, Biological control of	8
weeds, Biotechnology in forestry and wasteland development: tree	
improvement through biotechnology, tissue culture techniques	
Unit II	15
A: Biotechnology in combating environmental pollution	
Air pollution and its control through biotechnology, methods of	
biofiltration, Xenobiotics in environment, oxic and anoxic degradation of	7
xenobiotics,Biotechnological approach to address environmental problems	
B: Genetically Modified Organisms and IPR:	
Genetically Modified Organisms in environment, effects of GMO's on	
environment, effects on human health, biosafety management Environmental	0
biotechnology and Intellectual Property Rights	δ
Genetic engineering, concept of bio-safety, role of biotechnology in	
conservation of species	

- 1. Sohal H.S (1994), Environment and biothechnology, Ashish Publishing house, NewDelhi.
- 2. T. Srinivas (2008), Environmental Biotechnology, New age International Publishers, New Delhi.
- 3. H.K. Das (2017), Textbook of Biotechnology, Wiley Publications, New Delhi.
- 4. Scragg Alan (2011), Environmental Biotechnology, Oxford University Press, NewYork.
- 5. Buddola Viswanath, Environmental Biotechnology, Narosa publication house, NewDelhi.
- 6. Colin R., Kristiansen B.(2001), Basic Biotechnology, Cambridge University press, UK.
- 7. Bhattacharyya B. C., (2010), Environmental biotechnology, Oxford university press, New Delhi.
- 8. Jha Ashwini (2017), Environmental Biotechnology Principles and applications, Anmol Publication Pvt. Ltd., New Delhi

# Semester IV

# **DSC-D1 Environmental Engineering-I**

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understand the demand of water for various purposes.
- 2. Understand various steps involved in water treatment.

Unit	Lecture
Unit I	15
A: Introduction to Environmental Engineering & Water Supply Engineering	
Introduction to environmental engineering, Quality of water: rate of demand,	
factors affecting rate of demand, Population forecasting and methods of	
population forecasting sources of water supply: Surface runoff, precipitation,	8
measurement of rainfall	
B: Introduction to waste water engineering:	
Characteristics of waste water: Physical, Chemical and Biological	
Constituents in waste water and their sources, Domestic and industrial waste	7
water sources	
Unit II	15
Primary treatments to waste water:	8
Screening: types of screens, gravity separation, particle settling theory, grit	
removal: grit characteristics and types of grit chambers, equalization tank,	
primary and Secondary settling tank, clarifier tank	
Aeration, types of aeration systems, stabilization ponds.	
Secondary treatments to waste water:	7
Objectives of biological treatment, coagulation and flocculation, Aerobic biological	
oxidation, Trickling filters and types of trickling filters, root zone technology	
biological nitrification and denitrification, activated sludge process, sludge drying	
beds, Bio-digesters, lagoons	

- 1. Mathur Shruti, Kumar Rajendra (2017), Water on earth, Rawat Publication, New Delhi
- 2. Rangwala S.C., Rangwala K.S. (2004, Water supply and sanitary engineering, Charotar Publising House, Anand
- 3. Basak N.N. (2012), Environmental Engineeing, Tata McGraw Hill Education Private Limited, New Delhi
- 4. Rao M.N., Datta A.K. (2018), Waste water treatment, CBS Publishers and Distributors Pvt Ltd, New Delhi

# Semester IV DSC-D2 Environmental Engineering-II

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Study the characteristics and constituents in waste water.
- 2. Understanding primary, secondary and tertiary treatments to be provided to waste water.

Unit	Lecture Hours
Unit I	15
<b>Tertiary treatments to waste water:</b> Introduction to filtration, theory of filtration, classification of filters, essential parts of filter, advantages and disadvantages of filters, Membrane filtration Disinfection: introduction to disinfection, methods of disinfection, Chlorination, properties of chlorine, applications of chlorine, Reverse Osmosis	8
<b>B: Engineering systems for water purification</b> Softening, and water conditioning, Types of hardness, removal of temporary and permanent hardness, Lime soda process, zeolite process, Ion exchange and carbon adsorption	7
Unit II	15
A: miscellaneous methods of sewage treatment Septic tank, Imhoff tank, Water sterilization: ozonation, UV Radiation Flow chart of WTP, STP, ETP and CETP	8
<b>B: Designing of treatment plants</b> Water quality standards: drinking and effluent Water Quality Index	7
Designing of WTP, STP, ETP and CETP plant	/

- 1. Mathur Shruti, Kumar Rajendra (2017), Water on earth, Rawat Publication, New Delhi.
  - 2. Rangwala S.C., Rangwala K.S. (2004, Water supply and sanitary engineering, Charotar Publising House, Anand
  - 3. Basak N.N. (2012), Environmental Engineeing, Tata McGraw Hill Education Private Limited, New Delhi
  - 4. Rao M.N., Datta A.K. (2018), Waste water treatment, CBS Publishers and Distributors Pvt Ltd, New Delhi

- 5. Mark J. Hammer (2015), Water and wastewater, Pearson Publication, Noida
- 6. Mackenzie L. Davis, David A. Cornwell (2014), Introduction to environmental engineering, New York
- 7. R. Parker, N. Morris, F.N. Fair, S.C.Bhatia (2008), Waste water engineering, CBS Publishers and Distributors, New Delhi
- 8. Patra K. C. (2002), Hydrology and water resources engineering, Narosa publishing house, New Delhi
- 9. Metcalf and Eddy (2003), Waste water engineering treatment and reuse, Tata McGraw Hill, New Delhi.

# Semester IV DSC-D3 Computer Application and Biostatics-I

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Understanding use of statistical methods for environmental studies.
- 2. Understanding methods of collection and analysis of data.

Unit	Lecture Hours
Unit I	15
A: Introduction to statistics: Definition and functions of statistics, origin of statistics, statistical methods, characteristics of statistical data, importance of statisticsin biological and physical sciences, limitations of statistics, Types of data, methods of collecting data: primary and secondarydata, classification and organization of data, Vital statistics: Introduction, measures of mortality, standard deathrate, measures of fertility, life tables	7
<b>B: Diagrammatic representation and measures of centraltendency</b> Bar graph, histogram, frequency polygon, pie chart, Ogive curveIntroduction to measures of central tendency, Arithmetic mean, weighted arithmetic mean, geometric mean, harmonic mean, mode, median: introduction, merits and demerits, relation between mean, mode and median	8
Unit II	15
A: Measures of dispersion: Introduction and characteristics of good measure of dispersion, absolute and relative measures, Mean deviation and coefficient of mean deviation, mean deviationin continuous and discrete series, merits and demerits, Range and co- efficient of range, Quartile deviation and co-efficient of quartile deviation Standard deviation: standard deviation for discrete and continuousseries, merits and demerits, Variance, coefficient of variation	7
<b>B: Sampling, Coerrelation and regression</b> Introduction to sampling, steps involved in sampling, types andmethods of sampling, Correlation and regression: relation between variables, linear, regression analysis, regression analysis of grouped data, correlationanalysis, Karl Pearson's coefficient of correlation	8

- 1. Gupta C. B., Gupta Vijay (2010) An Introduction to Statistical Methods, Asian Books Pvt. Ltd., New Delhi
- 2. Bhowal M. K., Barua Pronob (2006) Statistics. Daya Publishing House, New Delhi.
- 3. Gupta S. P. (2005), Statistical Methods, Sultan Chand and Sons Publishers, New Delhi

- 4. Gaur A.S., Gaur S.S. (2006), Statistical Methods for Practice and Research, Sage Publication, New Delhi
- Medhi J. (2006), Statistical Methods, New Age International Publishers, New Delhi
  Rastogi V. B., (2009) Fundamental of Biostatistics, Ane Books Pvt. Ltd., New Delhi

# Semester IV

# **DSC-D4** Computer Application and Biostatics-I

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

1. Understand the basic concepts of hardware and software.

2. Learn various computer applications through report writing in MS word and presentation of data through Excel and power point

Unit	Lecture
	Hours
Unit I	15
A: Introduction to Computer	
Computer characteristics and Functionalities, Applications, Generations Types,	
Block Diagram, Concept of Hardware and Software	
	7
B: Input and Output Devices	
Input devices- Keyboard, mouse, joystick, scanner, MICR, OMR, OCR. Output	
Devices- Monitor, Printers (Impact and non-impact), plotterFlat-bed and drum,	_
Selection of printer and paper for output depending upon user requirements.	8
Memory- concept, primary memory – RAMSRAM, DRAM, ROM- PROM,	
EPROM, EEPROM, cache memory, Secondary memory- floppy disk, hard	
disk, Optical storage devices, Pen drive.	
Unit II	15
A:MS Excel	7
Basics of Excel – Ribbon, Workbook, worksheet, Format options, templates,	
data validation, sorting and filtering of data, FunctionsCount and Sum, Logical,	
Date and Time, Text, Lookup and References, financial and statistical functions,	
Using formula, Charts- column, pie, bar, line, scatter piot, data series	
<b>B:</b> MS word and MS PowerPoint MC Words Interchertism and features. Creating grand decompany Editing features	
MS Word : Introduction and feature, Creating word document, Editing features,	0
lext formatting options, page formatting –adding header and footer, page	8
number, insert page break, blank page, cover page, page orientation, print	
options. Working with tables, creating Table of Contents, Mail merge, shortcut	
keys, cursor control keys. MS PowerPoint: Features, factors to be considered for	
effective presentation, Creating Basic presentation, Editing and formatting	
options, inserting picture, chart, table, audio and video to slide, using animation	
and slide transition	

- 1. Schuurman, Nadine. 2000. "Troublein the Heartland: GIS and its Critics in the 1990s." Progress in HumanGeography, vol. 24, no. 4, pp. 569-590.
- 2. Schuurman, NadineandG.Pratt.2002."CareoftheSubject: Feminism andCritiquesof GIS."Gender,Placeand Culture,vol.9,no.3, pp.291-299.
- 3. Schuurman, Nadine. 2004. GIS-AShortIntroduction. BlackwellPublishing.
- Computer Fundamentals- P. K. Sinha 5. Operating System Godbole 6. Computer Today-S. Basndara 7. Computer Fundamentals- V. Rajaraman

# Semester IV DSC-D5 Occupational Health and Safety-I

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Get acquainted with importance of industrial safety to workers and use of PPE'S.
- 2. Making students to understand the methods of strategic planning for hazard prevention.

Unit	Lecture
	Hours
Unit I	15
A: Introduction to Occupational Health and Safety	
Introduction: Occupational Health and hazards, Types of Industrial Hazards	
Prevention of Occupational Health Hazards: medical, Engineering, Legislation	
and Administrative Measures.	7
B: Industrial Accidents	
Accidents: Introduction, causes: potential and actual causes, Approach to	
Accident Prevention Policy and Responsibilities, Accident Prevention	
Measures: 5E's, Preventing unsafe acts and conditions, Safety tag system,	8
Safety in Housekeeping, Employees training in safety and hazard check list	
Unit II	15
A: Fire Safety	7
Introduction of fire and its effects, Class of fire and fire extinguisher rating Fire precautions, measures to prevent fire, Types of fire extinguishers: water extinguisher, CO2 extinguisher, halon extinguisher, Powder extinguisher, how to use extinguisher	
B: Safety Management Systems	
Key elements of Safety Management System (ISO 14001, OHSAS 18001), ILO	
Legislation: Convention and Recommendation concerning Safety, Health and	8
Environment as Human Right issue.	
Safety Auditing	

- 1. Manual of fire safety by N Sesha Prakash.
- 2. Industrial and occupational Health by SK Haldar.
- 3. Safety Management by RK Mishra
- 4. Essentials of Safety Management by H.L.Kaila, A. Singh, S. Ravishankar and S.V Kamat

# Semester IV

# DSC-D6 Occupational Health and Safety-I

# Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

#### **Course Outcome:**

- 1. Get acquainted with importance of industrial safety to workers and use of PPE'S.
- 2. Making students to understand the methods of strategic planning for hazard prevention.

Unit	Lecture Hours
Unit I	15
A: Safety Education and Training	
Education as a safety tool, Safety training, Safety Habitat,	
Determining safety Training: Needs and Priorities, Training	
Methods and Aids, Employees participation in Safety	7
Participative Safety Activities: safety campaigns, safety contests,	
safety meeting and safety suggestion system	
B: Safety Management System	8
Introduction, organization and personnel, planning, safety	
management system, management representative, competence	
mapping, communication, design, emergency preparedness,	
system audit, review, safety committees, corrective action plan,	
right of employees, personal protective equipment.	
Unit II	15
A: Industrial Hygiene	7
Concept and importance of industrial hygiene,	
Physical hazards: heat, stress and its control, ventilation, noise,	
thermal radiation, X-ray and UV radiation, effects of exposure,	
prevention and control	
B: Safety and Motivation	
Motivating employees for safety: characteristics, importance, kinds,	
methods and advantages of motivation, Emergency Preparedness	8
Plan, MSDS, Personal Protective Equipment's,	-

- 5. Manual of fire safety by N Sesha Prakash.
- 6. Industrial and occupational Health by SK Haldar.
- 7. Safety Management by RK Mishra
- 8. Essentials of Safety Management by H.L.Kaila, A. Singh, S. Ravishankar and S.V Kamat

# Lab course

DSC-P5	Lab Course V
Sr. No.	Name of Experiment
1	Study of plotting of graphs and diagrams
2	Determination of measures of central tendency
3	Determination of measures of dispersion
4	Determination of correlation coefficient and regression
5	Preparation of life table
6	Determine fertility, natality and mortality rate of given population
	Use of MS word for report preparation
7	Use of MS excel for result preparation
8	Use of MS power point for preparing presentations
9	Determination of scale of aerial photographs
10	
11	Demonstration of Fire Extinguisher
12	Visit to CETP/ WTP/ STP

DSC –	Lab Course VI
P6	
Sr. No.	Name of Experiment
1	Preparation of media for microbial culture
2	Isolation of bacteria from soil and decaying matter
3	Isolation of culture of microbes from water
4	Study of cultural charachteristics of microorganisms
4	Gram staining
5	Study of motility of microorganisms
6	Study of microorganisms by Standard Plate Count method
7	Determination of MPN from given water sample
8	Isolation of Nitrogen fixing bacteria from root nodules
9	Determination of Sulphate from water sample
10	Determination of permanganate value of water
11	Estimation of water quality index
12	Study of vermicomposting techniques through field visit
13	Study of anaerobic digestion of cattle waste

DSC-P7	Lab Course VII
G . N	
Sr. No.	Name of Experiment
1	Determination of Hexavalent Chromium
2	Determination of oil and grease from given waste water sample
3	Langelier calcium carbonate saturation index
4	Determination of nitrite from water sample
5	Determination of nitrate from water sample
6	Analysis of Sulphur Dioxide in ambient air
7	Analysis of Nitrogen Oxides in ambient air
8	Measurement of noise levels at silence, residential and commercial zone
9	Visit to Wetland
10	Visit to wildlife