



SU/BOS/Science/349

Date: 24/06/2024

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

Subject: Regarding Minor Change syllabi of B.Sc. Part-I (Sem.I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

Ref: SU/BOS/Science/877/ Date: 26/12/2023 Letter.

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 Minor Change syllabi, nature of question paper B.Sc. Part-I (Sem. I & II) as per NEP-2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc.Part-I (Sem. I & II) as per NEP-2020 (2.0)			
1.	Food Science and Technology (Entire)	6.	Biochemistry
2.	Food Science	7.	Biotechnology (Optional/Vocational)
3.	Food Science and Quality Control	8.	Biotechnology (Entire)
4.	Food Technology & Management (Entire)	9.	Pollution
5.	Computer Science (Opt)	10.	Environmental Science (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. 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,

Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	4	B.Sc. Exam/ Appointment Section
2	Director, Board of Examinations and Evaluation	5	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	6	Affiliation Section (U.G.) (P.G.)

SHIVAJI UNIVERSITY, KOLHAPUR.



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Accredited By NAAC

Revised Syllabus For

B.Sc.I Pollution

(Faculty of Science & Technology)

Paper -I, II - (Semester- I) and

Paper-III, IV-(Semester-II)

(NEP-2020)

**Syllabus implemented from July-
2024 onwards.**

Department of Pollution (Optional/Vocational)
Teaching and Evaluation scheme
Three/ Four- Years UG Programme
Department/ Subject Specific Core or Major (DSC)

SHIVAJI UNIVERSITY, KOLHAPUR NEP-2020(2.0):CreditFrameworkforUG(B.Sc.)ProgrammeunderFacultyofScienceandTechnology									
SEM (Level)	COURSES			OE	VSC /SE C	AEC/VEC/IKS	OJ T/F P/C EP /C C/ RP	Total Credits	Degree/Cum.Cr. MEME
	Course-1	Course-2	Course-3						
SEMI(4.5)	DSC-I(2) Fundamentals of Environment and Pollution DSC-II(2) Environmental Chemistry and Physics. DSCP-I(2) Practical Course-I (Based On Paper –I and II)	DSC-I(2) DSC-II(2) DSCP-I(2)	DSC-I(2) DSC-II(2) DSCP-I(2)	OE-1(2)(T/P) Social Health And Hygiene		IKS-I(2) Environment in Ancient India		22	UGCertificate 44
SEMII(4.5)	DSC-III(2) Environmental Biology. DSC-IV(2) Environmental Microbiology. DSCP-II(2) Practical II- (Based On Paper- III and IV)	DSC-III(2)DSC-IV(2)DSCP-II(2)	DSC-III(2)DSC-IV(2)DSCP-II(2)	OE-2(2)(T/P) Agriculture Marketing		VEC-I(2) (Democracy,Election andConstitution)		22	
Credits	8(T)+4(P)=12	8(T)+4(P)=12	8(T)+4(P)=12	2+2=4(T/P)	--	2+2=4	--	44	ExitOption:4creditsNSQF/Internship/Skill courses

Programme Specific Outcomes (POs)

After completion of the course successfully, students would be able to

1. Apply environment related technical skills for sustainability.
2. Develop the skills to identify Environmental problems.
3. Use the fundamentals of interdisciplinary subjects to solve environmental problems
4. Understand concept and components of environment, history and meaning and Interdisciplinary nature of Environmental Pollution.
5. Identify sources, nature and effects of pollutants on global and local environment.
6. Perform procedure for qualitative and quantitative analysis of pollutants.
7. Assess the effects of pollutants and suggest the control
8. Apply the environmental conservation strategies
9. Create the interest of the society in the conservation of natural resources and improve the environmental quality through exhibitions and other similar activities.

SCHEME OF EXAMINATION:-

- The examination shall be conducted at the end of each term for semester pattern.
- The theory paper shall carry 40 marks.
- The evaluation of the performance of the students in theory papers shall be on the basis of Semester Examination of 40 marks.
- The internal evaluation for each paper shall carry 10 marks.
- (Semester I: Group activity/assignments and Semester II: practical's/Oral examination)
- Question paper will be set in the view of the /in accordance with the entire syllabus and preferably covering each unit of syllabi.

STANDARD OF PASSING:-

As prescribed under rules and regulation for each degree.

TITLES AND CONTENTS OF PAPERS-(FORNEWSYLLABUS)**(Introduced from July 2024 onwards)**

Sr.No.	Paper No.	Semester	Title of Paper
1	I	I	Fundamentals of Environment and Pollution
2	II		Environmental Chemistry and Physics
3	III	II	Environmental Biology
4	IV		Environmental Microbiology

Open Elective Papers (OE)

Sr.No.	Paper No.	Semester	Title of Open Elective Paper
1	I	I	Social Health And Hygiene
2	II	II	Agriculture Marketing

Skill Enhancement Course (SEC) Papers

Sr.No.	Paper No.	Semester	Title of SEC Paper
1	I	I	Plant Nursery
3	II	II	Waste to Wealth

13. SPECIAL INSTRUCTIONS, IF ANY. ---Nil

SEMESTER-I

POLLUTION PaperII: DSC: Environmental Chemistry and Physics

CREDIT: 2.LECTURE PERIODS:2 PER WEEK

MARKS: 50

MODULE	SUB-MODULE	TOPICS	LECTURE PERIOD
1.	Environmental Chemistry		
	1.1 Introduction	Definition and Scope of Environmental Chemistry, Segments of Environment and various interactive reactions occurring between these segments, Chemical Aspects of Bio-geo-chemical cycles, Green Chemistry	06
	1.2 Chemistry of Some Atmospheric Gases	Characteristic of the Chemical Reactions involved in atmosphere, Photochemical reactions in atmosphere, Smog: classical smog and photochemical smog, Ozone chemistry and ozone layer depletion, role of CFCs in ozone depletion Climate Change in Atmosphere, Greenhouse Gases.	08
2.	Environmental Physics		
	2.1 Introduction	Definition and Scope of Environmental Physics, Basic concepts of light and matter, Basic concepts of pressure, force, work and energy; types of forces and their relation (pressure gradient, viscous, Coriolis, gravitational, centripetal, and centrifugal force)	06
	2.2 Environmental Physics	Scope of Environmental Physics, Concept of diffusion and dispersion, Point and area source pollutants and dispersal Concept of heat and work, Transport and Exchange of Heat, Mass and Energy in environment, Types of radiations in the Environment, Gibbs Energy Equation,	10
Total Lectures			30

Learning Outcomes: -

- Elucidate the basics of environmental chemistry.
- Explicate in detail different chemical atmospheric reactions.
- Elucidate the basic concept of environmental physics.
- Explicate and recommended about scope of environmental physics.

SEMESTER–II

Pollution Paper III: DSC- : Environmental Biology

CREDIT:2.LECTURE PERIODS:2PER WEEK

MARKS: 50

MODULE	SUB-MODULE	TOPICS	LECTURE PERIOD
1.	Basics of Environment		
	1.1 Basics of Ecology	Ecology: Definition, subdivision and modern branches of ecology, ecology spectrum, scope of ecology. Application and significance of ecology to human beings.	05
	1.2 Abiotic Factors of Ecology	Temperature: effect of temperature on plants and animals, Adaptation to meet extreme temperature. Light: Zonation in marine habitat, effects of light on plants and animals, Microclimate and fire	06
	1.3 Biotic Factor of Ecology	Inter specific relationship Positive: Mutualism (symbiosis), 1commensalism, proto- cooperation Negative: Parasitism, predation, competition, Antibiosis, Neutralism	06
2.	Ecological Community and Adaptation		
	2.1. Population Ecology	Definition and types, characteristic of population: Natalty, mortality, population density, population dispersal and dispersion, population fluctuation, population growth curve (S & J), shaped curve, concept of carrying capacity.	04
	2.2 Community Ecology	Introduction, Definition, characteristic of community , structure ecological dominants and indicators , Ecotone and edge effect, ecological equivalents, ecological niche (definition and types) Major and minor communities , ecotypes, and its significance	04
	2.3 Ecological Adaptation	Introduction, Adaptation: Types of adaptation, Adaptation in plants: Hydrophytes, mesophytes and xerophytes. Adaptation in animal: Aquatic and desert. Mimicry: Definition, types: protective, Aggressive, and conscious mimicry, significance of mimicry.	05
Total Lectures			30

Learning Outcomes

1. Understand and explain basics of ecology
2. Illustrate and explain abiotic factors of ecology.
3. Explain and assess biotic factors of ecology.
4. Understand and recall different characteristics of ecology.
5. Elucidate the characteristics of population ecology.
6. Interpret and formulate different ecological adaptation.

SEMESTER–II

Pollution Paper IV: DSC- : Environmental Microbiology

CREDIT: 2.LECTURE PERIODS:2 PER

MARKS: 50

MODULE	SUB-MODULE	TOPICS	LECTURE PERIOD
1.	Aero microbiology		
	1.1 Basics of Aeromicrobiology	Introduction, Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi). Impact of air borne microorganisms on human health and environment, allergens	06
	1.2 Air sample collection and analysis	Introduction, Bioaerosol sampling, air samplers, methods of analysis, CFU, Culture media for bacteria and fungi, General identification, characteristics, Control measures: Fate of bioaerosols, Inactivation mechanisms-UV light, HEPA filters, desiccation, Incineration.	09
2.	Water Microbiology		
	2.1. Basics of Water Microbiology	Introduction, Water borne pathogens, Water borne disease Microbiological analysis of water, Sample Collection, Treatment and safety of drinking (potable) water.	06
	2.2 Water sample analysis	Introduction, Methods to detect potability of water samples: Standard qualitative, procedure: presumptive test (MPN test), confirmed and completed tests for faecal filter coliforms, Membrane technique and Presence/absence tests, Control measures: Precipitation, chemical disinfection, filtration, high temperature, UV light.	09
Total Lectures			30

Learning Outcomes:-

- Classify and describe air borne micro-organisms with their impact.
- State and formulate air sample collection methods and their analysis.
- Elucidate and recommend waterborne pathogens with their impacts and Control measures.
- Formulate and classify the water microbiological analysis methods.

LABORATORY COURSE PRACTICAL –I

Based on Paper I & II (Total Marks-50)

1. To study the first-aid and emergency treatment in laboratory.
- 2 Learning techniques for handling of the common equipment are of a laboratory.
- 3 Water sampling for ground and surface water and its storage techniques.
- 4 Estimation of Total solids of water and wastewater sample.
- 5 Estimation of dissolved solids, suspended solids of water and wastewater sample
6. Determination of moisture content of soil
- 7 Determination of pH of given soil samples.
- 8 Determination of water holding capacity of soil
- 9 Preparation of solutions (percentage solution, ppm, ppb dilutions)
- 10 Problems based on Normality, Molarity

LABORATORY COURSE PRACTICAL –II

Based on Paper III & IV (Total Marks-50)

1. Preparation of nutrient agar plates.
- 2 Preparation of broth.
- 3 Isolation of microorganisms from air.
4. Staining techniques to study morphology of microorganisms-Gram staining.
- 5 Checking the motility of bacteria by hanging drop method.
6. Determination of Alkalinity.
7. Determination of Hardness
- 8 Determination of Chlorides
- 9 Determination of pH of water
- 10 Analysis of frequency distribution of grassland species by quadrat method.
- 11 Construction of food chain/food web using given information /data
- 12 Visit to any one type of ecosystem (aquatic / terrestrial)

Nature of Question Paper
for B.Sc. Part – I, II & III (40 + 10 Pattern)
according to Revised Structure as Per NEP – 2020 to be
implemented from academic year 2024

Maximum Marks: 40

Duration: 2 hrs

Q. 1 Select the most correct alternate from the following [8]

i) to viii) MCQ one mark each with four options

A)

B)

C)

D)

Q.2 Attempt any TWO of the following [16]

A)

B)

C)

Q. 3 Attempt any FOUR of the following [16]

A)

B)

C)

D)

E)

F)

SEC-Skill Enhancement Course:

Pollution Paper I: SCE - : PLANT NURSERY

CREDIT: 2. LECTURE PERIODS: 2 PER WEEK

MARKS: 50

MODULE	SUB-MODULE	TOPICS	LECTURE PERIOD
1.	Introduction to plant nursery		
	1.1 : Introduction to plant nursery	Plant nursery: Definition, importance. Different types of nurseries –on the basis of duration, plants produced, structure used. , Basic facilities for a nursery; layout and components of a good nursery.	06
	1.2 Necessities for nursery	Nursery beds – types and precautions to be taken during preparation; Growing media, nursery tools and implements, and containers for plant nursery, in brief. ; Seeds and other vegetative material used to raise nursery in brief.	09
2.	Management of nursery		
	2.1. Management of nursery	Seasonal activities and routine operations in a nursery; Nursery management – watering, weeding and nutrients; pests and diseases; Common possible errors in nursery activities; Economics of nursery development, pricing and record maintenance; Online nursery information and sales systems.	06
	2.2	Plant propagation structures in brief, Outlines of vegetative propagation techniques to produce planting material; Sowing methods of seeds and planting material; Bureau of Indian Standards (BIS-2008) related to nursery	09
Total Lectures			30

Course Outcomes: On successful completion of this course students will be able to;

- Understand the importance of a plant nursery and basic infrastructure to establish it.
- Explain the basic material, tools and techniques required for nursery.
- Demonstrate expertise related to various practices in a nursery.
- Comprehend knowledge and skills to get an employment or to become an entrepreneur in plant nursery sector

Pollution Paper II :SEC :WASTE TO WEALTH

CREDIT:2. LECTURE PERIODS:2PER WEEK

MARKS: 50

MODULE	SUB-MODULE	TOPICS	LECTUR PERIOD
1.	Introduction to solid waste		
	1.1 : Introduction to solid waste	Introduction, Solid waste generation-characteristics-Physico-chemical characteristics Problems and Impacts of Municipal Solid Waste(MSW)-Methane emission due to MSW	06
	1.2 Disposal of Municipal Solid Waste(MSW)	Introduction, Disposal of Municipal Solid Waste(MSW)-Collection-Process of waste collection Segregation- Non-compostable-reusable-recyclable- non recyclable-compostable hazardous	09
2.	Vermicomposting		
	2.1. Composting types	Introduction, Composting types- Windrow method-Aerobic composting- Vermicomposting Compost pit -Garbage filled compost pit- Composed garbage	06
	2.2 Vermicomposting	Sources of organic waste- Vermicomposting Process – vermicast-Application of vermicompost- Preparation of organic by products: Vermi wash- Amritha karisal-Organic insecticide-Humicacid Advantages of Vermitechonolgy	09
Total Lectures			30

Course Outcomes:-1. Explore kind of waste available/generated by people.

2. Explore ideas for reusing and recycling the waste generated by residents.

3. Case profile of success stories of waste to wealth.

4. Develop prototype/ project for reuse and recycling of waste

Pollution Paper I: SEC - : PLANT NURSERY PRACTICAL

- 1, Demonstration of nursery bed making.
- 2 To study the useful nursery tools
3. Demonstration of preparation of media for nursery.
4. Hands on training on vegetative propagation techniques.
5. To study the sowing methods of seeds and other material.
6. Invited lecture cum demonstration by local expert.
7. Watching videos on routine practices in plant nurseries.
8. Visit to an agriculture/horticulture /forest nursery.
9. Case study on establishment and success of a plant nursery.
10. Effect of water and temperature on seed germination.

Pollution Paper II: SEC: WASTE TO WEALTH PRACTICAL

- 1 To study the systematic position, habits, habitat and external characters of earthworms
- 2 To study the different methods of Preparation of vermibeds
- 3 To study the vermicomposting setup and maintenance.
- 4 Vermicomposting Quality Assessment- Colour, pH, Moisture content, organic carbon content
- 5 To study the vermicomposting collection and Earthworms separation.
- 6 To study the harvesting method- Air drying of vermicomposting, sieving and storing.
- 7 Watching videos on routine practices of vermicomposting units
- 8 Invited lecture cum demonstration by local expert.
- 9 Study of pests and diseases of earthworms.
- 10 To study maintain health and safety at workplace.
- 11 Visit vermicomposting units.

OPETIONAL ELECTIVE**Pollution Paper-I OE: SOCIAL HEALTH AND HYGIENE****CREDIT:2 LECTURE PERIODS: 2PER****MARKS: 50**

MODULE	SUB-MODULE	TOPICS	LECTURE PERIOD
1.	PUBLIC HEALTH		
	1.2 Basics of good health	Introduction, Definition; Need for good health; factors affecting health, types of diseases (Deficiency, infection, pollution diseases) Personal hygiene – Food (Balanced die) food habits and cleanliness, food adulterants, avoiding smoking, drugs etc.	06
	1.2Public Health	Communicable diseases, Mode of transmission (Epidemic and endemic diseases), Management of Hygiene in public places (Railway stations, Bus stands and other public places) hospitals – Nonsocomial infections and hygiene in Educational institutions and hazards	09
2.	Sanitation and Legislation in India		
	2.1. Sanitation and Health	Introduction and Current situation Successful approaches to sanitation-strategies, Role of health sector, Global experience in improving sanitation and hygiene.	06
	2.2 Health legislation in India	Indian Epidemic Diseases Act , Purification of Air and Water Pollution Acts , Prevention of Food Adulteration Act , Birth and Death Registration Act ,Operational Aspects of National Health Programs - Family Welfare Program - Maternity and Child Care Services- Universal Immunization Program, Challenges of implementation of public health in India	09
Total			30

Course Outcomes: - Recognize the need of balance diet.

- Elucidate the communicable diseases and mode of transmission.
- Understand and recall role of sanitization in public health.
- Aware the students about public health legislation in India and Government facilities.

OPETIONAL ELECTIVE

Pollution Paper II: OE - : AGRICULTURAL MARKETING

CREDIT: 2. LECTURE PERIODS :2 PER WEEK

MARKS: 50

MODULE	SUB-MODULE	TOPICS	LECTURE PERIOD
1.	Agricultural Marketing		
	1.1 Introduction to Agriculture	Introduction of Agriculture and agricultural products (including agriculture, horticulture, sericulture, floriculture, aquaculture- genetic culture and dairy product).	06
	1.2Agricultural Marketing	Introduction, Role of agriculture marketing - Concepts - Goods and services - Movement of product from farm to consumer –Middlemen – Moneylenders - Types of agricultural markets (basic classification).	09
2.	Marketing Facilities and Planning production		
	2.1. Facilities of an agricultural market	Introduction, Basic structure and facilities of an agricultural market – Primary, secondary and tertiary markets, Functioning of Market Yards, Market information , Rythu Bharosa Kendras (RBK) , Govt market policies and regulations, Contract farming ,Govt Apps for marketing of agri products.	06
	2.2Planning production	Introduction, Planning production, assembling, grading, transportation, storage facilities. Price fixation. Dissemination of market information – and role of ICT. Marketing - Mix- Product element- Place element- Price element- Promotion element. Selection of target market. Government programs in support of Agricultural marketing in India.	09
Total Lectures			30

Paper II-Course Outcomes: By the successful completion of this course, the student will be able to;

- Know the kinds of agricultural products and their movement
- Understand the types, structure and functioning of agricultural marketing system
- Comprehend related skills and apply them in sample situation
- Extend this knowledge and skills to their production/consumption environment.

Reference Books:

- Fundamentals of Ecology: Eugene P. Odum, (Natraj Publishers, Dehradun.)
- Principles of Ecology: P. S. Verma, V. K. Agarwal (S. Chand and Co. New Delhi)
- Environmental Biology :P. D. sharma (Rastogi Publications, Meerut)
- Ecology and Environment :P. D. sharma (Rastogi Publications, Meerut)
- Principles of Environmental Biology :P. K. G. Nair (Himalaya Publishing House, New Delhi)
- Environmental Biology :M. P. Arora (Himalaya Publishing House, New Delhi)
- Environmental Science :Enger Smith, Smith, W. M. C. Brown (Company Publishing)
- Principles of Soil Science :Watt K. E. F. (1973), (McGraw Hill Book Company, New Delhi)
- Introduction to Environmental Studies :Turk & Turk
- Ecology and Field Biology :Robert Leo Smith (Harper Collins college publication)
- General Ecology :H. D. Kumar (Vikas Publishing house, New Delhi)
- Elements of Ecology :Brijgopal, N. Bharadwaj (Vikas Publishing house, New Delhi)
- Fundamentals of Environmental Science :G. S. Dahliwal, G. S. Sangha, P. K. ralhan (Kalyani Publishers, New Delhi)
- Environmental Ecology :Bill Freedman (Academic Press, New York)
- Concepts of Ecology :N. Arumugam (Saras Publication, Kottar, Dist. Kanyakumari)
- Plant Ecology :P. L. Kochhar
- Beard, J.M. 2013. Environmental Chemistry in Society (2nd edition). CRC Press.
- Boeker, E. & Grondelle, R. 2011. Environmental Physics: Sustainable Energy and Climate Change.Wiley.
- Connell, D.W. 2005. Basic Concepts of Environmental Chemistry (2nd edition). CRC Press.
- Girard, J. 2013. Principles of Environmental Chemistry (3rd edition). Jones & Bartlett.
- Harnung, S.E. & Johnson, M.S. 2012. Chemistry and the Environment. Cambridge University.
- Hites, R.A. 2012. Elements of Environmental Chemistry (2nd edition). Wiley & Sons.
- Manhan, S. E. 2000. Fundamentals of Environmental Chemistry. CRC Press.
- Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders.
- Abraham, C.M. 1999. Environmental Jurisprudence in India. Kluwer Law International
- Agarwal, V.K. 2005. Environmental Laws in India: Challenges for Enforcement. Bulletin of National Institute of Ecology 15: 227-238.
- Divan, S. & Rosencranz, A. 2002. Environmental Law and Policy in India: Cases, Materials and Statutes (2nd edition). Oxford University Press.
- Gupta, K.R. 2006. Environmental Legislation in India. Atlantic Publishers and Distributors.
- Leelakrishnan P.2008.
- Environmental Law in India (3rd edition). LexisNexis India. Naseem, M. 2011.
- Environmental Law in India Mohammad. Kluwer Law International
- A text book on soil science, D.K.Das,Kalyani Publications
- A text Book of Plant Ecology and Soil Science, Shukla Chandel, S. Chand & Co. pvt. Ltd.
- Text Book of Microbiology, Dubey & Mahewar
- Microbiology, Powar and Dagainawala

SEMESTER-I

IKS -I: Environment in Ancient India

CREDIT:2.LECTURE HOURS; 2PER WEEK

MARKS:50

MODULE	SUB-MODULE	TOPICS	LECTURE PERIOD
1.	Ancient Indian Environment and Man		
	1.1 Living with Nature	Environment and Early Urban Societies: Indus valley civilization Harappa Civilization , Beliefs, Practices and Natural Resources	07
	1.2 Colonialism and Transformation of Nature	Changing Land Use Patterns; Railway and Deforestation, Dams and Hydroelectric Power ,Inland Water bodies and Fisheries Urbanization and Environment	08
2			
	2.1 Era of Major Agrarian	Pastoralism, Agrarian Expansion , Forests and Tribal Groups ,Irrigation and Canals	07
	2.2 Development in India and Environment	Big Dams and Displacement; Narmada and Tehri Gender and Environmental Justice , Green Revolution; Biodiversity Loss; Species Extinction	08
Total Lectures			30