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(2014) with CGPA-3.16

Revised Syllabus For

Bachelor of Science Part-III Pollution

(Sem. – V and VI)

Syllabus to be implemented from June 2015-16 onwards.

Distribution of Marks for B.Sc. III (Pollution)

(Theory & Practical)

Semester Pattern

Semester	Paper No. and its nomenclature	Marks		
		Theory	Internal Evaluation	Practical
Semester-V	**Paper-V** (Biomedical Aspects of Pollution)	40	10	-
	Paper-VI (Pollution and Society)	40	10	-
Semester-VI	**Paper-VII** (Terrestrial Pollution and Recycling)	40	10	-
	Paper-VIII (Monitoring and Control of Pollution)	40	10	-
Annual	**Practicals I & II**	-	-	100

SEMESTER-V

Paper-V:

(Biomedical Aspects of Pollution)

1. Aerobiology: Definition; Scope; Microbes in air; Allergies; Collection and enumeration of bacteria in air; Gaseous and U.V. Sterilization (8)
2. Waterborne Pathogens and Nuisance Algae: Bacteria, Viruses, Protozoa, Parasites, Vectors; Algae causing problems in water treatment; Toxic algae; Control measures of algae (7)
3. Common diseases caused by aero-organisms and air pollutants: Common cold; Chronic bronchitis; Bronchiectasis; Sinusitis; Laryngitis; Diphtheria; Pulmonary emphysema; Bronchial asthma; Silicosis; Asbestosis (7)
4. Pollution Indicators: Organisms in water (bacteria, protozoans, algae, and higher organisms); Pollution indices for measurement of water pollution; Algal indicators of pollution (8)
5. Radioactive pollution: Radiation and their types; Sources; Effects on Man; Prevention; Radioactive waste management (6)
6. Noise pollution: Sources; Effects on Man; Measurement and control (4)

Paper-VI:

(Pollution and Society)

1. Global Conferences and Summits on environment: Stockholm Environment Conference, 1972; Montreal and Kyoto Protocols, Agenda 21 (8)
2. Role of various agencies in monitoring and control of pollution: US E.P.A., Ministry of Environment and Forests, NEERI, WHO, UNEP (6)
3. Environmental legislation in India: Forest Conservation Act, 1989; Wildlife Protection Act, 1972; Environmental Protection Act, 1986; Hazardous Waste Management and Handling Rules, 1989 (7)
4. Maharashtra Pollution Control Board: Activities and Achievements (5)
5. Environmental Clearance for Industrial Projects: Need and procedures for obtaining NOC from Pollution Control Board and Ministry of Environment and Forests (7)
6. Disaster management of earthquakes, floods, cyclones and epidemics (7)

SEMESTER-VI

Paper-VII:

(Terrestrial Pollution and Recycling)

1. Treatment of sewage: Primary and secondary treatment (activated sludge and trickling filters); Organisms associated with secondary treatment; Septic tanks; Stabilization ponds; Oxidation ditch; Sludge digestion (9)
2. Biogas plants: Significance in recycling of wastes; Substrates and role of microbes; design and construction; factors affecting production of biogas; mechanism (8)
3. Single cell protein: Single cell protein and its importance; Mass culture of algae *Spirulina* and *Scenedesmus*; Utilization of organic wastes in algal protein; Nutritional value (8)
4. Characteristics and management of biomedical and e-waste (5)
5. Refuse and its effects: Aesthetic and hygienic effects; Control measures (sanitary land-fills, incineration, salvage and recycling, etc.); Beneficial uses (composting, vermicomposting, energy production, etc.) (10)

Paper-VIII:
(Monitoring and Control of Pollution)

1. Environmental Impact Assessment and Environmental Audit: Concept and Process (7)
2. Faecal contamination and bacteriological examination of water (7)
3. Low cost treatment methods: Use of aquatic plants; land application of wastewaters for irrigation (6)
4. Air pollution control and monitoring: Control of air pollution in thermal power plants and cement industries; Use of green belts (8)
5. Monitoring and Control of water pollution: Characteristics and treatment of wastewater from dairy, sugar mills and distilleries (7)
6. Wastewater characterization: Elementary knowledge of flow measurement; Process of sampling and characterization of effluents in industries (5)

Practical Course –I

1. Preparation of nutrient agar medium (1)
2. Settling rate of bacteria from air (2-3)
3. Bacterial Gram staining (4)
4. Identification of bacteria from air up to colony characteristics (5-6)
5. Enumeration of bacteria from air (7-8)
6. Study of collection, concentration and preservation techniques of algae (9-10)
7. Identification techniques of algae (Study of morphological characteristics of algae (11)
8. Identification and significance of following algae with regard to pollution (12-18)
   - I. Chlorophyceae
     1. Scenedesmus
     2. Chlorella
     3. Pediastrum
     4. Eudorina
     5. Pandorina
     6. Cosmarium
   - II. Cyanophyceae
     7. Merismopedia
     8. Microcystis
     9. Anabaena
     10. Oscillatoria
     11. Spirulina
   - III. Bacillariophyceae
     12. Melosira
     13. Synedra
     14. Navicula
     15. Nitzchia
   - IV. Euglenophyceae
     16. Euglena
     17. Phacus
     18. Pediastrum

9. Calculation of Palmer’s Algal Genus Index (19)
10. Calculation of Nygaard’s Indices (20)
11. Calculation of species diversity from the given data (21)
12. Calculation of Margalef diversity index (22)
13. Calculation of Kothe’s species deficit index (23)
14. Estimation of Standard Plate Count (SPC) from water (24-25)
15. Estimation of MPN of coliforms from water (26-28)

Practical Course –II

16. Determination of phosphate levels in clean and polluted waters (29)
17. Determination of pH of soil (30)
18. Determination of organic matter in soil (31)
19. Determination of percent composition of soluble and insoluble components of community solid waste (32-33)
20. Determination of percent composition of various components of community solid waste (34)
21. Study of treatment efficiency of water-hyacinth in removal of TDS and changes in pH (35-38)
22. Study of a biogas plant (39)
23. Visit to wastewater and drinking water treatment plants under short tours and long tours (40-42)
24. Study of a vermicompost plant (43)
25. Calculation of SAR, % sodium and RSC values from the given data (44)
26. Project work on some environmental aspect* (45-50)

    * = One project can be shared maximum by two students.

Study Tour

A study tour of at least a week long duration should be undertaken to visit places like Industries, Research Institutions, R&D Departments, Pollution Control Boards, NEERI Laboratories, Academic Institutions, Natural and polluted areas, Mining areas, areas of environmental interest, etc.

Instructions for Practicals and Study Tours:

A. Every candidate/student must have recorded his/her observations on the above practicals in the laboratory Journal and written report on each exercise performed. Such journal is to be checked regularly and signed by a teacher in-charge. The Head of Department has to certify the same stating that the student has completed in a satisfactory manner the practical course as recommended by the Board of Studies and the Journal has been properly maintained throughout the year.

B. Candidates shall be required to submit the following at the time of practical examination.
   a. Certified laboratory Journal
   b. B. Tour Report

C. The candidates shall be orally examined (Viva-voce) for tour report, project work and other knowledge they gained of the subject during theory and Practicals. Distribution of marks for practical shall be 50 marks for each practical (Total 100 for Practical-I + Practical-II) as per the following scheme.

Practical-I

S. No.	**Topic**	**Marks**
1	Aerobiology	10
2	Algae identification and pollutional significance	10
3	Algal Indices	10
4	Water microbiology	10
5	Journal	10
	Total Marks	**50**

Practical-II

S. No.	Topic	Marks
1	Water pollution parameters: Analysis and calculation	10
2	Soil and compost analysis/Solid waste	10
3	Project work	10
4	Spotting	10
5	Tour Report and Viva-voce	10
	Total Marks	**50**

List of Recommended Books for B.Sc (III) Pollution

1. Agarwal, A. State of India's Environment: A Citizens Report, Centre for Science and Environment, New Delhi
2. APHA, Standard Methods for Examination of Water and Wastewater. American Public Health Association, New York
3. Arceivala, S.J. Wastewater Treatment and Disposal, Marcel Dekker Inc, New York (1981)
4. Besselivere et al. The Treatment of Industrial Waters, McGraw Hill Kogakusha (1978).
5. Bhide and Sundaresan, B.R. Solid Waste Management in India, NEERI, Nagpur.
6. Bockris, J.O.M. Environmental Chemistry, Plenum Press New York, U.S.A. (1978)
7. Brock, T.D. Microbial Ecology, Prentice Hall, England (1966)
8. Darlington, A. Ecology Refuse Tips. Heinemann Educational Books Ltd., London (1968).
9. Goel, P.K. Water Pollution: Causes, Effects and Control. New Age International, Publishers, New Delhi (2006)
10. Goel, P.K. and Sharma, K.P. Environmental Guidelines and Standards in India. Technoscience Publications, Jaipur (1996).
11. Gopal B. and Sharma, K.P.: Water-hyacinth, Hindasia Publishers, Delhi (1961)
12. Khoshoo, T.N. Environmental Concepts and Strategies, Ashish Publishing House, New Delhi (1984).
13. Liptak, B.G. Environmental Engineers Handbook, Vol. I. Air Pollution, Chilton Book Company, Pennsylvania, USA.
14. Liptak, B.G. Environmental Engineers Handbook, Vol. II. Water Pollution, Chilton Book Company, Pennsylvania, USA.
15. Liptak, B.G. Environmental Engineers Handbook, Vol. III. Land Pollution, Chilton Book Company, Pennsylvania, USA.
16. Mahida, U.N. Water Pollution and Disposal of Wastewater on LandTata McGraw Publishing Co. Ltd., New Delhi, 1981.
17. Metcalf and Eddy, Inc. Wastewater Engineering: Treatment Disposal, Reuse, Tata McGraw Hill Edition, New Delhi.
18. Mishra, P.C. and Trivedy, R.K. (ed.) Ecology and Pollution of Indian Lakes and Reservoirs, Ashish Publishing House 1993. pp. 450
19. Nemerow, N.L. Industria Water Pollution: Origins, Characteristics and Treatment, Addision-Wesley Publishing Co., Inc. Philipines, 1971.
20. Frolien and Cigie, (ed.) Encyclopedia of Environmental Science and Ecology Part-I and II.
21. Gar, N. Irving (ed.) Industrial Pollution, Van Nostrand Reinhod, New York.
22. Trivedy, R.K. and Goel, P.K. Chemical and Biological Medhods for Water Pollution Studies. Environmental Publications, 1986. Pp. 250.
23. Trivedy, R.K. and Goel, P.K. (ed.) Current Pollution Research in India Environmental Publications, 1985. Pp. 350.
24. Trivedy, R.K. (ed.) River Pollution in India, Ashish Publishing House, 1990. Pp. 300
25. Trivedy, R.K. and Sinha, M.P. (ed.) Impact of Mining on Environment, Ashish Publishing House, 1991. Pp-300.

26. Trivedy, R.K. (ed.) Advances in Environmental Pollution and Control (Vo. I & II). Enviro-Media, 1995. Pp. 300.
27. Trivedy, R.K. Encyclopedia of Environmental Pollution and Control (Vol. I & II). Enviro-Media, 1995, pp. 300.
28. Trivedy, R.K. and Goel, P.K. An Introduction to Air Pollution, Technoscience Publications, Jaipur, 1995. Pp-300.
29. Trivedy, R.K. Handbook of Environmental Laws, Acts. Rules, Guidelines, Compliances and Standards Vol. I & II) Environmental Media, 1997. pp-1000.
30. Tilak, S.T. Aerobiology, Vaijyanta Prakashan, Aurangabad.
31. Venkatraman, G.S., Algae: Fonn and Function IARI, New Delhi.
32. W.H.O. Health Hazards of Human Enviornment. WHO, Geneva.
33. W.H.O. Water Pollution Control in Developing Counties, WHO, Geneva

Nature of Question papers (Theory)

COMMON NATURE OF QUESTION FOR THEORY PAPER MENTIONED SPERATELY: