PUNJABI UNIVERSITY, PATIALA 147002

(INDIA)

(Established under Punjab Act No. 35 of 1961)

Faculty of Life Sciences

Outline of Course and Syllabi

for

M.Sc. Environmental Sciences

(Choice Based Credit System)

Sessions: 2020-21 and 2021-22

M. Sc-II (Environmental Sciences)

SEMESTER-III July/August 2020-2021 and 2021-2022 Sessions

Theory Classes : 20 Hours per week
Practical Classes : 12 Hours per week
Seminars/Library Consultation : 03 Hours per week

THEORY PAPERS

	Theory	Internal Assessment
MES311 Environmental Pollution	: 55 Marks	:20 Marks
MES312 Environmental Impact Assessment & Management	: 55 Marks	:20 Marks
MES313 Environmental Health Hazards	: 55 Marks	:20 Marks
MES314 Industrial and Biomedical Waste Management	: 55 Marks	:20 Marks

Total : 220 Marks   80 Marks

Total   : 220+80 =300 Marks

PRACTICAL PAPERS

MES315 Practical paper-V   (Pertaining to theory papers MES311 & MES312)   : 100 Marks
MES316 Practical paper-VI   (Pertaining to theory papers MES313 & MES314)   : 100 Marks

Total: 200 Marks

Total   300 + 200 =   500 Marks

Internal Assessment (Break-up)
Attendance   –   16 Marks
Project   –   32 Marks
MST   –   32 Marks
Total   -   80 Marks

The consolidated marks, out of maximum 80 marks, shall be supplied to the University through the Head of the Department under internal Assessment.

TOTAL MARKS FOR SEMESTER – III

Theory papers : 220 Marks
Practical Papers : 200 Marks
Internal Assessment : 80 Marks

Total: 500 Marks

Course Code	Course	Course option	Credits	Total Marks (Ext+Int)
MES311	Environmental Pollution	Core-VIII	5	55+20 = 75

MES312	Environmental Impact Assessment & Management	Core-IX	5	55+20 = 75
MES313	Environmental Health Hazards	Core-X	5	55+20 = 75
MES314	Industrial and Biomedical Waste Management	Core-XI	5	55+20 = 75
MES315	Practical Paper – V Pertaining to theory paper – MES311& MES312	Practical-V	6	100
MES316	Practical Paper – VI Pertaining to theory paper – MES313& MES314	Practical-VI		100
	Seminars/Library Consultation *Marks already included in Internal assessment*		1½	
	Total		**27½**	**500**

SEMESTER-IV November/December 2020-21 & 2021--2022 Sessions

Theory Classes	: 10 Hours per week
Practical Classes	: 6 Hours per week
Dissertation	: 13 Hours per week
Seminars/Library Consultation	: 03 Hours per week

THEORY PAPERS

	Theory	Internal Assessment
MES411 Environmental Biotechnology	: 55 Marks	20 Marks
MES412 Biometry & Computer Applications Elective Paper – II	: 55 Marks	20 Marks
MES413 Zoogeography Elective Paper – II	: 55 Marks	20 Marks

Total: 150 Marks

DISSERTATION   **Total: 250 Marks**

PRACTICAL PAPER

MES414 Practical paper-VII (Pertaining to theory papers MES411 & MES412/ MES413) : 100 Marks

Total: 100 Marks

INTERNAL ASSESSMENT

i	Attendance	20%	% of the Total Marks of the Internal
ii	Assignment/Project/Seminar	40%	

Iii	Two Mid-semester Tests/Internal Examinations	40%	Assessment

Attendance – **8 Marks**
Assignment/Project/Seminar – **16 Marks**
MST – **16 Marks**   **Total- 40 Marks**

The consolidated marks, out of maximum 40 marks, shall be supplied to the University through the Head of the Department under internal Assessment.

TOTAL MARKS FOR SEMESTER – IV

Theory papers   : 110 Marks
Practical Papers   : 100 Marks
Internal Assessment   : 40 Marks
Dissertation   : 250 Marks
                                                   Total : 500 Marks

Course Code	Course	Course option	Credits	Total Marks (Ext+Int)
MES411	Environmental Biotechnology	Core-XII	5	55+20 = 75
MES412	Biometry & Computer Applications	Elective Paper -II	5	55+20 = 75
MES413	Zoogeography	Elective Paper-II	5	55+20 = 75
	*MOOC courses			
	Dissertation		13	250
MES414	Practical Paper – VII Pertaining to theory paper – MES411& MES412/ MES413	Practical-VII	3	100
	Seminars/Library Consultation *Marks already included in Internal assessment*		1½	
	Total		**27½**	500

* The subjects which the students can opt from MOOC will be notified by the department semester wise time to time.
* In addition to the above mentioned subjects there will be an Open Elective (Economic Zoology) as a Optional Subject. The list of open elective subjects will be notified by the department from time to time.

SEMESTER - III

MES311
ENVIRONMENTAL POLLUTION

Maximum Marks: 75   Total Teaching Hrs: 45

Theory: 55   Time Allowed: 3 hrs

Internal Assessment: 20
Minimum Pass Marks: 35%

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B, & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry $8^{1/2}$ marks each. Section C will consist of 7 short-answer type questions covering the entire syllabus uniformly and each will carry 3 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A
AIR AND NOISE POLLUTION
1.1   Sources and kinds of air pollution.
1.2   Common effects of air pollution on materials, human beings, animals & vegetation
1.3.   Gaseous pollutants, Particulate pollutants and their control
1.4.   Air pollution & climate change: Acid rain, Ozone depletion & Global warming
1.5.   Noise pollution: sources, effects and control

LAND POLLUTION
2.1.   Sources and control of Soil pollution
2.2.   Sources and management of municipal solid waste
2.3.   Sources and management of Biomedical waste
2.4.   Sources and management of Hazardous waste
2.5.   Sources and management of Industrial waste.

SECTION-B
WATER POLLUTION
3.1.   Sources and kinds of water pollution.
3.2.   Water quality standards
3.3.   Effects of water pollutants on physico-chemical characteristics of water
3.4.   Effects of water pollutants on plants: phytoplankton and macrophytes
3.5.   Effects of water pollutants animals: zooplankton, macrobenthic invertebrates & fish

WATER POLLUTION-II
4.1   Sources and kinds of marine pollution
4.2.   Effects and control of marine pollution
4.3.   Sources, effects and control of thermal pollution
4.4.   Eutrophication and restoration of lakes
4.5.   Groundwater contamination and control

SUGGESTED READING MATERIAL

1. Bretsehnedder, B. & Kurfurst, J. (1987). Air Pollution. Elsevier Scientific Pub. Co. Amsterdam, Oxford, New York.
2. Bridgman, H. (1992). Global Air Pollution. CBS Pub. New Delhi.
3. Bush, M.B. (1997). Ecology of a changing planet. Prentice Hall, USA.
4. Dassber, H.S. & Bortitz, S. (1988). Air pollution & its influence on vegetation. Dr.W.Junk Pub. Dor drencht-Bostan Lancaster.
5. Davis, M.L. & Cornwell, D.A. (1991). Intro. Oto Environmental Engg. McGraw Hill International Edition.
6. Dhaliwal, G.S.; Sawgha, G.S. & Ralhan, P.K. (1996). Fundamentals of Environmental Science. Kalyani Pub., Ludhiana.
7. Edward, C.A. (1976). Environmental Pollution by Pestacades. Plenum Press, London & New York.
8. Kamboj, N.S. (1999). Control of Noise Pollution. Deep & Deep Pub. Pvt. Ltd., New Delhi.
9. Kudesia, V.P. (1990). Air pollution. Pragati Prakashan, Meerut - 250001.
10. Misra, S.C. And Mani, D. (1994). Agricultural Pollution.(Vol. I). Ashish Publishing House 8/81, Punjabi Bagh, N. Delhi - 110026.
11. Naji,G.K.;Dhillon, M.K.; Dhaliwal, G.S.(1999). Noise Pollution. Commonwealth Pub., New Delhi.
12. Odum,E.P. (1996). Fundamentals of Ecology. Natraj Pub. Dehradun.
13. Patrick, R. Dugan (1972). The Water pollution problems (Part-I). Plenium Publishing Corporation 227, West. 17th Street, New York - 110011.
14. Prasad, O & Choudhary, M.C. (1992). Environmental Pollution Radiation, Venus Publishing House 11/298 press Colony, Maya Puri, N. Delhi.
15. Rana, S.V.S. (2003). Essentials of Ecology & Environmental Sciences. Prentice Hall of India, New Delhi.
16. Rao, M.N. & Rao, H.U. (1998). Air Pollution. Tata McGraw Hill Pub. Company, New Delhi.
17. Tripathi, A.K. (1992). Air pollution. Vol. I. Ashish Publishing House 8/81, Punjabi Bagh, N. Delhi - 110026.

MES312

ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT

Maximum Marks: 75   Total Teaching Hrs: 45

Theory: 55   Time Allowed: 3 hrs

Internal Assessment: 20

Minimum Pass Marks: 35%

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B, & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry $8^{1/2}$ marks each. Section C will consist of 7 short-answer type questions covering the entire syllabus uniformly and each will carry 3 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

INTRODUCTION TO ENVIRONMENTAL IMACT ASSEMENT (EIA)

1.1   Environmental Impact Assessment (EIA): Concepts, objectives, origin & generalised approach to EIA.

1.2   Methodologies of EIA and EIA guidelines (GOI Notification of 1994, 2006).

1.3   Environmental Impacts, their types & important impacts to be considered in EIA .

1.4.   Environmental Impact Statement & Environmental Management Plan.

1.5   Environmental Auditing: Concept & guidelines.

ENVIRONMENTAL IMPACT ASSESMENT OF:

2.1   River valley Projects.

2.2   Mining Projects.

2.3.   Oil refinery

2.4.   Thermal Power Project

2.5   Cement Industries

SECTION-B

PREDICTION & ASSESSMENT OF IMPACTS ON:

3.1   Water Environment

3.2   Air Environment

3.3   Noise Environment

3.4   Socio-Economic & Cultural Environment

3.5   Biological Environment

IMPACT OF TOURISM ON ENVIRONMENT

4.1   Biotic impact on flora & fauna in Himalaya
4.2.   Land use & Land capability classification for sustainable Environment.
4.3   Ecotourism & environment : concept, objectives and its role in sustainable environment management
4.4   Environmental priorities in India & sustainable development
4.5   Environmental Education: formal & informal education & their role in environmental Awareness.

SUGGESTED READING MATERIAL

1.   Baldwin, J.H. 1985. Environmental Planning & Management. International Book Distributors. Dehradun, India.

2.   Bandhu,D., Bongartz, H., Ghazuawl, A.C. & Gopal B. 1994. Environmental Education for sustainable development. Indian Environmental Society, New Delhi.

3.   Cantar, L.W. (1977).Environmental Impact Assessment. Mc.Graw Hill,Pub., New York.

4.   Rajora, R. (2002). Integrated Watershed Management. Rawat Publications, Jaipur & New Delhi.

5.   Sapru, R.K. 1987. Env. Management in India, Ashish Publishing House, New Delhi.

6.   Singh, S.S., 1989. Impact of tourism on mountain env.. Research India Publication, Meerut

7.   Trivedi, P.R.& Raj,C.,1992 .Env. Problems Impact Assessment. Akashdeep Pub. House, New Delhi

8.   Trivedi, P.R.& Raj,C.,1992 .Env. Biology,Akashdeep Pub.House, New Delhi

9.   UNEP (United Nations: Env. Programme) 1980. Industry & Env. Series, Vol.1.

10.   United Nations 1994 .Trends in Environmental Impact Assessment of Energy Projects.

MES313

ENVIRONMENTAL HEALTH HAZARDS

Maximum Marks: 75   Total Teaching Hrs: 45

Theory: 55   Time Allowed: 3 hrs

Internal Assessment: 20

Minimum Pass Marks: 35%

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B, & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry $8^{1/2}$ marks each. Section C will consist of 7 short-answer type questions covering the entire syllabus uniformly and each will carry 3 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

ENVIRONMENT & HEALTH

1.1 Concept, indicators and determinants of health

1.2 Environmental hazards: physical, chemical, biological, sociological & psycological

1.3 Concept, causation and natural history of disease

1.4 Principles of environmental control

1.5 National health policy and health situation in India

OCCUPATIONAL HAZARDS

2.1 Environmental Surveys: recognition of hazards, preliminary survey & evaluation of Environmental exposure.

2.2 Dust diseases (Pneumoconiosis) with particular reference to Silicosis. Asbestosis, Anthracosis, Bagaossis & Byssinosis

2.3 Occupational cancers

2.4 Occupational Dermatitis: frequency, causes & prevention.

2.5 Prevention of occupational disease

SECTION – B

DISEASE VECTORS

3.1 Introduction:

3.1.1 Mosquitoes vector of diseases: Malaria, Dengue & Encephalitis.

3.1.2 Mosquito surveillance.

3.1.3 Control of mosquitoes: Biological, chemical & environmental

3.2 Flies vectors of diseases: Viral, bacterial, Protozoan & Helminth
    3.2.1 Fly population measurements
    3.2.2 C o m m u n i t y control programme
3.3 Cockroach & spiders as disease vectors
3.4 Ticks & bed-bugs as disease vectors
3.5 Rodents as disease vector:
    3.5.1 Plague, Murine typhus, Rickettsial pox, Leptospirosis, Rat Bite.
    3.5.2 Rodents surveillance
    3.5.3 Control of Rodents

COMMUNICABLE DISEASES

4.1 Communicable diseases - Dynamics of disease transmission
4.2 Water borne infections: Etiology, Pathogenesis & remedial measures of Diarrhoea and dysentery, Cholera and Typhoid
4.3 Air borne infections: Etiology, Pathogenesis & remedial measures of Tuberculosis, Influenza and Diptheria
4.4 Nosocomial infections and their control
4.5 General account, classification and control of zoonoses

SUGGESTED READING MATERIAL

1. Alcamo, I.E.(1994). Fundamentals of Microbiology. The Benjamin/Cummings Pub. Co., USA.
2. Kumar, R. (1987). Environmental Pollution & Health Hazards in India. Ashish Pub. House,
New Delhi.
3. Park, K. & Park, S.(2002). Textbook of preventive & social medicine. M/s Banarsi Das hanot, Jabalpur.
4. Prescott, L.M.; Harley, J.P. & Klein, D.A. (1993).Microbiology. WCB Pub., USA.
5. Shukla, S.K. & Sriviastava, P.R. (1992). Characterization of Health hazards in man & Environment. Commonwealth Pub. New Delhi.
6. Shukla, S.K. & Sriviastava, P.R. (1992). Environmental Pollution & chronic diseases. Commonwealth Pub. New Delhi.
7. Tortora, G.J.; Funke, B.R. & Case, C.L. (1995). Microbiology - An Introduction. The Benjamin / Cummings Pub. Co., USA.
8. Upton, A.C. & Graber, E. (1993). Staying Healthy in a risky Environment. Simon & Schuster Pub., USA.

MES314

INDUSTRIAL AND BIOMEDICAL WASTE MANAGEMENT

Maximum Marks: 75
Theory: 55
Internal Assessment: 20
Minimum Pass Marks: 35%

Total Teaching Hrs: 45
Time Allowed: 3 hrs

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B, & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 8$^{1/2}$ marks each. Section C will consist of 7 short-answer type questions covering the entire syllabus uniformly and each will carry 3 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

WASTE AND ITS MANAGEMENT

1.1 Radioactive waste and its Management
1.2 Electronic waste, types and Management
1.3 Basic Considerations of Wastes from Industries like textile, sugar, pulp and paper,
1.4 Cement, distilleries, dairy, food processing, mining
1.5 Types and Environmental problems of hazardous wastes: Lead and Mercury poisoning

INDUSTRIAL WASTE TREATMENT AND TECHNOLOGIES

2.1 Industrial Effluent Treatment: Standards of Disposal of industrial wastes-on land, in sea /in inland streams; Importance of planning location of industries and industrial estates;
2.2 Common Effluent Treatment plants, Types and Environmental problems of hazardous wastes
2.3 Generation, collection, segregation, treatment, transport and disposal of hazardous waste
2.4 Waste destruction, separation and Immobilization Technologies

SECTION-B
BIOMEDICAL WASTE AND ITS MANAGEMENT

3.1 Biomedical waste: Introduction: definition, Classification, types and composition, Types of solids, liquids, sharps, blood and blood tissue, radioactive material, biological and chemical material

3.2 Documentation of Biomedical waste types and guidelines

3.3 Storage of hospital waste; Types of bags and containers used for storage; Segregation of biomedical waste into different type; Handling and transport of hospital waste

3.4 Transport of medical waste: Authorization and accidental spilling reporting

BIOMEDICAL WASTE TREATMENT

4.1 Biomedical waste treatment/disposal methods: Incineration, autoclaving, microwave radiations, chemical treatments

4.2 Biomedical Waste Treatment Facility: record keeping, collection, transport and storage facilities

4.3 Hospital Effluent treatment plant: Its structure and Functioning

4.4 Hazardous waste (Management and Handling) Rules; Bio-medical wastes (Management and Handling) Rules;

SUGGESTED READING MATERIAL

1. Acharya, D.B. and Singh, M.(2003) *Hospital Waste Management*. Minerva Press, Delhi.

2. Blackman, W.C.(2001) *Basic Hazardous Waste Management*. CRC Press, USA.

3. Pichtel, J.(2005) *Waste Management Practices: Municipal, Hazardous, and Industrial*. CRC Press, USA.

4. Pruss, A., Giroult, E. and Rushbrook, P.(1999) *Safe Management of Wastes from Healthcare Activities.* World Health Organization, Geneva.

5. Williams, P.T.(2005) *Waste Treatment and Disposal*. John Wiley and Sons, USA.

6. Jaswal, P.S. and Jaswal, N.(2003) *Environmental Law*. Pioneer Publications, Delhi.

7. Leelakrishnan, P.(2005) *Environmental Law in India*. LexisNexis Butterworths Wadhwa, Nagpur.

8. Shastri, S.C.(2008) *Environmental law in India*. Eastern Book Co, Lucknow.

MES315
Practical Paper V: Pertaining to theory papers MES311 & MES312

MES311
1. To test different areas to assess levels of air pollution.
2. To discover the types of air pollution that arises from industrialization.
3. To observe the effect of activated carbon to neutralize the effect of pesticides.
4. To determine efficiency of a carbon filter at different concentrations of chlorine.
5. To determine the effect of different concentrations of detergents on plant growth
6. To study the biological pollutants: dust mites, Fungi and pollen grains present in air.
7. Field Trip to study disposal of solid waste (collection, treatment and disposal)

MES312
1. To draft a public notice for conducting public hearing.
2. To categorize the projects for activities requiring prior environmental clearance.
3. To prepare a format for data collection for EIA of river valley project.
4. To prepare the hypothetical EIA/prediction of impacts of any two of following: Urbanization, Dam construction, Hydroelectric power generation, Tourism, Road construction, Cement Industry.
5. Management practices of any three of the following Natural disasters such as Earth quake, Volcanic eruption, Landslides, Tsunami, Floods.
6. To prepare an environmental audit of hostel/institutes/industrial area/city.

MES316
Practical Paper – VI: Pertaining to theory papers MES313 & MES314
MES313
1. Study of different disease vectors.
2. Study of different water borne diseases.
3. Study of different air borne diseases.
4. To Study differential in gram positive and gram negative bacteria..
5. Preparation of a survey report on different dust diseases prevalent in a population

MES314
1. Survey of the town to make a list of various clinics/nursing homes/ tertiary medical care centers/dispensaries/health care centers/multi-specialty hospitals and medical centers
2. To study different types of wastes generated in clinics, nursing homes and hospitals in the city.
3. Report about the types and amount of waste generated in nursing home and clinic.
4. A visit to Industrial area handling hazardous material, hazardous waste Generation or disposal site
5. Data on the different methods of handling and transport of hospital wastes in the city

*Minor changes in the practical syllabus can be done as per availability of the material

MES411
ENVIRONMENTAL BIOTECHNOLOGY

Maximum Marks: 75   Total Teaching Hrs: 45
Theory: 55   Time Allowed: 3 hrs
Internal Assessment: 20
Minimum Pass Marks: 35%

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B, & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry $8^{1/2}$ marks each. Section C will consist of 7 short-answer type questions covering the entire syllabus uniformly and each will carry 3 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A
INTRODUCTION & POLLUTION CONTROL
 1.1 Definition, Historical background, scope & importance of biotechnology.
 1.2 Biosorption - use of bacteria, fungi and algae in biosorption.
 1.3 Biodegradation of polychlorinated hydrocarbons
 1.4 Biodegradation of Pesticides
 1.5 Microbial treatment of oil pollution.

RECYCLING AND RECLAMATION
 2.1 Conventional waste water treatment strategies using biosystem. Activated sludge process, Trickling filter, Rotating Biological contactor (RBC) and Fluidized Beds.
 2.2 Role of Biotechnology in:
  2.2.1. Energy production from Biomass
  2.2.2. Fuel Alcohol production.
  2.2.3. Hydrogen production.

SECTION-B
BIOTECHNOLOGY AND LAND RESTORATION
 3.1 Biotechnology for restoration of degraded land
  3.1.1. Reforestation through micropropogation.
  3.1.2. Use of mycorrhizae in reforestation.
  3.1.3. Use of microbes in improving soil fertility.
 3.2 Use of microbes as bioinsecticide
 3.3 Use of microbes as biofungicide and bioherbicides.

NOVEL METHODS FOR POLLUTION CONTROL
 4.1 Biotechniques for Air pollution Abatement & odour control Bioscrubbers, Biobeds, Biotrickling filters
 4.2 Production of b i o - fertilizers
 4.3 Vermitechnology
 4.4 Waste water treatment using aquatic plants

4.5 Biodegradable plastics - Bioplastics

SUGGESTED READING MATERIAL

1.   Abbasi, S.A. & Ramasami, E. (1999). Biotechnological Methods of Pollution Control.

      Unviersities Press (India) Ltd., Hyderabad.

2.   Chaterjii, A.K. (2002). Introduction to Environmental Biotechnology. Prentice Hall of

       India. Pvt. Ltd. N. Delhi.

3.   Gupta, P.K. (1994).Elements of Biotechnology .Rastogi & Co. Meerut

4.   Higgins et.al. (1984). Biotechnology - Fundamentals & Principles. Blackwell Publishers, London.

5.   Jogdand, S.N. (1995). Environmental Biotechnology. Himalayan Publishing House, New

       Delhi.

6.   Mukherjee, R.N. (1992). Down stream processing in Biotechnology. Tata McGraw Hill

       Publishers Co. New Delhi.

7.   Purohit, S.S. & Mathur, S.K. (1996).Biotechnology Fundamentals & Applications .Agro botanical Publication, New Delhi.

8.   Sohal, H.S. & Srviastava, A.K. (1994).Environment & Biotechnology .Ashish Pub. House, New Delhi.

MES412
BIOMETRY & COMPUTER APPLICATIONS
ELECTIVE PAPER - II

Maximum Marks: 75

Theory: 55

Internal Assessment: 20

Minimum Pass Marks: 35%

Total Teaching Hrs: 45

Time Allowed: 3 hrs

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B, & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry $8^{1/2}$ marks each. Section C will consist of 7 short-answer type questions covering the entire syllabus uniformly and each will carry 3 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

1.1 Importance and scope of biometry.

1.2 Sampling of data - random and non-random sampling.

1.3 Diagrammatic (Line, bar, pie diagram) and Graphic (Histogram, frequency polygon, frequency curve, cumulative frequency curve) representation of data.

1.4 Measures of central tendency – Mean (AM, GM & HM), Mode & Median.

1.5 Measures of dispersion; skewness & kurtosis

2.1 Probability distribution - Binomial distribution, Poison distribution and Normal distribution.

2.2 Test of hypothesis, two types of errors, T-Test and Chi square test and their applications.

2.3 Co-relation and regression, Examples of CRD and RBD.

2.4 One way and Two way analysis of variance

SECTION-B

3.1 Computer components & its types, terms & Number system (Binary to decimal & vice-versa).

3.2 Computer memory & its types, Secondary storage device FD/HD.

3.3 UNIX Operating system & its features, Windows.

3.4 Internal & External commands of DOS & its functions.

3.5 Language types & features.

4.1 Types of Networks, data transmission methods, communication protocols

4.2 Internet, World Wide Web.

4.3 Features of C, data types, constants, variables.

4.4 Operators, Library functions.

SUGGESTED READING MATERIAL

1. Gupta, S.C. (1999). Fundamentals of Statistics. Himalayan Pub. House Delhi.

2. Hoshmand, A.R. (1988).Statistical methods for Env.& Agr. Science. CRS Press, New York

3. Khan, I.A. & Khanum, A. (1994). Biostatistics. Ukaaz Publications, Hyderabad.

4. Rao, P.S.S. & Richard, J.(1996). An Introduction to Biostatistics. Prentice Hall, New Delhi.

5. Sukhatma, P.Iii. and Amble, Iii.N. (1976). Statistical methods for Agricultural workers : ICAR, New Delhi.

6. Balagurusamy, E. (1995). Programming with C. Tata McGraw Hil Pub., New Delhi.

7. Jain, P.K. (1995). Fundamentals of Computers. BPB Pub., New Delhi.

8. Kanetkar, Y. (1998). Exploring in C. BPB Pub., New Delhi.

9. Rajaraman, Iii. (1989). Fundamentals of Computers. PHI Pub., New Delhi.

10. Schaum Series (1992). Programming in C: Tata McGraw Hil Pub., New Delhi.

11. Sharma, A.K. (1996). Computer Science. Dhanpat Rai & Sons, New Delhi.

12. Sinha, P.K. (1995). Computer Fundamentals. BPB Pub., New Delhi

13. Jamwal, S.S. (2009) Executing C - a practical approach, Saksham Books International.

MES413
ZOOGEOGRAPHY
ELECTIVE PAPER - II

Maximum Marks: 75   Total Teaching Hrs: 45
Theory: 55   Time Allowed: 3 hrs
Internal Assessment: 20
Minimum Pass Marks: 35%

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B, & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry $8^{1/2}$ marks each. Section C will consist of 7 short-answer type questions covering the entire syllabus uniformly and each will carry 3 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions each from the section A and B of the question paper and the entire section C.

SECTION-A

1   Zoogeography:
    1.1 Zoogeographical realms
    1.2 Origin of major group of animals
    1.3 Principles, types and theories of distribution of animals

2   Island theory and conservation:

    2.1 Habitats as Islands

    2.2 Island biogeography theory

    2.3 Speciation and Island conditions

    2.4 Isolation, its types and mechanisms

SECTION-B

3   Population and Environment:

    3.1 Environmental components: Abiotic and Biotic

    3.2 Complexity of interactions between population and environment

    3.3 Reaction of organism to environmental complexity

    3.4 Sub-specific and trans-specific aspects of evolution

4 Origin of variation:

    4.1 Mutations, their causes, types and role in evolution

    4.2 Rates of mutations and rates of evolution

    4.3 Evolution of genome

    4.4 Diversification of natural selection

SUGGESTED READING MATERIAL

1. Whittaker, R.J.1998. Island Biogeography: Ecology, Evolution and conservation Oxford University Press, New York.

2. Seevers, Charles Systematics, Evolution and Zoogeography Chicago Natural History Museum, Chicago.

3. MacArthur, Robert H. and Wilson, Edward O.1967 The theory of Island Biogeography Princeton University Press, Princeton & Oxford.

4. Futuyma, D.J. 2005. Evolution. Sinauer Associates Inc., USA .

5. Dobzhansky, T, Ayala, F.J., Stebbins, G. Ledyard and Valentine, James W. 1975. Evolution. Surjeet Publications, Delhi, India.

MES414
Practical Paper VII: Pertaining to theory papers MES411 & MES412/ MES413

MES411
1. Study of the Microbial Techniques
2. Study of growth response of bacteria on petroleum fuel (diesel)
3. Isolation and Characterization of Bacteria from Crude petroleum oil contaminated soil.
4. Interaction of Plant seeds with diesel for potential use in the remediation of diesel fuel contaminated soils.
5. Detection of alkylbenzenesulfonate – degrading microorganisms
6. Field Trip: Waste water treatment plant, distilleries etc.
7. Enrichment for Uric Acid utilizing bacteria
8. To produce Biodiesels in the lab.
9. Solar energy : production and uses
10. Vermicomposting: to culture earthworm in soil.

MES412
1. Internal and External DOS Commands.
2. Write a program in C Language to print HELLO.
3. Write a program in C Language using Arithmetic Operators.
4. Write a program in C Language using conditional statements.
5. Write a program in C Language using conditional Operators.
6. Write a program in C Language using functions.

MES413
1. To study the habitat, distribution, habits and important characters of various animals: *Naja naja*, Pigeon, *Hystrix* (Porcupine), *Hyla*, *Salamander*, *Apteryx* (kiwi), Flying Squirrel, *Ornithorhynchus, Protopterus, Peripatus, Balanoglossus, Archaeopteryx*.
2. To study the vestigial organs in animals.
3. To study the zoogeographic realms of the world.
4. Map studies:
a. India – Climatic Regions
b. India Rainfall and wind
c. India – Distributions of Animals
d. Distribution of endangered animal species in Himalayan region
5. Map studies: Biodiversity Hotspots location in (a) World (b) India
6. Map Studies: Protected Areas of India such as National parks, Wildlife Sanctuaries, Biosphere Reserves.
7. To study the Leg modifications in case of insects.

*Minor changes in the practical syllabus can be done as per availability of the material