



Estd. 1962
NAAC 'A' Grade

SHIVAJI UNIVERSITY, KOLHAPUR-416 004. MAHARASHTRA

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शिवाजी विद्यापीठ, कोल्हापूर – 416004.

दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग- २६०९०९४)

फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

SU/BOS/Science/8644

Date: 29/08/2019

To,

The Principal,
College of Non-Conventional Vocational Courses for Woman,
SIBER, Kolhapur.

Subject: Regarding syllabi and Structure of B.Sc. Part- I Environmental Science (Entire) CBCS (Sem.I & II) 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, Structure, Subject list, Nature of question paper of **B.Sc. Part- I Environmental Science (Entire) under the Faculty of Science and Technology.**

This syllabi, Structure, Subject list, Nature of question paper shall be implemented from the academic year 2019-2020 (i.e. from June 2019) onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in (Online Syllabus)

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

Thanking you,

Yours faithfully,

Dy Registrar

Copy to:

1	The Dean, Faculty of Science & Technology	7	Appointment Section
2	Director, Board of Examinations and Evaluation	8	P.G.Seminar Section
3	The Chairman, Respective Board of Studies	9	Computer Centre/IT Cell
4	B.Sc. Exam	10	Affiliation Section (P.G./U.G.)
5	Eligibility Section	11	Affiliation Section (T-II)
6	O.E. I Section	12	P.G.Admission Section

SHIVAJI UNIVERSITY, KOLHAPUR.



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

Syllabus For

B.Sc. Part - I

Environment Science (Entire)

SEMESTER I AND II

(Syllabus to be implemented from June, 2019 onwards)

B.Sc. Part - I
Environment Science (Entire)

SEMESTER I AND II

(Syllabus to be implemented from June, 2019 onwards.)

- ❖ Guidelines shall be as per B. Sc. Regular Programme
- ❖ Rules and Regulations shall be as per B.Sc. Regular Programme except CBCS R.B.Sc.3 Structure of Programme and List of Courses.
- ❖ 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 learn Environment Science as a separate course (subject) from B. Sc. I.

The goal of the syllabus is to make the study of Environment Science 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 take holistic view in decision taking.

Structure of Program and List of Courses are as follows:

Structure of B. Sc. Environment Science (Entire) Programme Semester I & II Structure-I

SEMESTER – I (Duration – 6 Months)														
Sr. No.	Course (Subject) Title	TEACHING SCHEME						EXAMINATION SCHEME						
		THEORY			PRACTICAL			THEORY				PRACTICAL		
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Max	Total Marks	Min	Hours	Max	Min
1	DSC-A1	2	5	4	2	4	3.2	2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL		
2	DSC-A2	2						2	50					
3	DSC-A3	2	5	4	2	4	3.2	2	50	100	35			
4	DSC-A4	2						2	50					
5	DSC-A5	2	5	4	2	4	3.2	2	50	100	35			
6	DSC-A6	2						2	50					
7	DSC-A7	2	5	4	2	4	3.2	2	50	100	35			
8	DSC-A8	2						2	50					
9	AECC-A	2	4	3.2	-----	-----	-----	2	50	50	18			
Total		18	24	19.2	8	16	12.8	-	450					
SEMESTER – II (Duration – 6 Months)														
1	DSC-B1	2	5	4	2	4	3.2	2	50	100	35	As per BOS Guide-lines	50	18
2	DSC-B2	2						2	50					
3	DSC-B3	2	5	4	2	4	3.2	2	50	100	35			
4	DSC-B4	2						2	50					
5	DSC-B5	2	5	4	2	4	3.2	2	50	100	35			
6	DSC-B6	2						2	50					
7	DSC-B7	2	5	4	2	4	3.2	2	50	100	35			
8	DSC-B8	2						2	50					
9	AECC-B	2	4	3.2	-----	-----	-----	2	50	50	18			
Total		18	24	19.2	8	16	12.8	-	450			200		
Grand Total		36	48	38.4	16	32	25.6		900					
<ul style="list-style-type: none"> • Student contact hours per week : 32 Hours (Min.) • Theory and Practical Lectures : 48 Minutes Each • DSC – Discipline Specific Core course: All papers are compulsory. • AECC – Ability Enhancement Compulsory Course (A & B)- English • Practical Examination will be conducted annually for 50 Marks per course (subject). • There shall be separate passing for theory and practical courses. 						<ul style="list-style-type: none"> • Total Marks for B.Sc.-I (Including English) : 1100 • Total Credits for B.Sc.-I (Semester I & II) : 52 								
(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC) For Sem I: CCC – I : Democracy, Elections and Good Governance														
(B) Non-Credit Self Study Course : Skill Development Courses (SDC) For Sem II: SDC – I : Any one from following (i) to (v) i) Business Communication & Presentation ii) Event management iii) Personality Development, iv) Yoga & Physical Management v) Resume, Report & proposal writing														

Structure of B. Sc. Environment Science (Entire) Programme Sem III & IV
Structure – II

SEMESTER – III (Duration – 6 Months)														
Sr. No.	Course (Subject) Title	TEACHING SCHEME						EXAMINATION SCHEME						
		THEORY			PRACTICAL			THEORY				PRACTICAL		
		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	6.4	2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL		
2	DSC-C2	2	3	2.4				2	50					
3	DSC-C3	2	3	2.4	4	8	6.4	2	50	100	35			
4	DSC-C4	2	3	2.4				2	50					
5	DSC-C5	2	3	2.4	4	8	6.4	2	50	100	35			
6	DSC-C6	2	3	2.4				2	50					
7	AECC-C	4	4	3.2	---	---	---			---	---			
	TOTAL	16	22	17.6	12	24	19.2			300	---			
SEMESTER – IV (Duration – 6 Months)														
1	DSC-D1	2	3	2.4	4	8	6.4	2	50	100	35		As per BOS Guide-lines	
2	DSC-D2	2	3	2.4				2	50					
3	DSC-D3	2	3	2.4	4	8	6.4	2	50	100	35			
4	DSC-D4	2	3	2.4				2	50					
5	DSC-D5	2	3	2.4	4	8	6.4	2	50	100	35			
6	DSC-D6	2	3	2.4				2	50					
7	AECC- C AECC- D	---	---	---	---	---	---	3	70 30	100	25 10	---	---	---
	TOTAL	12	18	14.4	12	24	19.2			400	---			
		28	40	32	24	48	38.4			700	--	---	300	
<ul style="list-style-type: none"> Student contact hours per week : 32 Hours (Min.) Theory and Practical Lectures : 48 Minutes Each 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 for 100 Marks per course (subject). <i>There shall be separate passing for theory and practical courses also for Environmental Studies.</i> 					<ul style="list-style-type: none"> Total Marks for B.Sc.-II (Including EVS) : 1000 Total Credits for B.Sc.-II (Semester III & IV) : 52 									

Structure of B. Sc. Environment science (Entire) Programme Sem V & VI
Structure – III

S E M E S T E R – V (Duration – 6 Months)																
Sr. No.	Subject Title	TEACHING SCHEME						EXAMINATION SCHEME								
		THEORY			PRACTICAL			THEORY				PRACTICAL			PRACTICAL EXAMINATION IS ANNUAL	
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Theory	Internal	Min Marks	Hours	Max Marks	Min Marks		
1	DSE-E1	2	3	2.4	2	5	4	2	40	10	14+4=18					
2	DSE-E2	2	3	2.4	2	5	4	2	40	10	14+4=18					
3	DSE-E3	2	3	2.4	2	5	4	2	40	10	14+4=18					
4	DSE-E4	2	3	2.4	2	5	4	2	40	10	14+4=18					
5	AECC-E	2	4	3.2	---	---	---	2	40	10	14+4=18					
TOTAL		10	16	12.8	8	20	16	200	50	---						
S E M E S T E R – VI (Duration – 6 Months)																
1	DSE-F1	2	3	2.4	2	5	4	2	40	10	14+4=18	As per BOS Guidelines	50	18		
2	DSE-F2	2	3	2.4	2	5	4	2	40	10	14+4=18		50	18		
3	DSE-F3	2	3	2.4	2	5	4	2	40	10	14+4=18		50	18		
4	DSE-F4	2	3	2.4	2	5	4	2	40	10	14+4=18		50	18		
5	AECC-F	2	4	3.2	---	---	---	2	40	10	14+4=18		---	---	---	
TOTAL		10	16	12.8	8	20	16	200	50	---						
GRAND TOTAL		20	32	25.6	16	40	32	400	100	--		---	200			
<ul style="list-style-type: none"> • Student contact hours per week : 32 Hours (Min) • Theory and Practical Lectures : 48 Min. Each • DSE- Discipline Specific Elective : All papers are compulsory. • AECC- Ability Enhancement Compulsory Course (E & F) : English • Practical Examination will be conducted annually for 200 Marks. • <i>There shall be separate passing for theory, internal and practical.</i> 																
<p>(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC) For Sem V: CCC – II : Constitution of India and Local Self Government</p>																
<p>(B) Non-Credit Self Study Course : Skill Development Courses (SDC) For Sem VI: SDC – II: Any one from following (vi) to (x) vi) Interview & Personal Presentation Skill, vii) Entrepreneurship Development Skill, viii) Travel & Tourism, ix) E-Banking & Financial Services, x) RTI & Human Right Education (HRE), IPR & Patents</p>																

CBCS B. Sc.: Environment Science (Entire): List of courses:

i) B. Sc Environment Science: Part 1 (Sem I & II)

Course code	Name of Course	Course code	Name of Course
Sem I		Sem II	
DSC-A1	Ecology & Ecosystem	DSC-B1	Fundamental of Environmental Pollution -2 (air & noise)
DSC-A2	Natural Resources	DSC-B2	Biological Diversity and Conservation
DSC-A3	Fundamentals of Geosciences	DSC-B3	Climate Change and Sustainable Development
DSC-A4	Fundamentals of Environmental pollution-1[Water]	DSC-B4	Forest Management
DSC-A5	Fundamentals of environmental Science	DSC-B5	Solid and Hazardous Waste management
DSC-A6	Soil Science	DSC-B6	Occupational Health & Safety
DSC-A7	Fundamentals of Environmental Chemisrty	DSC-B7	Remote sensing & GIS
DSC-A8	Fundamentals of Environmental Biology	DSC-B8	Computer Applications
AECC – A	English – I	AECC – B	English – II

Practical

DSC-P1	Lab Course I (Based on DSC-A1, DSC-A2, DSC-A3, DSC-A4)	DSC-P3	Lab Course III (Based on DSC-B1, DSC-B2, DSC-B3, DSC-B4)
DSC-P2	Lab Course II (Based on DSC-A5, DSC-A6, DSC-A7, DSC-A8)	DSC-P4	Lab Course IV (Based on DSC-B5, DSC-B6, DSC-B7, DSC-B8)

DSC EVS: - Discipline Specific Core Course B.Sc. (Environment Science)

AECC: - Ability Enhancement Compulsory Course: Compulsory English

ii) **B.Sc. Environment Science:Part 2 (Sem III & IV)**

Course code	Name of Course	Course code	Name of Course
Sem III		Sem IV	
DSC-C1	Disaster Management-1 (Natural)	DSC-D1	Environmental Microbiology
DSC-C2	Biostatistics	DSC-D2	Environmental Management System & Audit
DSC-C3	Environmental Ethics and Environmental Issues	DSC-D3	Environmental Engineering - 2[waste water]
DSC-C4	Environmental Engineering - 1[water]	DSC-D4	Environmental Education & policy
DSC-C5	Environmental impact Assessment	DSC-D5	Environmental Economics
DSC-C6	Environmental Biotechnology	DSC-D6	Disaster Management–II(Man made)
AECC – C	Environmental Studies (Theory)	AECC – D	Environmental Studies (Project)

AECC-C: - Ability Enhancement Compulsory Course: Environmental Studies

Practical

DSC-P5	Lab Course V (Based on DSC-C1, DSC-C2, DSC-C3)	DSC-P7	Lab Course VII (Based on DSC-D1, DSC-D2, DSC-D3)
DSC -P6	Lab Course VI (Based on DSC-C4, DSC-C5, DSC-C6)	DSC-P8	Lab Course VIII (Based on DSC-D4, DSC-D5, DSC-D6)

iii) **B. Sc. Environment Science:Part 3 (Sem V & VI)**

Course code	Name of Course	Course code	Name of Course
Sem V		Sem VI	
DSE-E1	Land and water management	DSE-F1	Environmental Toxicology
DSE-E2	Environmental Legislation	DSE-F2	Ecorestoration
DSE-E3	Carbon Sequestration & Ecological Footprints	DSE-F3	Sustainable Agricultural Practices
DSE-E4	Wildlife Management	DSE-F4	Ecotourism
AECC – E	English – III	AECC – F	English – IV

Practical

DSC-P9	Lab Course IX (Based on DSC-E1, DSC-E2)	DSC-P11	Lab Course XI (Based on DSC-F1, DSC- F2)
DSC -P10	Lab Course X (Based on DSC-E3, DSC-E4)	DSC-P12	Lab Course XII (Based on DSC-F3, DSC- F4)

Semester I
Ecology and Ecosystem – Paper I
(DSC-A1 – Ecology and Ecosystem)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Understand the basic concepts regarding ecology and ecosystem.
2. Get acquainted with biogeochemical cycles and succession.

Unit	Lecture Hours
Unit I	15
A: Ecology Definition, Scope and basic principles of ecology and environment. Biological levels of organization, population, community, ecosystem and biosphere. Climatic factors - Light, temperature, water and precipitation. Population: Basic concepts, population characteristics – density, natality, mortality, immigration, emigration Age-structure, population growth. Ecological niche and habitat.	8
B: Ecosystems Ecosystem: Basic concepts, components of ecosystem. Trophic levels, food chains and food webs. Ecological pyramids, ecosystem functions. Energy flow in ecological systems, energy efficiencies Positive and negative interactions among populations – competition, predation, parasitism, mutualism.	7
Unit II	15
A: Biogeochemical Cycles Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Global Oxygen Cycles. Hydrological cycles.	8
B: Succession Succession: Concepts of succession, Types of Succession. Trends in succession. Climax and stability. Major biomes of the world. Characteristics of terrestrial fresh water and marine ecosystems. Forests, grasslands, lake, river and marine ecosystems of India.	7

SUGGESTED BOOKS:

1. Muller-Dombois, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.
2. Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.
3. Robert Ricklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.
4. Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management. Wiley Eastern Limited, Lucknow, India.
5. Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut.
6. Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York

Semester I
Natural Resources – Paper II
(DSC-A2 – Natural Resources)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Introduction to the concept of natural resources and its classification.
2. Understanding natural resources of India.

Unit	Lecture Hours
Unit I	15
A: Classification of Natural Resources Definition, Concept of natural resources and classification of resources-Renewable and non-renewable resources, Advantages and disadvantages of Renewable and non-renewable resources. Energy use pattern in world. Energy scenario at national level and its impacts on environment	7
B: Natural Resources of India Natural resources of India with Reference to : occurrence, distribution and utilization with special reference to i)Land resources ii)Soil resources iii)Mineral resources Mineral Resources: Utilization of metallic minerals (Iron, Aluminum and Manganese) and non-metallic minerals (Mica, Asbestos, Common Salt).	8
Unit II	15
A:Forest and Wildlife Resources Forest and wildlife resources: Concepts, Forest resources: Forest vegetation, status and distribution of forest and wildlife resources, contribution as resource. forest cover and types, Major and minor forest products	7
B:Conventional and Non-conventional Resources Energy demand analysis Fundamental of Energy: Energy; work and power; different forms of energy.Conventional Energy Sources and Technology: Coal, petroleum; natural gas, nuclear energy, Non conventional resources; solar, water, wind, tidal, geothermal resources, biomass energy	8

SUGGESTED BOOKS:

1. Cabbage, Frederick, Jay O’Laughlin, and Nils Peterson. 2015 (in preparation). Natural Resource Policy. Waveland Press. Chapters available on-line at NC State University electronic reserves.
2. Chaudhuri AB and Sarkar DD (2003) Megadiversity Conservation, Flora, Fauna and Medicinal Plants of India’s Hotspots. Daya Publishing House, New Delhi.
3. Environmental Resources by Mathur
4. Singh MP, Singh BS and Soma S. Dey (2004) Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
5. Singh, B. K. 2004: Biodiversity Conservation and Management, Mangaldeep Publications, Jaipur
6. Mital, K. M. 1997: Non-conventional Energy System, Wheeler Publishers, New Delhi

7. Singh, A. K. 1987: Forest Resources, Ecology and Environment, Concept Publishing Co., New Delhi
8. Sarma, P. K.: Forest Resources and their Utilization in India, Mittal Publishers, New Delhi
9. Agrawal, V. P.: Forestsin India, Oxford & IBH, New Delhi
10. Tyner, W.E.: Energy Resources and Economic Development in India, Allied Pub. Pvt. Ltd.
11. Mital, K.M. 1997: Non-conventional Energy System, Wheeler Publishers, New Delhi
12. Pachauri, R. K.: Energy, Environment and Development, Vol. I & II, HarAnand Pub. Pvt. Ltd

Semester I
Fundamentals of Geoscience – Paper III
(DSC-A3 – Fundamentals of Geoscience)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Understand origin of earth and different theories of evolution.
2. Awareness about various phenomenons taking place in atmosphere.

Unit	Lecture Hours
Unit I	15
A: Origin of Earth and Theories of Evolution Origin of Earth, Primary geochemical differentiation, Different types Rocks and Minerals, Control on formation of landforms-tectonic including plate tectonics and climatic Theories of Evolution- Wagener’s Continental drift Theory, Plate tectonic Theory	8
B: Hydrosphere and Trace Elements Water Resources and Environment: Global Water Balance. Origin and composition of sea water. Introduction to trace elements, Classification of trace elements, trace elements and health, possible effects of trace elements, biochemical factors in environmental health	7
Unit II	15
A: Weather and Atmospheric Phenomenon Concept of weather, climate, metereology, Earth’s thermal environment & seasons, Coriolis force, Indian mansoon, Droughts, El Nino phenomenon, La Nina phenomenon, its effects on rainfall pattern	8
B:Energy Budget and Temperature Inversion Energy budget of earth, Albedo, Heat island Lapse rate, Types-ELR, DALR & WALR Temperature inversion; Types-radiation, advection, frontal, subsidence, turbulence Types of interaction of solar rays with atmosphere	7

SUGGESTED BOOKS:

1. Valdiya K.S., Environmental Geology: Indian Context, Tata McGraw Hill
2. D.S. Lal(1989), Essentials of Climatology, Chitanya Publishing Houe, Allahabad
3. T.D. Biswas, & S. K. Mukharjee, Tata McGraw-Hill Education
4. Dilip Kumar das(2nd Edition) Dilip Kumar Das, kalyaniPublisgers
5. Environmetal Geology(9th edition) Kellar E.A., Prentice Hall
6. Environmental Science by S. C. Santra
7. Soil Geology by A. K. Koley
8. Concepts in Geology by A. K. Koley
9. Foundation of Earth science by F. K. Lutgens and E. J. Turback

Semester I
Fundamentals of Environmental Pollution I (Water) – Paper IV
(DSC-A4 – Fundamentals of Environmental Pollution I (Water))
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Explain water pollution, its types and effects on living organisms and environment.
2. Analyse physico-chemical parameters in relation to water.

Unit	Lecture Hours
Unit I	15
A: Water Pollution, Classification and Impacts Definition, classification of water pollution-groundwater pollution, surface water pollution, marine pollution Sources of water pollution-point and non point sources, Impacts of water pollution on human, plants & animals	8
B: Water Quality Parameters Introduction to various water quality parameters and their measurement i.e. pH, EC, Turbidity, TDS, hardness, chloride, Salinity, DO, BOD, COD and contaminants Sampling methods: Purpose of sampling, different types of samples, collection methods.	7
Unit II	15
A: Eutrophication and Heavy Metal Pollution Eutrophication, Types of Eutropopication, Causes of Eutropication, it's effects on water quality and aquatic animals, Preventive measures of eutropication Heavy metal pollution (Pb, Hg, Cd, Ar) & effect, bioaccumulation, bio magnification, pesticide, case studies – Itai-Itai, Minamate etc.)	7
B: Treatments Provided to Water Drinking water standards, effluent standards, Characteristics of domestic waste, characteristics of agricultural waste, Characteristics of industrial waste Water and waste water treatments i.e. Primary Treatment to waste water, Secondary Treatment, Tertiary / advanced treatment	8

SUGGESTED BOOKS:

1. Environmental Pollution of Cadmium by Rohatgi
2. Chemical and Biological Methods for Water Pollution Studies by Trivedy and Goel
3. Water Pollution and Management by C.K. Vershney
4. Responses to Oil and Chemical Marine Pollution by Cormack D. (1993), Applied Science Publishers, New York
5. Soil and Water Conservation Engineering by Schwab, SD, Frevert, RK, Edminster, TW and Barns, KK, John Wiley and Sons.
6. Water Pollution – Causes, Effects & Control by : P.K.Goel-1997
7. Elements of Environmental science and Engineering by Meenakshi P.
8. Manual of Environmental Analysis by Aery NC
9. Fundamentals of water Pollution by De Arnab Kumar

Semester I
Fundamentals of Environmental Science– Paper V
(DSC-A5 – Fundamentals of Environmental Science)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Get acquainted with interaction between man and environment.
2. Awareness about various environmental issues such as global warming, ozone depletion, deforestation etc.

Unit	Lecture Hours
Unit I	15
A: Concept of Environmental Science Definition, Principles & Scope of environmental science. Interactions between earth, man & environment, concept of sustainable development. Laws of thermodynamics, heat transfer process, mass energy transfer across various interfaces, materials balance.	7
B: Atmosphere, Hydrosphere, Lithosphere Structure & Composition of atmosphere, its layers- troposphere, stratosphere, mesosphere, thermosphere hydrosphere, lithosphere- crust, mantle and core, Biosphere meaning and its limits	8
Unit II	15
C: Meteorological Parameters Meteorological Parameters i.e. pressure, temperature, precipitation, humidity and its types, radiation & wind velocity and their units, instruments used for measurement	7
D: Biogeographic Provinces and Environmental Issues Biogeographic provinces of world Agroclimatic zones of India Major Environmental Issues in India- green house gas emission, ozone depletion, deforestation, depletion of fossil fuels and its impacts on mankind and animals	8

SUGGESTED BOOKS:

1. Environmental Chemistry – II Edition by A.K. De
2. Principles of Environmental Science by Watt, K.E.F. (1973), McGraw-Hill Book Company
3. Environmental Science by Nobel, B.J. and Kormandy, E.J. (1981), The Way the World Works, Prentice-Hall Inc., N.J.
4. Environmental Science by Turk A., Turk, J. Wittes J.T. and Wittes, R.E. (1978)
5. Ecology & Environment by P.D.Sharma
6. Environmental Science : An Introduction by G. T. Miller-1991
7. Environmental Science by S.C. Santra
8. Basic Concepts in Environmental Management by Mackenthun and Kenneth M.
9. Environmental studies by Joseph, Benny
10. Perspectives in Environmental studies by Kaushik, Anubha
11. Introduction to Environmental Management by Bal, Anand S.
12. Environmental studies by Uberoi N. K.

Semester I
Soil Science– Paper VI
(DSC-A6– Soil Science)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Understand the process of soil formation with respect to soil properties, soil chemistry.
2. Inculcation of various soil conservation practices and understanding other aspects such as bioremediation and biofertilizers.

Unit	Lecture Hours
Unit I	15
A: Soil Formation and Soil Profile Definition of soil, Classification, Types, Soil formation, Physical, chemical & biological weathering Soil Profile – Horizon A, B, C & D Soil Types in India	7
B: Soil Properties and Pollution Physical properties of soil – Texture, Structure & other chemical, Physical & biological properties Soil Microbes, Types & their role in soil fertility Soil pollution, types, sources & effects on plants and animals	8
Unit II	15
A: Soil Chemistry and Bioremediation Soil Chemistry – Acidic & alkaline soils, organic manures & green manures, bio fertilizers its types and advantages Effects of fertilizers on soil properties Bioremediation, soil erosion, types of agents & effects	7
B: Soil Conservation Soil conservation : methods, practices, land treatment Need & practices for agricultural lands, physical, mechanical & biological practices Points to be considered for choice of conservation practice Bunding, terracing, plantations and other practices, it's advantages	8

SUGGESTED BOOKS:

1. Land Pollution, Causes and Control by Harrusson and Laxon
2. Soil and Water Conservation Engineering by Schwab, SD, Frevert, RK, Edminster, TW and Barns, KK, John Wiley and Sons.
3. Manual of Soil & water Conservation Practices by Carmel singh, C. Venkataramamnan, G. sastry, B.p. Joshi
4. Principle of Soil Science by Rai M. M.
5. Basic Concepts in Soil Science by Kolay A. K.
6. Watershed Management by Murty J. V. S.

Semester I
Fundamentals of Environmental Chemistry– Paper VII
(DSC-A7 – Fundamentals of Environmental Chemistry)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Understand the basic concepts and scope of environmental chemistry.
2. Study the mechanism of various equipments utilized for environmental analysis..

Unit	Lecture Hours
Unit I	15
A: Concept and Scope of Environmental Chemistry Introduction – Concept and Scope of environmental chemistry. Segments of environmental and various interactive reaction occurring between these segments. Green Chemistry.	7
B: Pesticides and Problems Related to It Pesticides: Classification, degradation, analysis, pollution due to pesticides and DDT problems Stoichiometry, Gibb’s energy, Chemical potential, chemical equilibria, acid base reactions, solubility product, solubility of gases in water, the carbonate system, radionuclides.	8
Unit II	15
A: Heavy Metals and Their Impacts Thermo chemical and photochemical reactions in the atmosphere. Chemistry of water – Chemical & Physical properties, Hydrogen bonding, Interaction with gases & earth minerals Carcinogenic compounds and their effects. Aflatoxin occurrence, chemical composition and properties metabolism, acute toxicity, carcinogenicity.	8
B: Environmental Analysis and Instrumentation Environmental Analysis – Solution Concentration, (Normality, Molarity, ppm, equivalent weight etc.) Titrimetric methods. Instrumentation Principle & working pH meter, conductivity meter, spectrophotometer, flame photometer	7

SUGGESTED BOOKS:

- 1 Vogel’s Textbook of quantitative Chemical Analysis, 5th edition by J H Basett, J. Nendham and Denny, R.C.
- 2 Handbook of Analytical Instruments by Khandpur R.S.
- 3 Environmental Pollution Analysis by Khopkar S.M.
- 4 Instrumental methods of chemical analysis by BK Sharma
- 5 Instrumental methods of analysis by Willard, Meritt, Dean and Settle
- 6 S Watts and L. Halliwell; Essential Environmental Science and Techniques, Routledge (1996)
- 7 Elements of Environmental Chemistry by H. V. Jadhav
- 8 Environmental Chemistry by De Anil K.

- 9 Instrumental Methods of Analysis by Chatwal and Anand
- 10 Manual of Environmental Analysis by Aery N. C.

Semester I
Fundamentals of Environmental Biology– Paper VIII
(DSC-A8 – Fundamentals of Environmental Biology)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Identify the scope and importance of environmental biology.
2. Awareness about ecological adaptations and marine biology.

Unit	Lecture Hours
Unit I	15
A: Introduction to Biology Introduction to biology, branches, scope & importance Origin of life, evolution – eras, periods, epochs, events Explosions & mass extinctions & Paleontological evidences for these Biogeography – meaning, biogeographical profile of world, physical, microbial, floral & faunal characteristics of each biogeographic zone ecotone, edge effects	8
B: Biodiversity of India Biological diversity of India: Major genera, species, subspecies Definition and nature, India’s biogeographical history, physiography, climate and its impact on biodiversity. Indian forest and vegetation types	7
Unit II	15
A: Marine Biology and Species in Red List Endangered, Endemic and Extinct Species of India: Threatened species categories of IUCN, threatened species of plants and animals in India and their reasons, Red data books Marine Biology: biology of coastal and open sea environment, their distribution, adaptation and productivity	8
B: Ecological adaptations and Bioresources Ecological adaptations under various environmental conditions. Bio-resources – Forest, Agricultural crops, livestock, fisheries. Use of bio-resources, threats – over exploitation, habitat loss, invasive spp. etc.	7

SUGGESTED BOOKS:

1. Environmental Biology by P.S. Verma and V.K. Agrawal
2. Environmental Biology by Reiss and Michael
3. Environmental Microbiology by Buckley R. G.
4. Principles of Ecology By R.J. Rutman and S.D. Wratten
5. Ecology by Mohan P. Arora
6. Environmental Microbiology by K. Vijaya Ramesh
7. Animal Ecology and Environmental Biology by H. R. Singh

Semester II
Fundamentals of Environmental pollution II (Air & Noise) – Paper I
(DSC-B1 – Fundamentals of Environmental pollution II (Air & Noise))
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the sources and effects of air and noise pollution.
2. Explain the working of air pollution controlling devices and institutions working for the cause of environment.

Unit	Lecture Hours
Unit I	15
A: Properties of Atmosphere Physical and chemical properties of atmosphere, Solar radiation – Solar spectrum Insolation, Factors affecting insolation Atmospheric stability: concept and types, Pasquill stability classification Mixing heights, plume behavior, Dispersion of pollutants in atmosphere	8
B: Air Pollution and Sources Air Pollution, Definition, terminology, Sources of air pollution, Classification of air pollutants, National Ambient Air Quality Monitoring Standards Aerosols: Sources, classification, size, adverse effects, cloud seeding	7
Unit II	15
A: Pollution Controlling Devices and Institutions Air pollution control: stationary sources – settling chamber, cyclone, Wet collector, Fabric filter and Electro Static Precipitators Green house effect (Global Warming), Ozone layer depletion Acid Rain, Effect of air pollution and acid rain on plants, animals and property IPCC (Intergovernmental Panel on Climate Change), UNFCCC (United Nations Framework Convention on Climate Change), Kyoto Protocol	8
B: Noise Pollution Noise pollution, definition, sources Effects of noise pollution on human beings and animals Noise control measures Characteristics of sound waves- Sound Level, Frequency, Wavelength, Sound pressure	7

SUGGESTED BOOKS:

1. Air Pollution By: Arthur C Stern. 3rd Edn. Vol. I, II, VI, VII, Academic Press (1986)
2. Air Quality By: Thad Godish, 3rd Edition, Lewis Publishers, New York (1997)
3. Understanding Environmental Pollution By: Marquita K Hill. Cambridge University Press (1997)

4. Pollution: Causes, Effects & Control Edited By: Roy M Harrison. 2nd Edn. The Royal Society of Chemistry Cambridge (1995)
5. Environmental Chemistry: A Global Perspective By: Gary W vanLoon& Stephen J Duffy. Oxford University Press (2000)
6. Handbook of Air Pollution Control Engineering & Technology By: John C Mycock, John D McKenna & Louis Theodore. Lewis Publishers, CRC London (1995)
7. Handbook of Pollution Control Processes By: Robert Noyes. JaicoPublisheing House, Mumbai (2001)
8. An Introduction to Air Pollution By: RK Trivedy& PK Goel. ABD Publishers Jaipur, India (2003)
9. Air Pollution By MN Rao& HVN Rao. Tata McGraw-Hill Publishing company Ltd., New Delhi (1994)
10. The Atmosphere by Tarbuch and Lutgen
11. Introduction to Atmospheric Chemistry by Hoobs, Peter V

Semester II
Biological Diversity and Conservation– Paper II
(DSC-B2 – Biological Diversity and Conservation)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the concept, need, types and scope of biodiversity.
2. Know various biodiversity conservation measures and organizations working for it.

Unit	Lecture Hours
Unit I	15
<p>A: Biodiversity Concept and Disciplines Biodiversity concept, definition, need for assessment, scope of biodiversity studies various disciplines of Biodiversity- Evolutionary, taxonomic, Ecology, Genetics, Population, composition and level of biodiversity, Ecological, Organismal, genetic and cultural diversity, alpha-Beta-Gama diversity, process of diversification at genetic and species level Value of biodiversity – direct & indirect value – food, timber, medicinal & ornamental.</p>	8
<p>B: Loss of Biodiversity and It's Causes Centers of diversity, concept of endemism, types & endemic species with example. Loss of biodiversity, Founder Effects, Demographic bottlenecks, Genetic Drift, Inbreeding Depression, IUCN Threatened species Categories Loss of Ecosystem Diversity: Factors Affecting Ecosystem Degradation & Loss fragmentation, habitat loss, pollution & over exploitation, change in habitat, effects of climate change, Human wildlife conflict</p>	7
Unit II	15
<p>A: Conservation Measures Necessity of biodiversity conservation, Methods of biodiversity conservation: In situ (Biosphere reserves and national parks) & ex situ (Germplasm collection, botanical garden, seed banks, pollen banks, DNA banks) conservation, Conservation of genetic diversity, Species diversity and ecosystem diversity Concept of hotspot, India as mega – biodiversity country Conservation of biodiversity, need & awareness, Introduction, Biosphere Reserves and National Parks</p>	8
<p>B: Organizations and People's Movement Organizations involved in biodiversity conservation IUCN, UNEP, UNESCO, WWF, ICSU, FAO, WCMC, ISBI. Organizations Involved in Financing Biodiversity Introduction, International Biodiversity Law. Convention on Biological Diversity, Ramsar Convention, National Legislation: Environmental Protection Act 1986, Biodiversity Act, Biodiversity Rules and Regulations People's movement for biodiversity conservation, Biodiversity awareness programme</p>	7

SUGGESTED BOOKS:

1. Chaudhuri AB and Sarkar DD (2003) Megadiversity Conservation, Flora, Fauna and Medicinal Plants of India's Hotspots. Daya Publishing House, New Delhi.
2. Singh, B. K. 2004: Biodiversity Conservation and Management, Mangaldeep Publications, Jaipur
3. Krishnamurthy, K.V. 2003. An Advanced Textbook on Biodiversity – Principles and Practice, Oxford and IBH Publishing, New Delhi.
4. Kotwal, P.C. and S. Banerjee. Biodiversity Conservation – In Managed forest and Protected areas, (2002). Agrobios, India
5. Animal Ecology and Environmental Biology by H. R. Singh
6. Plant Diversity Hotspots in India – An Overview by Hajra P.K. and V. Mudgal
7. Plant Ecology by John E. Weaver and F.E. Clement
8. Restoration of Endangered Species by Bowles M.L. and Whelan C.J.
9. Understanding Biodiversity- Life, sustainability and Equity by Ashish Kothari

Semester II
Climate Change and Sustainable Development – Paper III
(DSC-B3– Climate Change and Sustainable Development)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the causes and effects of global environmental issues in relation to global warming and ozone depletion.
2. Inculcate the concept of sustainable development and practices.

Unit	Lecture Hours
Unit I	15
A: Global Warming and Ozone Depletion Definition and causes of global warming, role of CO ₂ in climate change, global impacts, Concept of atmospheric window, impact of climate change on atmosphere, sea level rise, agricultural productivity, introduction to carbon dating, Ozone layer and it's importance, causes of ozone layer depletion, Ozone depleting substances, Effects of ozone layer depletion	8
B: Climate Change and Policies International agreements regarding climate change, Montreal protocol, Kyoto protocol, Carbon credit and carbon trading, Mitigation strategies for climate change, Paris agreement, United Nations Framework on Climate Change, Vienna Convention	7
Unit II	15
A: Sustainable Development Definition, Concept and strategies of sustainable development, United Nation Conference on Environment and Development with special reference to agenda 21, CSR and sustainability, Clean development mechanism, Commission on sustainable development, The world summit on sustainable development, threats to sustainable development, principles of sustainable development	8
B: Sustainable Development Practices in India: Major issues in sustaining growth and development in India, Interlinking of rivers, desertification and it's control, Environmental priorities in India, Role of India in environmental treaties, urban and rural planning	7

SUGGESTED BOOKS:

1. Ecology & Environment by P.D.Sharma
2. Environmental Science by S. C. Santra
3. Atmosphere, Weather and Climate by Barry R. G.
4. Climate Change: Causes, Effects and Solutions by Hardy J. T.
5. Climate and Global Climate Change by Harvey D
6. Climate Change: The Science of Global Warming and Our Energy Future by Mathez E. A.
7. Climate Change and India by Mitra A. P., Sharma S., Bhattacharya S., Garg A., Devotta S. and Sen K.

Semester II
Forest management– Paper IV
(DSC-B4 – Forest Management)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the need of forest management and agroforestry, principles of forest management and legal aspects of forest management.
2. Understand the concept of silvicultural systems and management of forest resources.

Unit	Lecture Hours
Unit I	15
A: Forest Management and Silvicultural System Definition, Objectives, Importance of forest management in India Introduction to silviculture&silvicultural systems, types & advantages and disadvantages of different systems History of forest management in India Forest as ecosystem, productivity, forest types in India	7
B: Forest Management Systems and Forest Resources Forest Management Systems: Objective and principles; techniques; sustained yield relation; rotation of growing stock through management, Forest Working Plan, integrated approach, Forest Mensuration - Methods of measuring - diameter, girth, height and volume of trees; form-factor Forest Resources and Utilization : Direct and indirect, Environmentally sound forest harvesting practices, logging and extraction techniques and principles, transportation system, storage and sale, Need and importance of wood seasoning and preservation; Non-Timber Forest Products (NTFPs) definition and scope	8
Unit II	15
A: Agroforestry and Joint Forest Management Agroforestry, Social forestry, taungya system, shifting cultivation- Introduction, classification, scope Advantages & disadvantages of all these practices Joint Forest Management, introduction, objectives	7
B: Laws and Regulations Regarding Forest Conservation Forest conservation, need, services provided by forest, tangible, intangible Indian forest Act, 1927 Forest Conservation Act, 1980 National Forest Policy, 1894, National Forest Policy ,1952, National Forest Policy, 1988	8

SUGGESTED BOOKS:

1. Sarma, P. K.: Forest Resources and their Utilization in India, Mittal Publishers, New Delhi
2. Agrawal, V. P.: Forestsin India, Oxford & IBH, New Delhi
3. Desai, V. : Forest Management in India : Issues and Problems, Himalaya Publishing House, New Delhi

4. Principle and practices of Silviculture by L. S. khanna
5. Forestry in India by A. P. Dwiwedi
6. Forest and Forestry by KP Sagaraya
7. Handbook of Forestry by S SNegi
8. Social Forestry by K M Tiwari
9. Forest Ecology by A S Puri
10. Forest Mensuration by L. S. Khanna
11. India's Forest Policies: Analysis and Appraisal by L K Jha

Semester II
Solid and Hazardous Waste Management– Paper V
DSC-B5 – Solid and Hazardous Waste Management
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the fundamentals of solid and hazardous waste management.
2. Learning the rules and regulations of solid and hazardous waste.

Unit	Lecture Hours
Unit I	15
A: Introduction to Solid Waste Solid waste: Introduction and definition, classification of solid waste, sources of solid waste generation, components in solid waste, Collection and volume reduction prior to disposal, Physio-chemical properties of solid waste	7
B: Solid Waste Management Systems Solid Waste Management, advantages Factors affecting solid waste management system Indian Scenario of Solid Waste Management Case studies for solid waste management Traditional methods, ecofriendly methods-conversion of solid waste to energy/manure, other techniques for solid waste management Constraints in solid waste management	8
Unit II	15
A: Introduction to Hazardous Waste Hazardous waste definition, characteristics, types-biomedical, radioactive and other wastes, source of hazardous waste, handling and storage of hazardous waste, Health risks associated with hazardous waste,	7
B: Waste Management Rules and Methods Hazardous Waste (management and handling) rules, Biomedical (handling and management) rules, 2008Waste minimization, Waste treatment methods: Incineration, Stabilization, Secure Landfill, Disinfection, Irradiation, Pyrolysis Disposal of radioactive waste	8

SUGGESTED BOOKS:

1. Integrated Solid Waste Management – Engineering Principles & Management By: Issues by George Tchobanoglous, Hilary Theisen& Samuel A Vigil. McGraw-Hill International Editions, New York (1993)
2. Solid Waste Management in Developing Countries By: AD Bhide& BB Sunderesan. Indian National Scientific Documentation Centre, New Delhi (1983)
3. Solid Waste Engineering By: PA Vesilind, William Worrell & R. Thomas Brooks/Cole, Australia (2002)
4. Basics of Solid and Hazardous Waste Management Technology By: K.L Shah. Prentice Hall, Ohio (2000)
5. Industrial and Hazardous Wastes – Health Impacts & Management Plans By: Rajiv K Sinha& Sunil Heart. Pointer Publishers, Jaipur (2004)
6. Prospects and Perspectives of Solid Waste Management

7. Hazardous Waste management by M. LaGrega and others, McGraw-Hill Publication
8. Biomedical (handling and management) rules, 2008

Semester II
Occupational Health & Safety– Paper VI
DSC-B6 – Occupational Health & Safety
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 safety and PPEs Definition, goals, needs, Principles & Practices of industrial safety Role of Management in Industrial Safety Adverse health effects of noise, vibration, cold, heat stress, improper illumination, thermal radiation, ionising & non-ionising radiations Importance and types of PPEs	8
B:Strategic Planning and Hazard Prevention Hierarchy Definition, purpose, nature, scope and procedure Strategic planning and tools of implementation, Management by objectives (MBO) and its role in Safety, Health and Safety Management, Hazard prevention hierarchy	7
Unit II	15
A: Leadership and Motivation Direction: Definition, process, principles and techniques Leadership: Role, functions and attributes of a leader Theories of motivation and their application to safety, role of supervisors and safety departments in motivation	7
B: Introduction to Communication Communication: Purpose, process, types and channels, Essential rules in communication, Two ways communication, Barriers in communication, Essentials of effective communication, Communication and group-dynamics, Team building	8

SUGGESTED BOOKS:

1. Industrial Safety and Environment. V. K. Gupta, 2006
2. Industrial Safety and Health Management. C. Asfahl, 1984
3. Leading with safety. Thomas R Krause, 2005
4. Safe by Accident?: Take the Luck Out of Safety : Leadership Practices that Build a Sustainable
5. Industrial Safety and Risk Management. Doug McCutcheon and Laird Wilson, 2003 Culture. Judy L. Agnew, Aubrey C. Daniels, 2010
6. Practical Industrial Safety, Risk Assessment and Shutdown Systems for Industry. Dave Macdonald, 2004
7. Industrial Safety Management: Hazard Identification and Risk Control by Deshmukh L. M.

Semester II
Remote Sensing & GIS– Paper VII
DSC-B7 – Remote Sensing & GIS
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Introduction to remote sensing, GIS and satellites.
2. Study applications of Remote Sensing, GIS and satellites.

Unit	Lecture Hours
Unit I	15
A: Terms Related to Remote sensing Definition and Scope of Remote Sensing, Electromagnetic spectrum- Electromagnetic spectrum, Aerial photography- Classification Of Aerial Photographs , Types of aerial photographs, Geometry of Aerial photograph, Scale and Relief Displacement, overlap, drift crab, Principal Point and Conjugate Principal, Point of Aerial Photographs, Stereoscopy- Stereoscope, stereoscopic photograph, Parallax, elements of aerial photo interpretation and Applications of Aerial Photographs	7
B: Introduction to Satellites Satellite imageries-Scanners, pixels, grey levels, bands. Introduction, Remote Sensing Satellites- Meteorological Remote Sensing Satellite (Polar and Geostationary Satellites), Non Meteorological RS Satellites (Landsat, Spot, IRS), Resolution (Spectral and Spatial and Frequency of Coverage) , Satellite data products and selection of satellite data; Data Reception Archiving and distribution	8
Unit II	15
A: Introduction to GIS Definition of GIS, Capabilities and advantages of GIS, Sources of data, types of data, hardware requirement, components of GIS.,Data structure, Raster and Vector data models, advantages and disadvantages of vector data and raster data, GIS packages, Application of GIS in Environmental Management	8
B: Terms in GIS Topology: Error and editing, GIS data quality, errors, policies. Vectordataanalysis:Buffering,Overlayanalysis(pointinpolygon,lineinpolygon, polygoninpolygonetc.);Networkanalysis;Terrainanalysis:DEM,DTM andTIN; Interpolationtechniques in GIS; Rasterdataanalysis; Non-spatial data: Database Managementsystem(DBMS)	7

SUGGESTED BOOKS:

1. Principles of Photo geology by Singh
2. Principles of Remote Sensing by Currain
3. Fundamentals of Photo geology by SN Pandey
4. Remote Sensing and Image Interpretation:-Tomas M.Lillesand and Ralph W.Keifer john Wiley and sons Inc.NewYark.
5. Introduction to Remote sensing:-James B. Campbell, Tylor and FraneisLtd.Londan.
6. Remote Sensing application in applied geosciences:-Sumitra Mukherjee, Milton Book Company.

7. Principles of Remote Sensing:-A.N.Gatel and S.Singh, Scientific Publishers (India). Jodhpur (1999Edition).
8. Remote Sensing for Environment and Forest Management:-A.Mehrotra and R.K.Suri. Indus Publishing Co.New.Deqli(1994 Edition)
9. Remote sensing for large wildfires:-E.Chuvieco, Springer, New York (1999 Edition).
10. Textbook of Remote Sensing and GIS by Anil Reddy
11. Fundamentals of Remote Sensing by George Joseph
12. Principles of Geographical Information system by Burrough, Peter A.
13. Remote Sensing and GIS by Bhatta B.

Semester II
Computer Applications – Paper VIII
DSC-B8 – Computer Applications VIII
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), plotter- Flat-bed and drum, Selection of printer and paper for output depending upon user requirements. Memory- concept, primary memory – RAM- SRAM, DRAM, ROM- PROM, EPROM, EEPROM, cache memory, Secondary memory- floppy disk, hard disk, Optical storage devices, Pen drive.	8
Unit II	15
A: MS Excel Basics of Excel – Ribbon, Workbook, worksheet, Format options, templates, data validation , sorting and filtering of data ,Functions- Count and Sum, Logical, Date and Time, Text, Lookup and References, financial and statistical functions, using formula , Charts- column, pie, bar, line, scatter plot, data series.	7
B: MS Word and MS Powerpoint MS Word : Introduction and feature , Creating word document, Editing features, Text formatting options, page formatting –adding header and footer, page 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	8

SUGGESTED BOOKS:

1. Schuurman, Nadine. 2000. "Trouble in the Heartland: GIS and its Critics in the 1990s." Progress in Human Geography, vol. 24, no. 4, pp. 569-590.
2. Schuurman, Nadine and G. Pratt. 2002. "Care of the Subject: Feminism and Critiques of GIS." Gender, Place and Culture, vol. 9, no. 3, pp. 291-299.
3. Schuurman, Nadine. 2004. GIS – A Short Introduction. Blackwell Publishing.
4. Computer Fundamentals- P. K. Sinha
5. Operating System – Godbole
6. Computer Today- S. Basndara
7. Computer Fundamentals- V. Rajaraman

DSC-P1 and P2-LAB COURSE (Semester I)

Sr. No.	Name of Experiment
1	Study of Phytoplanktons and Zooplanktons.
2	Determination of frequency of species in ecosystem
3	Determination of species density in nearby ecosystem
4	Determination of Species Diversity Index
5	Classification and identification of minerals
6	Classification and identification of rocks
7	Study of floral resources in surrounding area
8	Determination of pH of given sample
9	Determination of Electrical Conductivity of water sample
10	Determination of Dissolved Oxygen in water sample
11	Determination of Free Carbon Dioxide in water sample
12	Determination of Biochemical Oxygen Demand of water sample
13	Determination of Chemical Oxygen Demand of water sample
14	Determination of Total Dissolved Solids and Total Suspended Solids
15	Estimation of Total Hardness of given water sample
16	Determination of Calcium and Magnesium hardness of given water sample
17	Determination of Alkalinity in water sample
18	Determination of Acidity in water sample
19	Determination of Bulk Density of soil sample
20	Determination of porosity of soil sample
21	Determination of water holding capacity and moisture content of soil sample
22	Determination of chlorophyll content of given plant material
23	Study various soil and water conservation practices through field visits

DSC- P3 and P4 LAB COURSE (Semester II)

Sr. No.	Name of Experiment
1	Measurement of noise levels at silence, residential and commercial zone
2	Study of Personal Protective Equipments
3	Study of occupational health hazards in nearby industry
4	Field Visit to Sewage Treatment Plant to understand its functioning
5	Determination of moisture content of solid waste
6	Study of composting technique through field visit
7	Study electricity generation from solid waste through field visits
8	Study working of High Volume Sampler
9	Determination of of PM ₁₀ in ambient air
10	Analysis of Sulphur Dioxide in ambient air
11	Analysis of Nitrogen Oxides in ambient air
12	Study and list out minor forest products used by community living near forest area
13	Interaction with community for awareness regarding environmental degradation
14	Study of instruments used for measurement of metereological parameters
15	Preparation of wind rose diagram
16	Study of well inventory
17	Measurement of height of tree
18	Measurement of clown density of tree
19	Measurement of girth and diameter of tree
20	Use of MS word for report preparation
21	Use of MS excel for result preparation
22	Use of MS power point for preparing presentations
23	Interpretation of aerial photographs
24	Determination of scale of aerial photographs