Shivaji University, Kolhapur

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CHOICE BASED CREDIT SYSTEM

Syllabus For

B.Sc. Part –III

Pollution

SEMESTER V AND VI

(To be introduced from the academic year 2020-2021)

Programme Specific Outcomes

After completing the course the students would be able to:

1. Acquire basic, scientific concepts of many of current environmental issues and happenings.
2. Upgrade the competency and different skills necessary for environment protection.
3. Undertake the post graduate program related to environmental science.

Programme Outcomes (PO'S)

1. To create awareness about the present day's environmental issues at global and local scale.
2. To create awareness about environmental and social impacts on developmental activity.
3. To generate positive attitude to solve the environmental issues with sustainable development.
4. To spread the environmental consciousness and responsibility to solve the problems of society.

Structure of B. Sc. Programme: Sem V & VI
Subject: Botany & Pollution
Structure – III

Sr. No.	Subject Name	Code	Paper Number	Title of Paper
Semester V				
1.	Botany	DSE-E25	IX	Genetics and Plant Breeding
2.	Botany	DSE-E26	X	Microbiology, Plant Pathology and Mushroom cultivation
3.	Pollution	DSE-E85	V	Biomedical Aspects of Pollution
4.	Pollution	DSE-E86	VI	Environmental Legislation
Semester VI				
1.	Botany	DSE-F25	XIII	Plant Biochemistry and Molecular Biology
2.	Botany	DSE-F26	XIV	Bioinformatics, Biostatistics and Economic Botany
3.	Pollution	DSE-F85	VII	Monitoring and Recycling of Pollution
4.	Pollution	DSE-F86	VIII	ISO and Environment safety

SEMESTER – V (Duration – 6 Months)															
	TEACHING SCHEME								EXAMINATION SCHEME						
	THEORY				PRACTICAL				THEORY				PRACTICAL		
Sr. No.	Subject Title	Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Theory	Internal	Min Marks	Hours	Max Marks	Min Marks
1	DSE-E25	2	3	2.4	8	20	16	2	40	10	14+4=18	PRACTICAL EXAMINATION IS ANNUAL		
2	DSE-E26	2	3	2.4				2	40	10	14+4=18			
3	DSE-E85	2	3	2.4				2	40	10	14+4=18			
4	DSE-E86	2	3	2.4				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**	---			
SEMESTER – VI (Duration – 6 Months)															
1	DSE-F25	2	3	2.4	8	20	16	2	40	10	14+4=18	As per BOS Guidelines	200	70
2	DSE-F26	2	3	2.4				2	40	10	14+4=18			
3	DSE-F85	2	3	2.4				2	40	10	14+4=18			
4	DSE-F86	2	3	2.4				2	40	10	14+4=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**	

Student contact hours per week : 20 Hours (Min)	Total Marks for B.Sc.-III (Including English) : 700
Theory and Practical Lectures : 48 Min. Each	Total Credits for B.Sc.-III (Semester V & VI) : 36

DSE- Discipline Specific Elective. A candidate shall select one course (subject) from the three Courses (Subjects) selected at B.Sc. – II. Select any 4 pairs of papers from DSE- E1 to DSE - E86 for Sem – V and DSE - F1 to DSE - F86 for Sem - VI

AECC- Ability Enhancement Compulsory Course (E & F) : English

Practical Examination will be conducted annually for 100 Marks.

There shall be separate passing for theory, internal and practical.

(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC)
For Sem V: CCC – II : Constitution of India and Local Self Government

(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

Course Outcomes (CO'S)

DSE E 85:

1) To introduce the concepts of aerobiology.
2) To educate the students about Biomedical aspects of pollution.
3) To educate the students about food safety.
4) To aware about pathogenic waterborne diseases.

DSE E 86:

1) To aware the students about Environmental Legislation act to control pollution.
2) To create awareness about NOC.
3) To educate students about role of various agencies involved in monitoring and controlling pollution.
4) To educate students about role of MPCB and CPCB.

DSE F 85:

1) To give knowledge to student about Monitoring and Recycling of Pollution.
2) To educate students about role of aquatic plants used in pollution treatment.
3) To aware students about Environmental Impact Assessment and Environmental Audit.
4) To create awareness about role of single cell protein in controlling pollution.

DSE F 86:

1) To understand of ISO standards and Environment safety measures
2) To create awareness about role of safety management in industries.
3) To give knowledge about disaster management for students.
4) To educate the students for safety management.

Syllabus for Pollution
SEMESTER-V

DSE E 85: Pollution V: Biomedical Aspects of Pollution

CREDITS: 2, LECTURE PERIOD: 3 PER WEEK- LECTURE HOURS: 2.4 PER WEEK, MARKS: 40

1. Aerobiology: Definition; Scope; Microbes in air; Allergies; Collection and enumeration of bacteria in air; Gaseous and U.V. Sterilization. (9)
2. Waterborne Pathogens and Nuisance Algae: Bacteria, Viruses, Protozoa, Parasites, Vectors; Algae causing problems in water treatment; Toxic algae; Control measures of algae. (8)
3. Common diseases caused by aero-organisms and air pollutants: Common cold; Chronic bronchitis; Bronchiectasis; Sinusitis; Laryngitis; Diphtheria; Pulmonary emphysema; Bronchial asthma; Silicosis; Asbestosis. (8)
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. Fecal contamination and Bacteriological examination of water. (7)
6. Food and safety – Definition, Quality of food, Impact of additives, preservatives and chemicals on human health. (5)

DSE E 86: Polluion VI: Environmental Legislation

CREDITS: 2, LECTURE PERIOD: 3 PER WEEK- LECTURE HOURS: 2.4 PER WEEK, MARKS: 40

1. Global Conferences and Stockholm Environment Conference 1972 – Earth summit 1992 the Rio declaration on environment & development, earth agreement, monitor protocol & carbon credits, Agenda 21 (9)
2. Role of various agencies in monitoring and control of pollution: US E.P.A., Ministry of Environment and Forests, NEERI, WHO, UNEP,WWF (7)
3. Environmental legislation in India: National Forest policy 2006; Wildlife Protection Act, 1972; Environmental Protection Act, 1986; Hazardous Waste Management and Handling Rules, 1989, Motor vehicle act 1988, The biological diversity act 2002 (9)
4. Environmental Clearance for Industrial Projects: Need and procedures for obtaining Environmental Clearance from State and Govt. Ministry of Environment and Forests (9)
5. Functions of State and Central Pollution Board (6)
6. Maharashtra Pollution Control Board: Activities and Achievements (5)

SEMESTER-VI

DSE F 85: Pollution VII: Monitoring and Recycling of Pollution

CREDITS: 2, LECTURE PERIOD: 3 PER WEEK- LECTURE HOURS: 2.4 PER WEEK, MARKS: 40

1. Waste water characterization & Treatment of sewage: Elementary knowledge of flow measurement; Process of sampling and characterization of effluents in industries, Primary and secondary treatment (activated sludge and trickling filters); Organisms associated with secondary treatment; Septic tanks; Stabilization ponds; Oxidation ditch; Sludge digestion. (12)
2. 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. (7)
3. Monitoring and Control of water pollution: Characteristics and treatment of wastewater from dairy, sugar mills and distilleries. (6)
4. Low cost treatment methods: Use of aquatic plants; land application of wastewaters for irrigation. (6)
5. Air pollution control and monitoring: Method of sampling analysis with CPCB standard, Control of air pollution in thermal power plants and cement industries; Use of green belt. (7)
6. Environmental Impact Assessment and Environmental Audit: Concept and Process. (7)

DSE F 86: Pollution VIII: ISO and Environment safety

CREDITS: 2, LECTURE PERIOD: 3 PER WEEK- LECTURE HOURS: 2.4 PER WEEK, MARKS: 40

1. Definition of ISO, Overview of ISO, types of certificates, ISO 14001-2015 based EMS and EMS standards (7)
2. Introduction to safety, Occupation health and safety, management system, definition, goals, need, principles and practices of Industrial safety (9)
3. Industrial safety and policy formulation; concept and importance of safety audit, accidental reporting, emergency evaluation plan, principle of accidents prevention (9)
4. Fire safety management; chemistry of fire, factors to towards fire, common causes of fire, prevention of fire, portable fire extinguisher (water type, CO_2, foam type, Chemical type) (8)
5. Management information system; sources of information on safety, health & environment protection, analysis and use of modern method of programme, health & environment (7)
6. Disaster management of tsunami, drought, landslide (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. Study of process and mechanism of fire safety equipments (32-33)
20. Study of personal protective equipment's (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.

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. Environment and Pollution – Dr. N. Arumugm , Prof. V. Kumarresan – Saras Publication
10. Environmental education – Mahip Singh DPA publishing house Delhi
11. Environmental Science – S. C. Santra 2001 New Central Book Agency P Ltd.
12. Environmental science student Companion – Kenneth Gregroy
13. Environmental Studies – P. D. Sharma
14. Environmental Studies –D. L. Manjunath – 2006 Pearson Publisher
15. Frolien and Cigie, (ed.) Encyclopedia of Environmental Science and Ecology Part-I and II.
16. Gar, N. Irving (ed.) Industrial Pollution, Van Nostrand Reinhod, New York.
17. Goel, P.K. and Sharma, K.P. Environmental Guidelines and Standards in India. Technoscience Publications, Jaipur (1996).
18. Goel, P.K. Water Pollution: Causes, Effects and Control. New Age International, Publishers, New Delhi (2006)
19. Gopal B. and Sharma, K.P.: Water-hyacinth, Hindasia Publishers, Delhi (1961)
20. Industrial Waste water treatment – A. D. Patwardhan – PHI learning 2017
21. Khoshoo, T.N. Environmental Concepts and Strategies, Ashish Publishing House, New Delhi (1984).
22. Liptak, B.G. Environmental Engineers Handbook, Vol. I. Air Pollution, Chilton Book Company, Pennsylvania, USA.
23. Liptak, B.G. Environmental Engineers Handbook, Vol. II. Water Pollution, Chilton Book Company, Pennsylvania, USA.
24. Liptak, B.G. Environmental Engineers Handbook, Vol. III. Land Pollution, Chilton Book Company, Pennsylvania, USA.
25. Mahida, U.N. Water Pollution and Disposal of Wastewater on LandTata McGraw Publishing Co. Ltd., New Delhi, 1981.
26. Metcalf and Eddy, Inc. Wastewater Engineering: Treatment Disposal, Reuse, Tata McGraw Hill Edition, New Delhi.
27. Mishra, P.C. and Trivedy, R.K. (ed.) Ecology and Pollution of Indian Lakes and Reservoirs, Ashish Publishing House 1993. pp. 450
28. Nemerow, N.L. Industria Water Pollution: Origins, Characteristics and Treatment, Addision-Wesley Publishing Co., Inc. Philipines, 1971.

29. Text book of Environmental Studies for undergraduate courses – Erach Bharucha Universities Press, Hyderabad
30. Tilak, S.T. Aerobiology, Vaijyanta Prakashan, Aurangabad.
31. Trivedy, R.K. (ed.) Advances in Environmental Pollution and Control (Vo. I & II). Enviro-Media, 1995. Pp. 300.
32. Trivedy, R.K. (ed.) River Pollution in India, Ashish Publishing House, 1990. Pp. 300
33. Trivedy, R.K. and Goel, P.K. (ed.) Current Pollution Research in India Environmental Publications, 1985. Pp. 350.
34. Trivedy, R.K. and Goel, P.K. An Introduction to Air Pollution, Technoscience Publications, Jaipur, 1995. Pp-300.
35. Trivedy, R.K. and Goel, P.K. Chemical and Biological Medhods for Water Pollution Studies. Environmental Publications, 1986. Pp. 250.
36. Trivedy, R.K. and Sinha, M.P. (ed.) Impact of Mining on Environment, Ashish Publishing House, 1991. Pp-300.
37. Trivedy, R.K. Encyclopedia of Environmental Pollution and Control (Vol. I & II). Enviro-Media, 1995, pp. 300.
38. Trivedy, R.K. Handbook of Environmental Laws, Acts. Rules, Guidelines, Compliances and Standards Vol. I & II) Environmental Media, 1997. pp-1000.
39. Venkatraman, G.S., Algae: Fonn and Function IARI, New Delhi.
40. W.H.O. Health Hazards of Human Enviornment. WHO, Geneva.
41. W.H.O. Water Pollution Control in Developing Counties, WHO, Geneva
42. Waste water treatment – M. N. Rao, S.C. Dutta – Oxford & IB Publisher

Nature of Question Paper for Semester Pattern
Semester-V

Paper-V (Biomedical Aspects of Pollution)
Total Marks: 40

Q. 1. Objective type question (Multiple choice type questions)	8 Marks
Q. 2. Essay type question (Any two out of three)	16 Marks
Q. 3. Short Notes (Any four out of six)	16 Marks

Paper-VI (Environmental Legislation)

Total Marks: 40

Q. 1. Objective type question (Multiple choice type questions)	8 Marks
Q. 2. Essay type question (Any two out of three)	16 Marks
Q. 3. Short Notes (Any four out of six)	16 Marks

Semester-VI

Paper-VII (Monitoring and Recycling of Pollution)
Total Marks: 40

Q. 1. Objective type question (Multiple choice type questions)	8 Marks
Q. 2. Essay type question (Any two out of three)	16 Marks
Q. 3. Short Notes (Any four out of six)	16 Marks

Paper-VIII (ISO and Environment safety)
Total Marks: 40

Q. 1. Objective type question (Multiple choice type questions)	8 Marks
Q. 2. Essay type question (Any two out of three)	16 Marks
Q. 3. Short Notes (Any four out of six)	16 Marks

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