**Appendix 4**

**(M.Sc. in Remote Sensing)**

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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. Remote Sensing (2017-2019)**

**M.Sc. Remote Sensing: 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** | **RS 101** | **Remote Sensing and Its Techniques** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 2** | **RS 102** | **Digital Image Processing and Technique** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 3** | **RS 103** | **Geological remote Sensing and Technique** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 4** | **RS 104** | **Basic Digital Cartography** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 1** | **RS 105** | **Remote Sensing and Digital Image Processing and Technique** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 2** | **RS 106** | **Geological remote Sensing and Technique, Basic Digital Cartography** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development Course I** | **RS 107** | **Survey in Field** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

**M.Sc. Remote Sensing : 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** | **RS 201** | **GIS and Software** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 6** | **RS 202** | **GIS Data Analysis** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 7** | **RS 203** | **DBMS** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 8** | **RS 204** | **GPS and electronic Survey** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 3** | **RS 205** | **GIS and Software, GIS Data Analysis** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 4** | **RS 206** | **DBMS, GPS and electronic Survey** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development course II** | **RS 207 (any one)** | 1. **Minerals and rocks** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

**M. Sc. Remote Sensing: 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** | **RS 301** | **Microwave remote Sensing and Applications** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 2** | **RS 302** | **Hyperspectral Remote Sensing and Applications** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 3** | **RS 303** | **Digital Photogrammetry and Applications** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 4** | **RS 304** | **Lidar Remote Sensing and Applications** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 1** | **RS 305** | **Microwave remote Sensing and Applications, Hyperspectral Remote Sensing and Applications** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 2** | **RS 306** | **Digital Photogrammetry and Applications, Lidar Remote Sensing and Applications** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development Course I** | **RS 307** | **RS and GIS for Urban and Regional Planning** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

**M. Sc. Remote Sensing: 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** | **RS 401** | **RS & GIS for Hydrology and Water Resources** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 2** | **RS 402** | **RS & GIS for Agriculture and Forestry** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 3** | **RS 403** | **RS & GIS for ocean Engg & Coastal Managment** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 4** | **RS 404** | **RS & GIS for Diaster Managment** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 1** | **RS 405** | **RS & GIS for Hydrology and Water Resources, RS & GIS for Agriculture and Forestry** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 2** | **RS 406** | **RS & GIS for ocean Engg & Coastal Management, RS & GIS for Diaster Managment** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development Course I I** | **RS 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. Remote Sensing Syllabus**

**(2017-2019)**

**SEMESTER I**

1. **Core PAPER RS 101: Remote Sensing and Its Techniques**

**UNIT I-INTRODUCTION AND CONCEPTS**

Introduction of Remote Sensing – Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with Atmospherescattering, Absorption, EMR interaction with earth surface features reflection, absorption, emission and transmission, Spectral response pattern , vegetation, soil, water bodies- Spectral reflectance 5 RS-2013 SRM(E&T)

**UNIT II-AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY**

Introduction-,Terrestrial and Aerial photographs - vertical and oblique photographs - height determination contouring - photographic interpretations - stereoscopy – parallax bar- Flight Planning- Photo Interpretation, Applications of aerial Photos-Photo theodolite

**UNIT III-SATELLITE REMOTE SENSING PRINCIPLES**

Data acquisition –Procedure, Reflectance and Digital numbers- Intensity-Reference data, Ground truth, Analog to digital conversion, Detector mechanism-Spectro- radiometer-Ideal remote sensing system – Characters of real and successful remote sensing system- Platforms and sensors- orbitstypes – Resolution

**UNIT IV-REMOTE SENSING SATELLITES**

Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, Weather/Meteorological satellites, INSAT series, NOAA, GOES, NIMBUS Applications, Marine observation satellites OCEANSAT

**UNIT V-TYPES OF REMOTE SENSING AND IMAGE INTERPRETATION**

Introduction- Active, Passive, Optical Remote sensing, visible, infrared, thermal, sensors and characters. Microwave remote sensing Sensors, Concept of Microwave remote sensing, SLAR, SAR Scattrometers,- Altimeter, Characteristics , Image interpretation characters.

**Paper RS 102: Digital Image Processing and Techniques**

**UNIT I-IMAGE ACQUISITION AND FORMAT**

Satellite data acquisition, DN characters-kernels- storage devices, CC, CDisk, Optical disk.Data retrieval. Export and import, Data formats, BSQ, BIL, BIP, Run length encoding, Image Compression Data products , hard copy, digital products, Image display system, requirement.

**UNIT II-IMAGE DISTORTION AND RECTIFICATION**

Introduction-Sensor model, Preprocessing and Post processing Geometric distortion, sources and causes for distortion, rectification, GCP, Resampling, Image registration, transformation, Radiometric distortion, sources and causes, Computation of radiance, Computation of reflectance, cosmetic operations, Noise removal, atmospheric correction.

**UNIT III-IMAGE ENHANCEMENT**

Satellite image statistics ,Univariate and multi-variate statistics. Basics of Histogram, noise models, image quality,. contrast manipulation, grey level thresholding, level slicing, contrast stretching- Spatial feature manipulations, spatial filtering, convolution Low pass, high pass, edge enhancement, edge detection, Fourier analysis .

**UNIT IV-IMAGE CLASSIFICATION**

Introduction,Classification techniques, feature extraction, Supervised, training stage, classification stage, scatterogram, minimum distance to mean 7 RS-2013 SRM(E&T) classifier, Parallelepiped classifier, Gaussian maximum Likelihood classifier,unsupervised classification, Hybrid classifier, classification of mixed pixel-fuzzy classification, output stage, classification accuracy , error matrix

**UNIT V-IMAGE ANALYSIS**

Digital Image interpretation ,Pattern recognition, shape analysis, Textural analysis, Decision concepts, fuzzy sets and Evidential reasoning, Change detection, multitemporal data merging, multi sensor image merging-merging image data with ancillary data, Expert system, Artificial Neural Network; Integration with GIS.

**Paper RS 103: Geological Remote Sensing and Technique**

**UNIT I-SPECTRAL PROPERTIES OF ROCKS AND MINERALS**

Reflectance Properties of Rocks, minerals in visible, NIR, MIR, SWIR, TIR and Microwave regions Laboratory spectroscopy - laboratory and field spectral data comparative studies, Spectral reflection curves for important Rocks, Minerals

**UNIT II-GEOLOGICAL STRUCTURE AND APPLICATIONS**

Significance of Geological structures, Role of aerial photographs, Photo interpretation characters of photographs and satellite images, structural mapping, Fold, fault, Lineaments, Direction circular features. Intrusive rocks, rock exposure, Fractures and Joints, Rose diagram. Digital image processing for structural mapping

**UNIT III-LITHOLOGICAL MAPPING**

Introduction on Igneous rocks, sedimentary rocks, metamorphic rocks, mapping of regional scale lithological units, Image Characters of igneous rocks, sedimentary and metamorphic rocks, examples. Digital image processing of various rock types, resolution and Scale of lithological mapping and advantages

**UNIT IV-GEOMORPHOLOGICAL MAPPING**

Significance of landform, Geomoprphological guide, interpretation and image/photo characters, Tectonic landforms, Fluvial landforms, Denudational landforms, Volcanic landforms- Aeolian landforms, Coastal landforms. Importance of ground truth and geological field data collection

**UNIT V-GEOLOGICAL SURVEY TECHNIQUES AND DATA INTEGRATION**

Geophysical survey, surface investigation, subsurface investigation, Gravity survey, Seismic survey, refraction methods, reflection methods, applications, Magnetic survey and Electrical resistivity survey, self potential methods, potential drop methods, resistivity values, data interpretation, Curve fitting, GIS data generation , integration and analysis

**Paper RS 104: Basic and Digital Cartography**

**UNIT I-INTRODUCTION**

History and development of Cartography, Definition, scope and concepts of cartography. Characteristics of Map. Categories of maps.. Methods of mapping, relief maps, thematic maps. Trends in Cartography. 16 RS-2013 SRM(E&T)

**UNIT II-EARTH MAP RELATION**

Geodesy,Map projection, classification principles of construction of common projections, cylindrical, conical, azimuthal and globular projections. Properties & uses of projection. The spheroid, Map scale, and co-ordinate system. Plane co-ordinates in UTM system, projection used in Survey of India topographic sheets.

**UNIT III-CATROGRAPHIC PROCESS**

Sources of Data-Ground Survey and positioning, Remote sensing, Census and sampling, Data processing-image processing, digital database, Geographic and cartographic database, basic Statistical processing, Design of colour and pattern, typography and lettering the map.

**UNIT IV-CARTOGRAPHIC ABSTRACTIONS**

Processing and generalizing geographic data, Simplification and Classification, computer assisted cartographic processes, symbolization, mapping with point, line and area symbols-Portraying the land surface form. Map Compilation-Analog and Digital Compilation.

**UNIT V-MAP EXECUTION**

Map reproduction. Methods of few copies and many copies. Map production: Form of Art Work-Construction Method-Output option- Digital cartography, Geographic Information System

**RS 105 : Core Practical 1:**

1. INTRODUCTION OF REMOTE SENSING AND CONCEPTS OF AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY
2. SATELLITE REMOTE SENSING PRINCIPLES AND REMOTE SENSING SATELLITES
3. TYPES OF REMOTE SENSING AND IMAGE INTERPRETATION AND IMAGE ACQUISITION AND FORMAT
4. IMAGE DISTORTION AND RECTIFICATION, IMAGE ENHANCEMENT
5. IMAGE CLASSIFICATION AND IMAGE ANALYSIS

**RS 106: Core Practical 2:**

1. SPECTRAL PROPERTIES OF ROCKS AND MINERALS, GEOLOGICAL STRUCTURE AND APPLICATIONS
2. LITHOLOGICAL MAPPING AND GEOMORPHOLOGICAL MAPPING
3. GEOLOGICAL SURVEY TECHNIQUES AND DATA INTEGRATION, INTRODUCTION TO CARTOGRAPHY
4. EARTH MAP RELATION AND CARTOGRAPHIC PROCESS
5. CARTOGRAPHIC ABSTRACTIONS AND MAP EXECUTION

**RS 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 RS 201 : GIS and Software**

**UNIT I-BASICS OF GIS**

Introduction, concepts , Information system , components of GIS, History, Geospatial data architecture, Operations, Geographic co ordinate systems, Map projections, concepts, Input data for GIS , display ,types of output products. GIS categories, Level and scale of Measurement, importance of data quality

**UNIT II-VECTOR DATA & PROCESSING**

GIS data types, data Representation, Data sources, typical GIS data sets, Data Acquisition, vector data model , topology, topology rules, Non topological vector data, object based vector data model, relationship between classes, data structure, data verification and editing spatial data models and errors –GIS database , attribute data input and management

**UNIT III-RASTER DATA AND PROCESSING**

Raster data – elements of data model, cell, value, data structure, cell by cell encoding, run length encoding, Quad tree, Header files,, format, Types of raster data, data compression, Linking and integration of vector data, Registration 10 RS-2013 SRM(E&T)

**UNIT IV-DATA CONVERSION AND EDITING**

Data format conversion, Medium conversion, Spatial interpolation, measurement and analysis methods, Data accuracy and standards, Attribute data input and Management- Relational mode- Data manipulation-leclassification techniques,

**UNIT V-META DATA AND GIS MODELLING**

Meta data – data standard- OGC- open source GIS - GIS modeling, basic elements, classification, model processing, integration, Binary models, index model, regression models, linear regression model, logistic regression model, process model.

**PAPER RS 202: GIS and Data Analysis**

**UNIT I-INTRODUCTION TO GIS SOFTWARES**

Defining GIS -introduction to Spatial Data File Formats - Basics of Arc Catalog and Arc Map, Tabular Data Design, Functions, pitfall and Reprocessing, Tables, Queries, and Basic Geoprocessing Tools, Data sources and data collection data files in ArcMap and ArcPad, The Raster Data File Format-, Overview of MAP INFO, QGIS, ERDAS IMAGINE

**UNIT II-DATA ANALYSIS TOOLS**

The Spatial Analyst Extension and Model Builder, Metadata –Georeferencing – Geocoding- Network Analyst, Interpolation and Surface Modeling ,Interpolation Methods , The Geodatabase , Building a Geodatabase, Cartographic Design .

**UNIT III-SPATIAL DATA ANALYSIS**

Spatial interpolation, measurement and analysis methods, reclassification techniques, Buffer analysis, overlay analysis, Vector over lay analysis, Topological overlay, raster over lay analysis – measurement of length, perimeter and area – queries –2D to 3 D conversion- DTM and DEM, advantages and disadvantages, Network modeling,

**UNIT IV-GIS MODELLING**

GIS modeling, basic elements – classification, model processing, integration, Binary models, index model, regression models – linear regression model, logistic regression model, process model, applications – problem identification– designing data model, project management and evaluation – implementation

**UNIT V-SPATIAL ANALYSIS**

GIS Applications in automated mapping (AM)/ Facility management (FM) Multi criteria evaluation using GIS - Techniques - case studies - use of knowledge based tools with GIS - Expert system.Object oriented GIS, web based GIS, WEB based GIS Applications.

**Paper RS 203: DBMS**

**UNIT I-TYPES OF DBMS**

Data -Types -Database – Attribute – Types - Hardware and Software requirements -Database Management Systems -Types of DBMS -Hierarchial, Network, Relational Models - Distributed Databases - Client Server Databases -Knowledge Based Systems -Geographic Databases - E-R diagram

**UNIT II-NORMALIZATION**

File Organization -Sequential, Index Sequential, Random, Multikey file Organisation -advantages -Relational Database Management System - Normalization -First, Second, Third, Boyce-Codd, Fourth and Fifth normalizations.

**UNIT III-ORACLE OPERATORS**

Oracle Operators -Arithmetic, Comparison, Logical Operators – Operator Precedence -Privilege commands - SQL functions -Single row, data, 13 RS-2013 SRM(E&T) character and numeric functions -Group functions - Count functions-Triggers in Oracle.

**UNIT IV-SQL FUNCTIONS**

SQL – TCL, DDL, DML – Data types – basic constraints – change statements – basic queries in SQL – Complex SQL queries – Nested, correlated Nested queries – joined tables – Insert, Delete, update Statements in SQL.

**UNIT V-ORACLE DEVELOPER 2000**

Oracle forms – Object Navigator – Triggers – Hierarchical levels – Alerts – Blocks – Items – Editors – Record groups – LOVs – Object Groups – Menus – Query – Oracle reports – Data model Editor – Layout Editor

**Paper RS 204 : GPS and Electronic Survey**

**UNIT I-BASICS OF GPS**

Introduction – GPS satellites – components – Satellite Ranging – codes - Basics of Geodesy – Branches, Applications and Observations of Geodesy.

**UNIT II-GPS RECEIVERS**

GPS – DGPS - GPS Receiver and its Features – Receiver selection – enhancement of receiver - GPS processor Software – GPS Data – Processing of GPS data and types

**UNIT III-TYPES OF GPS SURVEYING**

GPS Field Survey techniques – advantages – Characteristics – Positioning modes – static surveying – kinematics surveying - Doppler effect and basic positioning concept - Dilution of Precision – Types - Multi-path effect – field practices

**UNIT IV-FUNDAMENTALS OF ELECTRONIC SURVEYING**

Refractive index. Factors affecting RI, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions.

**UNIT V-TYPES OF EDM INSTRUMENTS**

Electro-optical system, measuring principle, working principle, sources of errors, infrared EDM instruments, Laser EDM instruments and total station. Microwave system, measuring principle – field practices.

**RS 205: Core Corse Practical 1**

1. BASICS OF GIS, VECTOR DATA PROCESSING
2. RASTER DATA AND PROCESSING, DATA CONVERSION AND EDITING
3. META DATA AND GIS MODELLING, INTRODUCTION TO GS SOFTWARES
4. DATA ANALYSIS TOOLS, SPATILDATA ANALYSIS
5. GIS MODELLING AND SPATIAL ANALYSIS

**RS 206: Core Corse Practical 2**

1. TYPES OF DBMS, NORMALIZATION
2. ORACLE OPERATORS AND SQL FUNCTIONS
3. ORACLE DEVELOPER 2000 AND BASICS OF GPS
4. GPS RECEIVERS AND TYPES OF GPS SURVEYING
5. FUNDAMENTALS OF ELECTRONIC SURVEYING AND TYPES OF EDM INSTRUMENTS

**RS 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**

**RS 301**

**Paper I: Microwave Remote Sensing and Applications**

**UNIT I-BASICS OF MICROWAVE REMOTESENSING**

Fundamentals – EMR-Electromagnetic Spectrum - Microwave Band Designation Microwave interaction with atmospheric constituents, Earth's surface, vegetation, and ocean.

**UNIT II-RADIOMETRY & ANTENNA SYSTEMS**

19 RS-2013 SRM(E&T) Basics - Theory of Radiometry - Sensors applications in atmosphere, ocean and land. Antenna –Types and Functions of different types of antenna

**UNIT III-RADAR**

Radar-Real and synthetic aperture radars, - Principles - different platforms and sensors, System parameters, Target parameters, Radar equation measurement and discrimination, Airborne Data products and selection procedure - SEASAT, SIRA, SIRB, ERS , JERS, RADARSAT missions.

**UNIT IV-RADAR DATA PROCESSING**

Radar grammetry, Image processing, SAR Interferrometry – Polarimetry- Interpretation of microwave data - Physical mechanism and empirical models for scattering and emission, volume scattering.

**UNIT V-APPLICATIONS OF MICROWAVE REMOTE SENSING**

Geological interpretation of RADAR –sites-default-files, Application in Agriculture -forestry, Hydrology - ice studies – land use mapping and ocean related studies

**RS 302 Paper II: Hyperspectral Remote Sensing and Applications**

**UNIT I-INTRODUCTION**

Multispectral and hyperspectral remote sensing, Comparison of Multispectral and Hyperspectral Image Data, Spectral Signatures and BRDF in the Visible, Near Infrared and Shortwave Infrared regions of EMR, Hyperspectral Issues.

**UNIT II-SENSORS AND HYPERSPECTRAL IMAGING DEVICES**

Scanner types and characterization - specifications of various sensors Spectrographic imagers- hyperspectral sensors, Design tradeoffs. Data formats and systems, AVIRIS, CASI, NASA Terra Moderate Resolution Imaging Spectrometer (MODIS), Hyperion.

**UNIT III-PREPROCESSING OF HYPERSPECTRAL DATA**

Hyperspectral Data Cube, Hyperspectral Profiles, Data Redundancy. Problems with Dimensionality, Principal Component, Minimum Noise Fraction (MNF), Atmospheric Correction, Atmospheric Correction Measures, Flat Field Correction, Empirical Line Calibration, Empirical Flat Field Optimized, Reflectance Transformation (EFFORT), Continuum Removal, Spectral Feature Fitting.

**UNIT IV-HYPERSPECTRAL DATA ANALYSIS**

Derivative spectral analysis, techniques for analysis of hyperspectral data, first-order and second- order derivative spectra, Theoretical basis and relevance, Methods of generating derivative spectra, electronic, electromechanical, numerical techniques, case studies.

**UNIT V-APPLICATIONS**

21 RS-2013 SRM(E&T) Applications of Hyperspectral Image Analysis Forestry to Mineral

exploration, soil mapping, coastal water quality studies, quantification of biophysical parameters

**RS. 303: Paper III: Digital Photogrammetry and Applications**

**UNIT I-INTRODUCTION**

Evolution of digital photogrammetry - analog, analytical, digital-Advantages - Auto - Imation - accuracy - Representation of digital images - 8/ W. RG8, CMYK, HLS. EMR - Band designation - Microwave interaction with atmospheric constituents, Earth's surface, vegetation, and ocean. 22 RS-2013 SRM(E&T)

**UNIT II-DIGITAL PHOTOGRAMMETRY & ITS COMPONENTS**

Digital Cameras - CCD Camera - Full frame CCD Frame transfer CCD, CCD cameras 1 with piezo shift, Interline transfer CCD, Time delay integration CCD sensor - Spectral Sensitivity of CCD sensor, Geometric problems of CCD images - line jitter, blooming, warm up effect, tailing - Typical CCD systems, line scanners - SPOT, MOMS Data.

**UNIT III-DIGITAL CONVERSIONS**

Analog to digital conversion - Scanner - flat bed, drum type – Sensor characteristics - Scanner resolutions - Scanner calibration -Video Cameras - Frame Grabber - Typical Scanner systems and Video cameras.

**UNIT IV-IMAGE TRANSFORMATIONS & MEASUREMENTS**

Merits, demerits - Stereo viewing - Spatial, spectral and temporal methods - Image measurement - Coordinate system - Image movement -fixed image, moved image - Image transformation - Geometrical transformation, Radiometric transformation - Concepts of Interior, Relative and Absolute orientation.

**UNIT V-DIGITAL PHOTOGRAMMETRIC APPLICATIONS**

DTM generation - Image correlation - Image matching - Digital Orthophoto generation - Automated aerotriangulation - Link between GIS and Digital Photogrammetry.

**RS. 304**

**Paper IV: Lidar Remote Sensing and Applications**

**UNIT I-LIDAR SYSTEM DESIGN**

Introduction to Lasers and Lidar – Difinitions - History of Lidar Development - Lidar System Components - lidar sensors single-return, multireturn, waveform, photon-counting, Characteristics of Lidar Data - interaction of laser energy with earth surface features - Lidar Systems

**UNIT II-LIDAR REMOTE SENSING PLATFORMS**

Introduction to the Lidar remote sensing platform - Historical development of lidar remote sensing platforms Airborne platforms, Laser Scanning, Fixed- Wing Platforms, Rotary-Wing Platforms - Terrestrial, airborne, and spacebar types – Spaceborne platforms – orbits- Bathymetric Mapping.

**UNIT III-GEOREFERENCING AND CALIBRATION OF LIDAR DATA**

Geodesy, Datums, Map projections and Coordinate Systems – Direct Georeferencing Technology - Boresight Calibration - Lidar Data Preprocessing - Project Coverage Verification - Review Lidar Data against Field Control - Lidar data errors and rectifications, - processes calibration of Lidar data - artifacts and anomalies - Lidar Error Budget.

**UNIT IV-AUTOMATED CLASSIFICATION**

Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering -. Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement – Lidargrammetry - Terrain Data Products, definitions, DEM, DSM -TIN, Breaklines, Contours,

Specifications, Terrain Products from Lidar - Quality Assurance, Control, and Accuracy Assessment.

**UNIT V-LIDAR APPLICATIONS**

24 RS-2013 SRM(E&T) Topographic Mapping, , flood inundation analysis, line-of-sight analysis – Forestry, various types of lidar sensors-, vegetation metric calculations - specific application software - corridor mapping system, data processing and quality control procedures.

**RS 305: Core Corse Practical 1**

1. BASICS OF MICROWAVE REMOTE SENSING AND RADIOMETRY AND ANTENNA SYSTEM
2. RADAR AND RADAR DATA PROCESSING
3. APPLICATIONS OF MICROWAVE REMOTE SENSING AND INTRODUCTION TO HYPERSPECTRAL REMOTE SENSING AND APPLICATION
4. SENSORS AND HYPERSPECTRAL IMAGING DEVICES AND PREPROCESSING OF HYPERSPECTRAL DATA
5. HYPERSPECTRAL DATA ANALYSIS AND ITS APPLICATIONS

**RS 306: Core Corse Practical 2**

1. INTRODUCTION TO DIGITAL PHOTOGRAMMETRY AND APPLICATIONS AND DIGITAL PHOTOGRAMMETRY AND ITS COMPONENTS
2. DIGITAL CONVERSIONS AND IMAGE TRANSFORMATIONS & MEASUREMENTS
3. DIGITAL PHOTOGRAMMETRIC APPLICATIONS, LIDAR SYSTEM DESIGN
4. LIDAR REMOTE SENSING PLATFORMS, GEOREFERENCING AND CALIBRATION OF LIDAR
5. AUTOMATED CLASSIFICATION AND LIDAR APPLICATIONS

**RS 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**

**RS 401**

**Paper I: RS and GIS for Hydrology and Water Resources**

**UNIT I-HYDROLOGICAL COMPONENETS**

Hydrological cycle, Estimation of various components of hydrological cycle, rainfall, runoff, evaporation, transpiration, evapotranspiration, crop evapotranspiration, depression and interception loss, infiltration and percolation losses.

**UNIT II-WATERSHED CHARECTERS**

Watershed, types, divide, catchment , command area, stream types, influent, effluent, ephemeral, non perennial. Drainage network, different pattern, morphometric analysis, linear, area, relief aspects. GIS applications for watershed analysis

**UNIT III-HYDROLOGICAL STIDIES**

Hydrological aspects- mapping and monitoring, management Mapping of snow covered area and glacial outburst, soil moisture estimation, Optical and microwave remote sensing techniques , drought zonations, Agricultural, meteorological and hydrological, flood mapping pre and post flood area estimation and control measures –GIS applications for hydrological disaster studies

**UNIT IV-GROUND WATER RESOURCES APPLICATIONS**

28 RS-2013 SRM(E&T) Types of Aquifers formations confined and unconfined aquifers Assessment of Groundwater potential zones and Groundwater mapping. Site selection for recharge structures- Hydrogeological Mapping GIS applications to ground water studies

**UNIT V-SURFACE WATER RESOURCES APPLICATIONS**

Surface water bodies, lakes, reservoirs, ponds, rivers , channels ,mappingchange detection , Water harvesting structures, in-situ and Ex-situ , Mapping and monitoring of catchment and command area, Water logging and salt affected area mapping, Reservoir Sedimentation, sedimentation control. GIS applications to surface water studies

**RS 402: Paper II : RS and GIS for Agriculture and Forestry**

**UNIT I-SPECTRAL CHARACTERISTICS OF LEAF**

Structure of leaf - Spectral behavior of leaf – Vegetation indices – NDVI, TVI, SVI, PCA – Vegetation classification and mapping - Estimation of Leaf area index, Biomass estimation – Estimation of terrestrial carbon assimilation in forests - case studies.

**UNIT II-FOREST MAPPING**

Forest type and density mapping and forest stock mapping using RS technique -factors for degradation of forests – deforestation/afforestation/. Change detection in forests - case studies

**UNIT III-BIODIVERSITY CHARACTERIZATION MAPPING**

Forestry – Forest taxonomy – Linnaeus classification – Biodiversity characterization – Forest fire risk zonation – wildlife habitats suitability analysis - case studies.

**UNIT IV-AGRICULTURAL APPLICATIONS**

Identification of crops -acreage estimation -production forecasting - pests and disease attacks through remote sensing -crop stress detection due to flood and drought - catchments and command area monitoring.

**UNIT V-SOIL APPLICATIONS**

Soil survey and land use classification - water logging - characters of saline, alkali soils - soil erosion – types – Estimation of soil loss from USLE using Remote sensing and GIS - Wasteland development.

**RS 403: Paper III: RS and GIS for Environmental Engineering**

**UNIT I-BASICS**

Water- Air-Land-Marine Environment Global Climatologic, urban Environment Environmental satellites GEOS, NOAA, AVHRR, CZCR Monitoring land, water, atmosphere and ocean using Remote Sensing Data. Water- Air-Land-Marine Environment Global Climatologic, urban

Environment:

**UNIT II-SOIL DEGRADATION**

Spectral characteristics of soil- Soil formation- classification of soils- soil survey interpretation and mapping- impact of agricultural and industrial activity on soil properties. RS & GIS in assessing Soil salinity- alkalinitywater logging studies- soil erosion- types and estimation -control measures.

**UNIT III-WATER QUALITY AND GROUND WATER POLLUTION**

Spectral characteristics of water- classification of water quality -Data base creation and quality modeling using GIS. Aquifer Vulnerability –Intrinsic and specific vulnerability- contaminant transport model

**UNIT IV-AIR QUALITY AND COASTAL STUDIES**

Atmosphere: Chemicals, Particulate matters present in the atmosphere, allowable limits, Remote Sensing techniques - Monitoring atmosphere 31 RS-2013 SRM(E&T) constituents- air pollution - industrial activity, modeling using GIS – Ecology studies- Coastal color monitoring- marine studies.

**UNIT V-ENVIRONMENTAL MANAGEMENT**

Revenue management-environment and ecological concerns- Resource development in remote areas-Impacts of anthropogenic activity- Solid Waste management- Forest classification Mapping – Biomass estimation – Carbon footprints and sinks, carbon trading, carbon credits and marketing, Indian and international status

**RS 404**

**Paper IV: RS and GIS for Disaster Management**

**UNIT I-HYDROLOGICAL & GEOLOGICAL DISASTERS**

Basic concepts and principles - Hydrological and geological disasters, Role of Government administration, NGO's - International disaster assistance -Sharing techno - logy and technical expertise.

**UNIT II-PREDICTION & MITIGATION**

Needs and approach towards prevention - Principles and components of mitigation - Disaster legislation and policy - Cost effective analysis - Utilisation of resources - Training - Education - Public awareness - Roles of media.

**UNIT III-CYCLONES & FLOODS**

Dams, Bridges, Hospitals, Industrial structures, Disaster resistant structures - Low cost housing for disaster prone areas - Cyclone shelter projects and their implications - Reconstruction after disasters.

**UNIT IV-REMOTE SENSING MONITORING & ANALYSIS**

Remote Sensing Application - Risk assessment - Damage assessment – Land use planning and regulation for sustainable development - Use of Internet - 34 RS-2013 SRM(E&T) Communication Network -Warning system - Post disaster review – Case studies.

**UNIT V-ROLE OF GIS IN DISSTERS**

Vulnerability analysis of infrastructure and settlements - Pre-disaster and post disaster planning for relief operations - Potential of GIS application in development planning and Disaster management plan - Case studies.

**RS 405: Core Corse Practical 1**

1. HYDROLOGICAL COMPONENS AND WATERSHED CHARACTERS
2. HYDROLOGICAL STUDIES AND GROUNDWATER RESOURCES APPLICATIONS
3. SURFACE WATER RESOURCES APPLICATIONS AND SPECTRAL CHARACTERISTICS OF LEAF
4. FOREST MAPPING AND BIODIVERSITY CHARACTERIZATION MAPPING
5. AGRICULTURAL APPLICATIONS AND SOIL APPLICATIONS

**RS 406: Core Corse Practical 2**

1. BASICS OF RS AND GIS FOR ENVIRONMENTAL ENGINEERING, SOIL DEGRADATION
2. WATER QUALITY AND GROUNDWATER POLUTION, AIR QUALITY AND COASTAL STUDIES
3. ENVIRONMENTAL MANAGEMENT, HYDROLOGICAL AND GEOLOGICAL DISASTERS
4. PREDCTION & MITIGATION, CYCLONES AND FLOODS
5. REMOTE SENSING MONITORING & ANALYSIS, ROLE OF GIS IN DISSTERS

**RS 407: SKILL DEVELOPMENT COURSE**

Building and Decorative Stone