**Appendix 5**

**(M.Sc. in Environmental Geology)**

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###### JAI NARAIN VYAS UNIVERSITY, JODHPUR

###### FACULTY OF SCIENCE

###### NEW CAMPUS

GUIDELINES FOR CHOICE BASED CREDIT SYSTEM:

**Definitions of Key Words:**

* 1. **Academic Year**: Two consecutive (one odd + one even) semesters constitute one academic year.
  2. **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed elective and skill courses.A student need to select **two elective papers** offered by the Department in which he/she is doing core course this shall be part of core programme during third and fourth semester. Each student has to complete **four skill courses**: two within the Department and two from other Department within JNV University or the Universities approved by JNV University
  3. **Course**: Usually referred to, as ‘papers’ is a component of a programme. All coursesneed not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory work/ field work/ project work/ self-study etc. or a combination of some of these.
  4. **Credit Based Semester System (CBSS)**: Under the CBSS, the requirement forawarding a degree is prescribed in terms of number of credits tobe completed by the students.
  5. **Credit Point**: It is the product of grade point and number of credits for a course.
  6. **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one period of teaching (lecture or tutorial) or two periods of practical work/field work per week.
  7. **Cumulative Grade Point Average (CGPA)**: It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
  8. **Grade Point**: It is a numerical weight allotted to each letter grade on a 10-point scale.
  9. **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.
  10. **Programme**: An educational programme leading to award of the Postgraduate Degree in the Core subject in which he/she is admitted.
  11. **Semester Grade Point Average (SGPA)**: It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
  12. **Semester**: Each semester will consist of 15-18 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to November/ December and even semester from December/January to May.

**Odd semester University examination shall be during second/third week of December and even semester University examination shall be during second/third week of May. Each Department shall conduct the Practical examinations of Odd semester with internal examiners only; however during even semester one Examiner shall be from other University/Institute**.

* 1. **Transcript or Grade Card or Certificate:** Based on the grades earned, a statement of gradesobtained shall be issued to all the registered students after every semester. This statement will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester

**Fairness in Assessment**

Assessment is an integral part of system of education as it is instrumental in identifying and certifying the academic standards accomplished by a student and projecting them far and wide as an objective and impartial indicator of a student’s performance. Accordingly the Faculty of Science resolves the following:

1. All internal assessments shall be open assessment system only and that are based on Quizzes, term test, seminar
2. Attendance shall carry the prescribed marks in all papers and Practical examination internal assessment
3. In each semester three out of four theoretical component University examination shall be undertaken by external examiners from outside the university conducting examination, who may be appointed by the competent authority

**Grievances and Redressal Mechanism**

1. The students will have the right to make an appeal against any component of evaluation. Such appeal has to be made to the Head/Principal of the College or the Chairperson of the University Department concerned as the case may be clearly stating in writing the reason(s) for the complaint / appeal.
2. The appeal will be assessed by the Chairman and he/she shall place before the **Grievance Redressal Committee (GRC),** Chaired by the Dean, Faculty of Science comprising all HODs of the Faculty and if need be Course Teacher(s) be called for suitable explanation; GRC shall meet at least once in a semester and prior to CCA finalization.
3. The Committee will consider the case and may give a personal hearing to the appellant before deciding the case. The decision of the Committee will be final.

Table 1: Grades and Grade Points

|  |  |  |  |
| --- | --- | --- | --- |
| S.No. | Letter Grade | Meaning | Grade Point |
| 1 | ‘O’ | Outstanding | 10 |
| 2 | ‘A+’ | Excellent | 9 |
| 3 | ‘A’ | Very Good | 8 |
| 4 | ‘B+’ | Good | 7 |
| 5 | ‘B’ | Above Average | 6 |
| 6 | ‘C’ | Average | 5 |
| 7 | ‘P’ | Pass | 4 |
| 8 | ‘F’ | Fail | 0 |
| 9 | ‘Ab’ | Absent | 0 |

1. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.
2. For noncredit courses (Skill Courses) ‘Satisfactory’ or “Unsatisfactory’ shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA

**Grade Point assignment**

= and > 95 % marks Grade Point 10.0

90 to less than 95 % marks Grade Point 9.5

85 to less than 90 % marks Grade Point 9.0

80 to less than 85 % marks Grade Point 8.5

75 to less than 80 % marks Grade Point 8.0

70 to less than 75 % marks Grade Point 7.5

65 to less than 70 % marks Grade Point 7.0

60 to less than 65 % marks Grade Point 6.5

55 to less than 60 % marks Grade Point 6.0

50 to less than 55 % marks Grade Point 5.5

45to less than 50 % marks Grade Point 5.0

40 to less than 45 % marks Grade Point 4.5

35 to less than 40 % marks Grade Point 4.0

**Computation of SGPA and CGPA:**

1. The SGPA is the ratio of sum of the product of the number of credits with the gradepoints scored by a student in all the courses taken by a student and the sum of thenumber of credits of all the courses undergone by a student,

i.e

**SGPA** (Si) = Σ(Ci x Gi) / ΣCi

whereCi is the number of credits of the ith course and Gi is the grade point scored by thestudent in the ith course.

1. The CGPA is also calculated in the same manner taking into account all the coursesundergone by a student over all the semesters of a programme,

i.e.

**CGPA =** Σ(Ci x Si) / Σ Ci

where Si is the SGPA of the ith semester and Ci is the total number of credits in thatsemester.

1. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in thetranscripts.

***Illustration* for SGPA**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.No.** | **Course** | **Credit** | **Grade letter** | **Grade point** | **Credit Point**  (Credit x Grade) |
| **1** | Course 1 | **4** | **B** | **8** | **4 x 6 =24** |
| **2** | Course 2 | **4** | **B+** | **7** | **4 X 7 =28** |
| **3** | Course 3 | **4** | **B** | **6** | **4X 6 = 24** |
| **4** | Course 4 | **4** | **O** | **10** | **4 X 10 =40** |
| **5** | Course 5-Practical I | **4** | **C** | **5** | **4 X 5 =20** |
| **6** | Course 6 – Practical II | **4** | **B** | **6** | **4 X 6 = 24** |
|  | Total | **24** |  |  | **24+28+24+40+20+24 =160** |

Thus, **SGPA =160/24 =6.67**

***Illustration* for CGPA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Semester- I** | **Semester-II** | **Semester-III** | **Semester-IV** |
| **Credit** | **24** | **24** | **24** | **24** |
| **SGPA** | **6.67** | **7.25** | **7** | **6.25** |

**CGPA = (24X6.67+ 24X 7.25 + 24X7 + 24 X 6.25)/ 96**

**652.08/96 = 6.79**

The Department is free to distribute the Periods between Theory/Tutorial/Practical as per the Course content and the need of the course. However the selection shall be from any one of the following pattern

4 : 0 : 0 (four lectures only (no tutorial and no practical) per week).

2 : 1 : 1 (two lectures, one tutorial, and one practical per week).

0 : 2 : 2 (no lecture, two tutorials, and two practicals per week).

1 : 2 : 1 (one lecture, two tutorials, and one practical per week).

2 : 2 : 0 (two lectures, two tutorials, and no practical per week).

0 : 4 : 0 (no lecture, four tutorials only, and no practical per week).

1 : 1 : 2 (one lecture, one tutorial, and two practicals per week).

2 : 0 : 2 (two lectures, no tutorial, and two practicals per week).

0 : 0 : 4 (no lecture, no tutorial, and four practicals only per week).

1 : 0 : 3 (one lecture, no tutorial, and three practicals per week).

3 : 1 : 0 (three lectures, one tutorial, and no practical per week).

0 : 1 : 3 (no lecture, one tutorial, and three practicals per week).

1 : 3 : 0 (one lecture, three tutorials, and no practical per week).

3 : 0 : 1 (three lectures, no tutorial, and one practical per week).

0 : 3 : 1 (no lecture, three tutorials, and one practical per week).

**The Duration of the Period shall be forty five minutes. In each of these combinations, the first value stands for the same number of lecture instructions per week, whereas the last two values stand for double the number of tutorial / practical instructions per week**.

**In each practical group the number of students that can be accommodated will be decided by the respective Department Council; the general/existing pattern is 15 to 20 students in each group. The workload is to be computed accordingly.**

**Course Evaluation (Evaluation of the Students)**

All courses (Core/ Elective) involve an evaluation system of students that has the following two components:-

* 1. **Continuous Comprehensive Assessment (CCA)** accounting for 30% of the final grade that a student gets in a course; and
  2. **End-Semester Examination (ESE)** accounting for the remaining 70% of the final grade that the student gets in a course.

1. **Continuous Comprehensive Assessment (CCA)**: This would have the following components:
   1. **Quizzes:** Two Quiz examinations of 45 minutes duration each having a maximum of 40 marks shall be arranged for theory paper during the semester course period
   2. **Term Test**: One term test shall be arranged for each theory paper prior to End-Semester Examination; examination duration shall be of three hours; maximum marks is 70
   3. **Seminar**: Each student shall prepare and deliver a seminar per theory paper; maximum marks shall be 15. The seminar shall commence after first quiz examination and shall be completed prior to term test for all the papers.
   4. **Classroom Attendance –** Each student will have to attend a minimum of 75% Lectures / Tutorials / Practicals. A student having less than 75% attendance will not be allowed to appear in the End-Semester Examination (ESE). Attendance shall have 15 marks and will be awarded by following the system proposed below:

Those having greater than 75% attendance (for those participating in Co-curricular activities, 25% will be added to per cent attendance) will be awarded CCA marks as follows:-

75% to 80% = 3 marks

80% to 85% = 6 marks

85 to 90% = 9 marks

90% to 95% = 12 marks

˃ 95% = 15 marks

**All students’cumulative attendance shall be displayed in the Department Notice Board every month with a copy to the Dean, Faculty of Science.**

* 1. CCA are based on open evaluation system without any bias to any student
  2. Any grievance received in the Department from student shall be placed before the **Grievance Redressal Committee** with adjudicated comments

Each component marks will be added without rounding and the total thus obtained is ratio by a factor of six. This value shall be rounded.

Illustration : Quiz 1 – Marks obtained = 30

Quiz 2 – Marks obtained = 35.5

Term Test Marks obtained = 50.5

Seminar Marks obtained = 14

Attendance Marks obtained = 9

Total = 139.00

Conversion = 139/6 = 21.16666

Award = 22.00

**Skill Course Evaluation:** Based on his/her performance and hands on practice, the respective Department shall declare the result as “Satisfactory” or “Non-Satisfactory”; each student need to get a minimum of three “Satisfactory” declaration for the course completion

**In laboratory courses (having only practical (*P*) component**), the CCA will be based on students attendance (50%); hands on Practical in physical science stream (50%) and collection of biological material (25%) and hands on Practical (25%) in biological and earth science stream.

**For QUIZ** (2 quizzes per semester), 40 marks per Quiz and total of 80 marks, 45 minutes duration for each quiz:

|  |  |  |  |
| --- | --- | --- | --- |
| Types of question | Number of Questions | Marks  Per question | Total marks per type |
| 1. Multiple choice 2. Fill in the blanks 3. Short answer (15 words) | 10  10  5 | 1  2  2 | 10  20  10 |
| Total | 25 |  | 40 |

**For the Term test and ESE**:

**Part A**

Ten short type questions (Definitions, functions, short explanations, etc) for two marks each. 10 × 2= 20 marks; two questions from each Unit; no choice in this part

**Part B**

Five short answer (250 words) type questions for four marks each. 5 × 4 = 20 marks; one question from each Unit with internal choice

**Part C**

Five questions of long/explanatory Answer (400 words) type, one drawn from each Unit; student need to answer any three; ten marks each; 3 × 10 = 30 marks

**20+20+30 = 70 marks**

**Qualifying for Next semester**

* + 1. **A student acquiring minimum of 35% in total of the CCA is eligible to join next semester**.
    2. A student who does not pass the examination (CCA+ESE) in any course(s) (or due to some reason as he/she not able to appear in the ESE, other conditions being fulfilled, and so is considered as ‘Fail’), shall be permitted to appear in such failed course(s)’in the subsequent ESE to be held in the following October / November or April / May, or when the course is offered next, as the case may be.
    3. A student who fails in one or more papers in a semester shall get three more chances to complete the same; if he/she fails to complete the same within the prescribed timei.e three additional chances for each paper;the student is ineligible for the Postgraduate degree in the Subject in which he/she is admitted. Additional chances examination fee shall be on additive basis.

**Improvement Option**:

Every student shall have the opportunity to improve Credit thorough University Examination only. Improvement opportunity for each paper is only with two additional chances; improvement examination fee shall be on additive basis; the Credit obtained in improvement examination shall be final. There shall be no improvement opportunity in Practical examinations**.**

**Result Declaration:**

The ESE (End Semester Examination/University Examination) results shall be declared within twenty days of the last examination. The Theory/ Practical Classes of even semesters shall begin from the next day of ESE; whereas odd semester classes shall commence after summer vacation.

**M.Sc. Environmental Geology (2017-2019)**

**M.Sc. Environmental Geology: Semester I**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of course** | **Course code** | **Title of the Course** | **Lecture-Tutorial-Practical/Week** | **No. of credits** | **Continuous Comprehensive Assessment (CCA)** | **End-Semester Examination (ESE)**  **[University Examination]** | **Total** | |
|  |  |  |  |  |  |  |  | |
| **Core course 1** | **EG 101** | **Basic concepts and elements of Ecology and Environment** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 2** | **EG 102** | **Earth Processes and Natural Cycle** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 3** | **EG 103** | **Natural Resources and their conservation** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 4** | **EG 104** | **Environmental Pollution and Monitoring** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 1** | **EG 105** | **Basic concepts and elements of Ecology and Environment and Earth Processes and Natural Cycle** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 2** | **EG 106** | **Natural Resources and their conservation and Environmental Pollution and Monitoring** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development Course I** | **EG 107** | **Survey in Field** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

**M.Sc. Environmental Geology: Semester II**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of course** | **Course code** | **Title of the Course** | **Lecture-Tutorial-Practical/Week** | **No. of credits** | **Continuous Comprehensive Assessment (CCA)** | **End-Semester Examination (ESE)**  **[University Examination]** | **Total** |
| **Core course 5** | **EG 201** | **Biodiversity Conservation** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 6** | **EG 202** | **Environmental Chemistry** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 7** | **EG 203** | **Environmental Sustainability and Managment** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 8** | **EG 204** | **Environmental Hazards and managment** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 3** | **EG 205** | **Biodiversity Conservation and Environmental Chemistry** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 4** | **EG 206** | **Environmental Sustainability and Management and Environmental Hazards and managment** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development course II** | **EG 207 (any one)** | 1. **Minerals and rocks** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

**M. Sc. Environmental Geology: Semester III**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of course** | **Course code** | **Title of the Course** | **Lecture-Tutorial-Practical/Week** | **No. of credits** | **Continuous Comprehensive Assessment (CCA)** | **End-Semester Examination (ESE)**  **[University Examination]** | **Total** | |
|  |  |  |  |  |  |  |  | |
| **Core course 1** | **EG 301** | **Environmental Toxicology** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 2** | **EG 302** | **Environmental Awareness and Social Issue** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 3** | **EG 303** | **Environmental Laws** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 4** | **EG 304** | **Instrumentation and Environmental Analysis** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 1** | **EG 305** | **Environmental Toxicology and Environmental Awareness and Social Issue** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 2** | **EG 306** | **Environmental Laws and Instrumentation and Environmental Analysis** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development Course I** | **EG 307** | **RS and GIS for Urban and Regional Planning** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

**M. Sc. Environmental Geology: Semester IV**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of course** | **Course code** | **Title of the Course** | **Lecture-Tutorial-Practical/Week** | **No. of credits** | **Continuous Comprehensive Assessment (CCA)** | **End-Semester Examination (ESE)**  **[University Examination]** | **Total** | |
|  |  |  |  |  |  |  |  | |
| **Core course 1** | **EG 401** | **Environmental Impact Assessment** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 2** | **EG 402** | **Environmental and Occupational Health** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 3** | **EG 403** | **Environmental Planning and Biostatics** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 4** | **EG 404** | **Restoration Ecology** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 1** | **EG 405** | **Environmental Impact Assessment and Environmental and Occupational Health** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 2** | **EG 406** | **Environmental Planning and Biostatics and Restoration Ecology** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development Course I I** | **EG 407** | **Building and Decorative stone** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

* 1. **Seminar**: Each student shall prepare and deliver a seminar per theory paper; maximum marks shall be 15. The seminar shall commence after first quiz examination and shall be completed prior to term test for all the papers.
  2. **Classroom Attendance –** Each student will have to attend a minimum of 75% Lectures / Tutorials / Practicals. A student having less than 75% attendance will not be allowed to appear in the End-Semester Examination (ESE). Attendance shall have 15 marks and will be awarded by following the system proposed below:

Those having greater than 75% attendance (for those participating in Co-curricular activities, 25% will be added to per cent attendance) will be awarded CCA marks as follows:-

75% to 80% = 3 marks

80% to 85% = 6 marks

85 to 90% = 9 marks

90% to 95% = 12 marks

˃ 95% = 15 marks

**Each student’s cumulative attendance shall be displayed in the Department Notice Board every month with a copy to the Dean, Faculty of Science.**

Condonation of Shortage of attendance shall be governed in accordance with the provisions in the Act and Statute of the University vide Ordinance 78 to Ordinance 80 as amended from time to time.

Second addition:

**Qualifying for Next semester**

* + 1. **A student acquiring minimum of 40% in total of the CCA is eligible to join next semester**.
    2. A student who does not pass the examination (CCA+ESE) in any course(s) (or due to some reason as he/she not able to appear in the ESE, other conditions being fulfilled, and so is considered as ‘Fail’), shall be permitted to appear in such failed course(s) in the subsequent ESE to be held in the following October / November or April / May, or when the course is offered next, as the case may be.
    3. A student who fails in one or more papers in a semester shall get three more chances to complete the same; if he/she fails to complete the same within the prescribed time, i.e. three additional chances for each paper; the student is ineligible for the Postgraduate degree in the Subject in which he/she is admitted, for additional chances examination fee shall be on additive basis.

**Improvement Option**:

Every student shall have the opportunity to improve Credit thorough University Examination only. Improvement opportunity for each paper is only with two additional chances; improvement examination fee shall be on additive basis; the Credit obtained in improvement examination shall be final. There shall be no improvement opportunity in Practical examinations**.**

**Result Declaration:**

The ESE (End Semester Examination/University Examination) results shall be declared within twenty days of the last examination. The Theory/ Practical Classes of even semesters shall begin from the next day of ESE; whereas odd semester classes shall commence after summer vacation.

**Students Failed in CCA**:

Any student declared “Not Eligible” by the Department based on CCA in Semester I, II, III or IV and accordingly did not appear in ESE; can be readmitted as an additional student in that Semester in the **following year only**. Such student need to deposit the annual university fee as prescribed for that academic year.

**M.Sc. Environmental Geology Syllabus**

**(2017-2019)**

**SEMESTER I**

**Core PAPER EG. 101: BASIC CONCEPTS AND ELEMENTS OF ECOLOGY AND ENVIRONMENT**

**Unit I**

Basic concept of ecology and Environment, Scope of ecology and its relations with other disciplines of ecology; Principles pertaining to ecosystem; ecosystem components; Ecosystem energetics; processes of primary productivity, gross and net productivity; Homeostasis; Principles of limiting factors.

**Unit II**

Biogeochemical cycles in Environment: concept and significance; Carbon cycle, Nitrogen cycle, Phosphorus cycle, Sulphur cycle; Autecology: Basic principles; concept of population growth and survivorship; population characteristics and dynamics; population growth forms and concept of carrying capacity; Population regulation,

**Unit III**

Biotic community: concept and classification; community characteristics; Ecotone and continuum concept, Life form and biological spectrum; Community coefficients; Ecological dominance and ecological niche; ecological succession, concept of climax and community stability.

**Unit IV**

Aquatic ecosystems: Physicochemical characteristics of fresh water environment, Biotic communities of pond and lakes, thermal stratification of lakes, conservation and management of fresh water habitats. Physicochemical characteristics of Marine ecosystem, biotic communities of oceanic regions, coral reefs and mangroves, Estuarine ecology.

**Unit V**

Terrestrial Environment: Physicochemical characteristics; Forest Biomes, Grassland Biomes, Desert Biomes, Tundra Biomes; Flora and Vegetation of India; Endemism; Age and Area hypothesis, Dispersal dynamics.

**Paper EG 102: EARTH PROCESSES AND NATURAL CYCLES**

**Unit I**

Evolution of atmosphere; Chemical composition and thermal stratification of present day atmosphere, Atmosphere and earth radiation balance; Circulation of earth’s atmosphere and world precipitation pattern; precipitation to evaporation ratio; Hydrological cycle

**Unit II**

Climate classification; World climate regimes; Climate types of India, Indian Monsoon; El Nino; Climate control and distribution of plants and animals, Gaia hypothesis, Climate and biosphere feedback mechanisms, Climate elements in crop production.

**Unit III**

Climate and habitable areas; climate and rural housing; climate and buildings; Micro climate and architectural design; Human body and heat balance; climate and human health, climate and race temperament, clothing insulation and clothing zones of the world.

**Unit IV**

Meteorology fundamentals– Pressure, temperature, wind, humidity, radiation, atmospheric stability adiabatic diagrams, turbulence and diffusion. Scales of meteorology. Applications of micrometeorology to vegetated surfaces, urban areas, human beings, animals; Application of meteorological principles to transport and diffusion of pollutants.

**Unit V**

Scavenging processes; Effects of meteorological parameters on pollutants and vice versa; Wind roses; Topographic effects; Pollution climatology; Preliminary concepts of climate change – global warming sea level rise, ozone depletion, green house gases.

**Paper EG 103: NATURAL RESOURCES AND THEIR CONSERVATION**

**Unit I**

Natural resources and their classification, biosphere reserves, nature conservation and its importance in national economy. Human use of surface and ground water. Environmental impact of resource exploitation; Resources of oceans and their conservation; Mineral resources and their conservation

**Unit II**

Types of energy resources: conventional and non conventional energy resources; Renewable and non-renewable energy resources, commercial and non commercial energy demand; Fossil fuel classification, composition, energy content of coal, petroleum and natural gas; Principles of generation of hydroelectric power, tidal power, thermal energy conversion, wind, geo thermal energy, solar collectors, photovoltaics, solar ponds, oceans.

**Unit III**

Nuclear energy- fission and fusion, bio energy -energy from biomass and biogas, anaerobic digestion, energy use patterns in different parts of the world; energy conservation policies. Impacts of large scale exploitation of solar, wind, hydro and ocean energy.

**Unit IV**

Biomass fuel types: solid fuels, liquid fuels, gaseous fuels; biomass fuel conservation devices; management of information on biomass fuels; Concept of environmental sustainable technology; Sun as the source of energy, solar radiation and its special characteristics.

**Unit V**

Economic and environmental perspectives of energy demand, Energy conservation, energy from Refuse; Studies of biomass fuels; availability of biomass fuels in India: Organic residues, energy plantation, carbohydrate crops, petro crops, energy weeds.

**Paper EG 104: ENVIRONMENTAL POLLUTION AND MONITORING**

**Unit I**

Natural and anthropogenic sources of pollution; primary and secondary pollutants; Transport and diffusion of pollutants; Photochemical smog and acid rain; Air pollution: source, effect of gaseous air pollutants on plants and animals, TSP and their effect on plants and animals; Principles of air monitoring; Air Pollution Tolerance Index, Air Quality Standards, control of air pollution, Euro standards. Indoor air pollution.

**Unit II**

Sources and consequences of water pollution; Principles of water quality monitoring, physicochemical and bacteriological sampling and analysis of water quality; water quality standards; water pollution control; Ganga Action Plan; Marine pollution; Thermal pollution.

**Unit III**

Sources and classification of Radioactive pollution, effect of radioactive pollution on biological system; Sources and measurement of noise pollution, noise exposure levels and standards; noise pollution control and abatement measures.

**Unit IV**

Sources of Soil pollution, Heavy metals sources and effects on biological systems; Pesticides sources and effect on biological systems, Detrimental effects of soil pollutants on soil micro biota, Ecological consequences and soil pollution control.

**Unit V**

Sources and characteristics of solid wastes, Solid waste disposal and management, Biomonitoring of air, water and soil environment, concept of indicator species and their environmental significance.

**EG 105 : Core Practical 1:**

1. Determination of minimum size of quadrate by species area curve method.

2. Study of vegetation by line transect

3. Determination of IVI

4. Find out the similarity and dissimilarity indices between disturbed and undisturbed grassland.

5. Determination of pattern (non randomness) in vegetation.

6. Estimation of total chlorophyll content of herbaceous vegetation on per square meter of land area basis

7. Study of biotic interactions

8. Representation of climate data

(1) Simple graph

(2) Hytherograph

(3) Rainfall variability graph

(4) Wind rose

(5) Combine bar and line graph

(6) Climograph

9. Observation of India weather maps.

10. Preparation of wind rose.

11. working of weather instruments Thermometer, Rain gauze, Anemometer, Barometer, Pedometer, Compass

.

**EG 106: Core Practical 2:**

1. Analysis of air samples

(1) SO2

(2) SPM

2. Analysis of water sample

(1)Dissolved oxygen

(2)Chlorides

(3)Nitrates

(4)Hardness

(5)Biological oxygen demand

(6) pH

3. Analysis of Soil

(1)Texture

(2)Moisture 3

(3) pH

(4)Water holding capacity

(5) Chloride

(6) Wilting coefficient

(7) Porosity

4. Quantitative and qualitative analysis of planktons.

5. Study of foot prints and demarcation of territorial limits of few wild animals.

6. Estimation of crude proteins

7. Study faecal coli forms in water sample by M.P.N.

8. Qualitative and quantitative analysis of water samples for zooplanktons and phytoplankton’s.

9. Preparation of field report of any case study carried out in any areas to assess the pollution status.

10. Analysis of soil for biotic components like bacterial fungi and soil nematodes

**EG 107: SKILL DEVELOPMENT COURSE:**

**Survey in Field**

1. Principles of surveying. Survey equipments.
2. Radial method of plane table survey.
3. Plane table survey with intersection methods.
4. Pace/Tape and compass methods survey with theodolite with various applications.

**SEMESTER II**

**Paper: EG 201 : BIODIVERSITY CONSERVATION**

**Unit I**

Concepts and component of biodiversity- genetic, species and ecosystem biodiversity, evolution of organisms & distribution in space and time, levels of biodiversity, biodiversity indices, value of biodiversity, biodiversity trends, modern techniques of measurement and monitoring of biodiversity, bio perspecting, patent protection and bio piracy .

**Unit II**

Major threats to biodiversity, IUCN threat categories, Red data book, threatened plants & animals of India; Endangered flora and fauna of India and Rajasthan, Mega diversity zones of India, Hot spot concept and hot spots of India, Biodiversity informatics, International efforts in biodiversity conservation

**Unit III**

Conservation of biodiversity- *In-situ-* Sanctuaries, biospheres Reserves, National Parks, Nature Reserves, Preservations plots; *Ex- situ* - Botanical gardens, Zoos, Aquaria, Home Garden & Herbarium, In vitro conservation: Germplasm & gene banks, tissue culture, pollen and spore bank, DNA bank; Wildlife reserves in India, Theory of reserve design, Restoration of biodiversity; Ecosystem people and traditional conservation mechanism; Importance of biodiversity in Ecotourism; endemic flora and fauna of tropics and India with special reference to Rajasthan

**Unit IV**

National and International programmes for biodiversity conservation; Conservation of wildlife-significance and status of India, Wildlife reserves- Biosphere and nature reserves, Project tiger, sanctuaries and national parks in India; Impact of tourism on wildlife and problem in wildlife protection; Role of WWF,WCU,CITES, TRAFFIC .

**Unit V**

Conservation of forests; Indian strategies and planning; Agroforestry, Social forestry; Management of forest products; Forests and tribals; Chipko Aandolan; Coral reefs, mangroves and estuarine biodiversity and their conservation; wetland conservation with special reference to Rajasthan; Biodiversity and agenda-21; Biodiversity conventions.

**Paper: EG 202: ENVIRONMENTAL CHEMISTRY**

**Unit –I**

Concept and Scope of Environmental Chemistry;segments of environment; Principles and cyclic pathways in the environments; Chemistry of Biologically Important Molecules: Chemistry of Water: Unusual physical properties, hydrogen bonding in biological systems, unusual solvent properties, changes in water properties by addition of solute. Protein structure and biological functions, enzymes, enzyme metabolism.

**Unit - II**

Basic chemistry: Structure of atoms, their properties, their nuclear stabilities and their arrangement in the periodic table; fundamentals of chemical thermodynamics and solution formation-Normality, Molarity, Molality, Molecular weight, Equivalent weight, Mole concept; basic organic chemistry and biochemistry; Stochiometry, Gibb’s energy, Chemical potential, chemical equilibria, acid-base reactions; Solubility product, solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons.

**Unit – III**

Classification of elements, chemical speciation, Particles, ions and radicals in the atmosphere. Chemical processes for formation of inorganic and organic particulate matter; Thermochemical and photochemical reactions in the atmosphere; Basic concepts of surface and interface chemistry: Absorption, adsorption, catalysis; collides, surfactants; carbonate system, radionuclides, radioactivity, decay of parent and growth of daughter nuclides & methods of radiometric dating; C14 dating system and procedure, stable isotopes – their fractionation and application to geo thermometry and paleo climates.

**Unit – IV**

First law of thermodynamics, enthalphy, adiabatic transformations; second law of thermodynamics, Carnot’s cycle, entropy, Gibb’s free energy, chemical potential, phase equilibria, Gibb’s Donnan equilibrium; third law of thermodynamics, enzymes catalysis, Michaelis/ Menten equation; Concept, principle and utility of green chemistry, green reagents, green catalysts, industrial interest in green chemistry.

**Unit – V**

Oxygen and ozone chemistry, Chemistry of air pollutants, Photochemical Smog, Chemistry of water, concept of D.O., B.O.D., and C.O.D. Water treatment: Sedimentation, Coagulation, Filtration, tertiary and advanced treatment; Redox potential; Inorganic and organic components of soil; nitrogen pathways and NPK in soils. Bio transformation and bio magnification; Principles of photo chemistry- Photo chemical & photo sensitized reactions, energy transfer.

**Paper EG 203: Environmental Sustainability and Management**

**Unit I**

Introduction, concept and scope of environmental management; Systems and approaches, environmental management of resources-water, forest, biological, minerals and agriculture; International summits and treaties-Vienna convention, Montreal protocol, Kyoto protocol, Copenhagen convention

**Unit II**

Sustainable development –concept & growth of idea, indicators of sustainability, Sustainable use of natural resources, Sustainability in industry and agriculture, eco restoration, green funding

**Unit III**

Basic concept of environmental economics, International trade & environmental integrity, eco labeling, eco marketing, current environmental issues in India-case studies, Narmada Dam, Tehri & Almeti dam; the role of risk assessment in environmental Management decisions.

**Unit IV**

Management systems-Quality, environment, Health and safety, Social responsibility (ISO 9000, 14000,18000, 8000); international organization of standardization (ISO) and their clarification; Relation of EIA to Sustainable development;

**Unit V**

Environmental Management of Industrial pollution, Management of Pollution due to mining, chemical & manufacturing industries (Petroleum, coal, cement, Paper & fertilizer)

**Paper EG 204 : Environmental Hazards and Management**

**Unit I**

Introduction to hazards, classification and types: –Natural Hazards, Chemical hazards, Physical hazards, Biological hazards; Basics of hazard management and mitigation, natural Hazards –causes, continental drift, plate tectonics and sea floor’s spreading; hazard analysis, potential risk; Human perturbation and natural hazards – impact of deforestation, land use and developmental activities on natural hazards, Role of climate change; Man Made hazards - Dams & reservoirs, NPP; Desertification-causes, evaluation, Mitigation.

**Unit II**

Natural Disasters: nature, causes and effect, Cyclone, tornadoes, floods, earthquakes, avalanches, Tsunami ,land slides, drought, fires, volcanism, Case study of disasters- community reaction to disasters, coping mechanism; disaster management- pre disaster phase, actual disaster phase, post disaster phase.

**Unit III**

Disaster assistance-technological assistance, relief camps, food requirement, water needs, sanitation security, information administration, fire fighting training, Safety Measures – a general account, emergency rescue, disaster education- alternatives and new direction, Forecasting and warning systems

**Unit IV**

Concept of disaster recovery- mitigation and preparedness, program planning and management, Vulnerability analysis, Training needs – Target Groups, emergency preparedness plan, occupational risk analysis survey and health evaluation, behavioral studies, Man-made disasters-occupational injury, Industrial Safety Management Techniques – Industrial Safety Standards, Industrial Accidents and Disasters - Frequency Rate, Prevention and Control; Dispersion of Radioactive material and release of Toxic and inflammable materials

**Unit V**

Environmental hazards, protective measure while handling hazardous substance, hazardous waste disposal. Hospital waste handling and disposal, guidelines for their disposal, fire and explosion hazards, radiation hazards. Case studies related to hazardous waste accidents, simplified measures for their assessment. Various diseases related to handling of hazardous waste. Nasal cancer and other fatal diseases- their symptoms, prevention and control.

**EG 205: Core Corse Practical 1**

1. Find out the percentage frequency values of grassland species using 1 x 1 size quadrat. Classify the species into frequency classes A to E and prepare the frequency diagram. Compare result with Raunkiers standard frequency diagram.
2. Determine the biomass of producers.
3. Find out the effect of various quadrat size 25 x 25, 50 x 50, 75 x 75 and 1 x 1 m on percentage frequency result on same grassland plot considered in exercise I
4. Find out the species diversity index in disturbed and protected vegetation area.
5. Find out the leaf area index of crop field.
6. Study of anatomical features of ecological adaptation in selected hydrophytes and xerophytes.
7. Study of climatic conditions obtained in open field and under the shade of trees for temperature, light intensity, wind velocity, R.H and comparison of ground vegetation of these areas.
8. To determine the age of forest patch by DBH.
9. To determine the vegetation by Point frame quadrate method.

* **Spotting**:
* **Xerophytes**: Nerium – Stem & leaf; calotropis stem; capparis stem; pinus needle; opuntia; euphorbia, casurina
* **Hydrophyte**s: Ecchornia, Hydrilla, trapa, nymphea, chara, potemogeton, scirpus, nelumbo
* Point frame
* **Xerophytic animals**: Phyrnosoma ,draco
* **Aquatic animals**: exocetus, hyla, gappi, katla, Rohu, gambusea

**EG 206: Core Corse Practical 2**

1. Analysis of Soil samples
   * 1. Texture
     2. Moisture
     3. pH
     4. conductivity
     5. Water holding capacity
     6. Bulk density & porosity
     7. Calcium carbonate
     8. Sulphate
     9. Carbonate and bicarbonate
     10. Organic carbon & organic matter
     11. Chlorides
     12. Nitrates
     13. Available phosphorus
2. To compare the wilting coefficient of a xerophytic and mesophytic plant.
3. Assessment of noise pollution in different zones of the city by Sound level meter.
4. Study of soil for biotic components like bacteria, fungi & soil nematodes.

* **Spotting**:
* Instruments- Spectrophotometer, sound level meter, colorimeter, refrigerated centrifuge
* Foot prints- of wild animals as available for demarcation of territory.
* Soil fauna-Micro & macro fauna: Milipede, centipede, earthworm, nematodes, actinomycetes
* Soil fungi and soil bacteria
* Seives set for soil texture

**EG 207: SKILL DEVELOPMENT COURSE (Any One)**

1.Introduction to minerals and rocks: common rock forming mineral.

2.Common non silicate minerals.

3. Igneous rocks.

4. Sedimentary rocks

5. Metamorphic rocks

**SEMESTER III**

**EG 301 ENVIRONMENTAL TOXICOLOGY**

**Unit I**

Toxicology: definition, Origin, classification & general nature of toxicants in environment; Principles in toxicology: Concept of dose response relationship, Chronic toxicity, Sub acute toxicity and acute toxicity, concept of LC 50 & LD 50, Median tolerance limit, Statistical concepts of LD50; Safe limits, MATC, threshold concentration, NOEL,NOAEL & bioaccumulation; Risk assessment; Biological and chemical factors that influence toxicity; Influence of ecological factors on the effects of toxicity.

**Unit II**

Toxicity testing: Holistic and numeric approach; Drug toxicity and abuse; Heavy Metal toxicity in animals; mutagenesis ,Teratogenicity and carcinogenicity; Practical problems in toxicity testing; Global dispersion of toxic substance; Dispersion and circulating mechanisms of pollutants; degradable and non-degradable toxic substances in food chain; Eco-system influence on the fate and transport of toxicants.

**Unit III**

Route of entry of pollutants into ecosystem-Surface water, land, Air; Uptake of toxic substances by plants, metabolic basis of toxicity of SO2, NO2, O3 and heavy metals in plants; Microbial transport of toxic metals; Air and water borne toxins and diseases; Radiation toxicity and safety measures; Biomonitoring and bioindicators of toxicants; response of ecosystem to toxicants ; biodegradable and non-biodegradable toxic substance.

**Unit IV**

Uptake of toxic substances by animals; Accumulation and chemical localization of toxic substances by animals; detoxification and excretion of toxic substances by animals; Metabolism of toxic substances by animals.; Aquatic toxicity testing ,Response of planktons to animals; pest & pesticides: classification, surveillance, resistance & residual effects.

**Unit V**

Toxic effect of pollution on terrestrial animals; xenobiotics in environment, bioconcentration, biological and non biological degradation, detoxification; chemical hazard assessment and communication; Information management system in Eco-toxicology; fumicatoris and masticatoris; Microbial toxicology-concepts and principle , Algal toxins, Mycotoxins, Cynobacteria; Eco toxicology-legal perspectives and animal ethics.

**EG 302 Paper II: Environmental Awareness and Social Issues.**

**Unit I**

Basic concept of sustainable development, social environmental issues and urban problems related to energy, need for environmental awareness, role of government and non- government organization in creating environmental awareness, environmental awareness programme, local state, national and international level environmental awareness among rural and urban population.

**Unit II**

Problems of increasing population ,population status in India, population explosion, family welfare programme, human rights value education, Environmental education at school level ,environmental education in colleges and universities, women and child welfare ,role of environmental education in the management of environment.

**Unit III**

Role of information technology in the management of human health, role of natural resources in the human development, Role of the human society in conservation of forest, rivers, ponds other natural resources ,Role of plants to control the human population from diseases. Case studies.

**Unit IV**

Basic knowledge of personal hygiene and cleanliness, Environmental awareness camps and programmes, involvement of rural population in environmental awareness programmes, Special environmental education courses for rural women and children. Environmental education through films, dramas and skits. Consequences of lack of environmental education, spread of various communicable diseases and epidemics due to poor sanitation.

**Unit V**

Environmental ethics, social and cultural values of biodiversity. Role of various plants and animals in traditional Medicare, ethno botanical and zoological values, social values for water conservation, water harvesting and water shed management.Role of communities in conserving environment.Social interaction among various population and communities. Community welfare programmes local and national level.

**EG 303: Paper III:**  **ENVIRONMENTAL LAWS**

**Unit – I**

Law relating to hazardous substances and relevant provisions in the Factories Act 1948; Environment (protection) act 1986; powers of central government and provisions pertaining to prevention control and abatement of environmental pollution; Report of Tiwari committee; Environmental (prevention) rules 1986.

**Unit - II**

Central and state boards for prevention and control of air and water pollution; Air (prevention and control of pollution) Act 1981; Air (prevention and control of pollution) Amendment Act 1987 and rules 1982; The Water (prevention and control of pollution) Act 1974; The water (prevention & control of pollution) amendmend 1988 & rules 1975.

**Unit - III**

Motor Vehicle Act 1988; legislation related to forest and wild life conservation; Forest Conservation Act 1980; Indian Forest Act, 1970, revised 1982; Wildlife Protection Act 1972 and amendment 1991; Biodiversity Act, 2002.

**Unit - IV**

Code of criminal procedure and environmental protection; guidelines issued by the government of India for inspection of Industries under pollution control laws; Scheme of lebeling of environmentally friendly products (ecomark). Public liability Insurance Act. 1991. Provision of constitution of India regarding environment (article 48 A & 58A).

**Unit - V**

Environment guidelines for industries which required industrial licensing, Industrial licensing procedure; Environmental Clearance Process; Consents for handling hazard substances; Environment protection issues & problems, international & national efforts for environment protection, provision of constitution of India regarding environment (Article A & 58 A).

**EG 304 Paper IV:**  **Instrumentation and Environmental Analysis**

**Unit I**

Basic concepts of instrumentation, current, voltage and power; pH meter, conductivity meter, TDS meter, Visible spectrophotometer, Homogenizer, Autoclave , colony counter.

Introduction of various equipments of environmental monitoring and analysis: High volume air sampler, Atomic absorption spectrophotometer, Flame photometer, Infrared gas analyzer, UV spectrophotometer, H.P.L.C, scanning electron microscope, transmission electron microscope. Cooling centrifuge, growth chamber, Autoclave, polarograph, nuclear magnetic resonance.

**Unit II**

Introduction of basic field instruments: Handy air sampler, Noise level/Sound level meter; lux meter; pedometer; compass; Anemometer; High volume air sampler-construction, principle and working .

Machines involved in various equipments, working principles of all the equipments used in environmental monitoring and analysis.

**Unit III**

Introduction to advance concepts of Instrumentation –theory, principle & working and application of UV-Spectrophotometer, flame photometer, CO2 analyzer, AAS, methane analyzer, refrigerated centrifuge, plant growth chamber, HPLC, gas chromatography, Paper chromatography, NMR, X-ray, Infra red gas analyzer.

Air pollution analysis, monitoring of SO2, NO2, CO2 and analysis of SPM, sampling methods for aerosol, organic gases and vapor analysis.

**Unit IV**

Introduction to solution preparation; calculation of concentration of solution using specific gravity and molecular weight; units of concentration of solution; inter conversion; ionic product of water, pH, poH , buffer solutions.

Water pollution analysis, Physical analysis, chemical analysis, Biological Analysis, analysis of minor components, Industrial and domestic effluent analysis, Primary, Secondary and tertiary treatment of water.

**Unit V**

Selection of sampling sites, analytical methods and selection of appropriate analytical technique; sample blank preparation and solvent blank preparation ; efficiency of sampling; preparation of serial dilutions and standard curves for air, water ,soil and plant analysis.

Soil pollution and pesticide analysis, agricultural pollution, Role of micronutrient in soil, trace elements in soil, pesticide and soil pollution ,chromatography characterized zones, polarographic spectroscopic analysis. Soil pollution and crop health, soil microbes and plants diseases. Physical, chemical and biological analysis of soil.

**EG 305: Core Corse Practical 1**

1. Determination of the dust capturing capacity and percent leaf area injury of selected plant species.
2. Effect of heavy metals on seed germination and early seedling growth.
3. Effect of heavy metals on ascorbic acid content in plant leaves.
4. Effect of heavy metals on chlorophyll content, soluble protein, phenols and carbohydrates.
5. To calculate the LC 50 in fishes for heavy metals calculation of MATC and threshold concentration.
6. Short term bioassay lists of industrial pollutants in relation to fresh water animals.
   1. Calculation of 96 hours LC 50
   2. Assessment of threshold concentration.
   3. Calculation of MATC ( Maximum acceptable toxicant concentration)
   4. Calculation of application factor or safe concentration)
7. Observation of stomata movement and measurement of stomatal aperture
8. Observation of various stages of cell division in onion root tips with special reference to heavy metals
9. Observation of plant cell structure in onion peel
10. Study of petro plants and energy weeds
11. Principle, construction and working of biogas plant

* **Spotting** :
* Study and identification of minerals and rocks.
* Toxicity curves
* Heavy metal identification
* Principle & working of STP’s and ETP’s
* Identification and study of coal : bituminous, lignite, anthracite, peat
* Biomass pellets
* Different types of woods : briquettes
* Solar equipments: solar cooker, solar lantern, solar water heater, solar dryer, photovoltaic cell

**EG 306: Core Corse Practical 2**

1. Working and principles of handling various equipments:
   1. High volume air sampler
   2. Spectrophotometer
   3. Refrigerated centrifuge
   4. Homogenizer
   5. Flame photometer
   6. Gas analyzer
   7. Growth chamber
   8. Atomic Absorption Spectrophotometer
   9. Autoclave
   10. Polarograph
   11. Muffle furnace
   12. Bomb calorimeter

Diagram, working and instrumentation of all the equipments mentioned above

* **Spotting :**
* pH meter, conductivity meter, TDS meter , turbidity meter, weigh balance
* Identification and study of local and migratory birds in and around the wetlands of Udaipur
* Study and ecological significance of endemic plants and animals of southern Rajasthan
* Field excursion

**EG 307: SKILL DEVELOPMENT COURSE (Any One)**

RS & GIS for Urban and Regional Planning

1. To study the RS and GIS data
2. To study the Mapping for Urban and Regional areas
3. To study GIS Tool in Urban Planning

**SEMESTER IV**

**EG 401: ENVIROMENTAL IMPACT ASSESSMENT**

**Unit-I**

Introduction to environmental impact assessment; origin and development of environmental impact assessment; relationship of environmental impact assessment to sustainable development; basic concepts, objectives and its significance of EIA; EIA guidelines -1994 and modified in 2006; Generalized approach to impact analysis.

**Unit II**

Environmental Impact statement process; environmental impact assessment methodologies-Adhoc method; Check list methodologies-Matrix method, LCA method

**Unit III**

Introduction to environmental planning, Baseline Information and predictions- land, water, atmosphere, energy and socio-economic status and demographic profile; environmental audit-guidelines concept and process; concept of public participation- public hearing; ISO 9000,14000 & 18001.

**Unit IV**

Prediction and assessment of impact on water, air, Noise, soil and biological systems; cost benefit analysis.

**Unit V**

R & R plan(Act).2007; Green belt development; National environmental policies and guidelines in India; condition and approach for EIS review; Case–studies-River valley projects, Thermal power plants, Mining projects, Dams and reservoirs, Oil refineries, Petro chemicals, national Highway Projects; Identification and prediction of Impact mitigation measures.

# EG 402: ENVIRONMENTAL AND OCCUPATIONAL HEALTH

**Unit I**

Basic principle of environmental health; Environmental factors and human health; Physiological responses of man to relevant stresses in the environment; Disease causing infectious organisms (Virus, bacteria, and parasites); teratogens and mutagens; Detailed account of AIDS and sexually transmitted diseases (STD); Environmental health management.

**Unit II**

Air pollution and human health; causes of air pollution and air borne diseases, Soil pollution- Sources and effect on human health; Water pollution- sources and effects on human health; water borne diseases; Risk assessment and preventive measures; Toxico genomics- interaction of pollutants with biological systems at different levels-organism ,organ and organelles.

**Unit III**

Environmental health management in India; Occupational health safety and health administration; Environmental health in indigenous tribal communities- problems and remedies; Environmental health protection - Issues and problems ;Industrial safety management techniques and standards.

**Unit IV**

Definition of occupational health, Occupational hazards and associated diseases- silicosis, anthrax and other lung diseases; WHO standards of working conditions; factors affecting occupational health (physical, chemical and biological); prevention of occupational diseases; Various international organizations (WHO, ILO, UNICEF) on human health, Lead poisoning, occupational cancers, Dermatitis.

**Unit V**

Nuclear pollution and human health- case studies; Agriculture chemicals and human health; Hazardous wastes- human health and management; Noise pollution and human health hazards; Human health education and awareness. Hazard evaluation in polluted environment with specific emphasis on radiological health; causes and consequences of hazardous wastes in soil, water and air with respect to human health; Industrial hygiene application and statistical methods through medical records, in study of health problems of human population in green environment

**EG 403: Paper III: ENVIRONMENTAL PLANNING AND BIOSTATISTICS**

**Unit I**

Basic concepts of Environmental planning; Environmental priorities in India; urban planning; Environmental problems of urban planning; rural environmental planning; national and state Environmental policies**.**

**Unit II**

Land use and degradation; land use planning; waste land and their reclamation; water logging; Salinization of lands; strategies for sustainable land management**.**

**Unit III**

Watershed management and planning in India; Structure and functioning of MOEF, CPCB, SPCB; wetlands planning and management; eco friendly technologies for natural resources.

**Unit IV**

Fundamentals of bios statistics -basic concept & introduction to sampling methodology; measures of central tendency and graphical representation of data: Mean (arithmetic, harmonic and geometric), Median and Mode; Measures of central tendency & dispersion; skewness and kurtosis, Poisson and binomial distribution; Standard deviation; Standard error of mean.

**Unit V**

Null hypothesis, t test and pair T test; Chi square test, Coefficient of association (measure of association); Analysis of variance; Probability –definition, addition and multiplication laws; concept of random variable; Correlation coefficient- testing of significance of correlation coefficient; Regression coefficient and the line of best fit; relationship between correlation and regression; introduction to multivariate methods for environmental sciences –ANOVA (one way & two way), PCA, factor analysis and cluster analysis.

**EG 404 Paper IV: Restoration Ecology**

**Unit I**

Contaminated lands: Types of contaminated lands and contaminants; effects of contaminants on biota; Ecology of Disturbed Ecosystems: disturbance and its impact on the structure and functioning of terrestrial and aquatic ecosystems; Types of waste and its characteristics.

**Unit II**

Aims and strategies of restoration: Concepts of restoration, single vs. multiple end-points; ecosystem reconstructions; physical, chemical, biological and biotechnological tools of restoration; Restoration of biological diversity: Acceleration of ecological succession, reintroduction of biota.

**Unit III**

Degradation and restoration of natural ecosystems: Forests, Grasslands, Savanna, Aquatic; Selection of plant species for restoration

**Unit IV**

Restoration of degraded soils: Restoration of contaminated soils and soil fertility; mine spoil restoration. Phytoremediation, phytostabilization, rhizofilteration, phytodegradation, Conditioning strategies

**Unit V**

Advances and possibilities in phytoremediation: Plant biochemistry, genetic engineering, transgenic plants, use of bacteria. Application and performances; Case studies: In India and abroad

**EG 405: Core Corse Practical 1**

1. To determine the LAI, chlorophyll content, soluble leaf protein, ascorbic acid, phenol, carbohydrate and air pollution tolerance index (APTI) of selected plants species and comparison of plants for their relative susceptibility to pollution
2. Permanent Preparation of slides- xerophytes, hydrophytes, zooplankton and phytoplankton in polluted and non polluted areas.
3. Assessment of respiratory activity with increasing branch diameter
4. Qualitative and Quantitative analysis of plant enzymes
5. Estimation of chlorophyll a, b and total chlorophyll from commercial, roadside and industrial areas.
6. Estimation of crude proteins
7. To evaluate bryophytes and lichens for their sensitivity to different pollutants
   1. Number of species
   2. Degree of cover
   3. Frequency of each species
   4. Growth and development
   5. Biomass
   6. Chlorophyll content
8. Use of animals in terrestrial amd aquatic ecosystem as bio indicators/ bio monitors (mammals/micro arthropods/earthworms/wood lice/molluscs)

**EG 406: Core Corse Practical 2**

1. Test the difference between means of two samples using ‘t’ test and paired t test.
2. To determine the correlation between two variables.
3. Test of null hypothesis by computing SE of difference between two means.
4. To determine the association between two species by using chi- square test.
5. To determine mean, median and mode between various samples.
6. Introduction of biotechnological tools and techniques: principles and applications.
7. Isolation and culture of excised plant parts for micropropagation studies.
8. Isolation, purification and identification of aerobic bacteria from different soil and water sources.
9. Application of stage and ocular micrometer for measurements of microbes.
10. Preparation of different type’s media for culture of bacteria, algae and plant tissues.
11. Isolation, purification and identification of mycorrhizal fungi.
12. Demonstration of biogas production by methanogen bacteria.
13. Study of the following:
14. Organisms as bio fertilizer- *Azolla, Anabena, Nostoc, Aulosira, Plectonema.*

*Oscillaloria, Tolypothrix, Glomus, Gigaspora, Sclerocystis, Rhizobium*

1. Different stages of micropropagation -shoot multiplication, rooting, in vitro hardening

* **Spotting :** Laminar Flow
* Auto Clave
* Hot Air oven
* Sterlizer
* Sprit lamp
* Instruments for inoculation
* Plant growth chamber
* Micro Pipette
* Stage & ocular Micro meter
* Compound Micro scope

**EG 407: SKILL DEVELOPMENT COURSE**

Building and Decorative Stone