**Appendix 7**

**(M.Sc. Tech. (Mineral Resource and Management)**

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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 courses need 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 for awarding 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. Tech Mineral Resources and Management (2017-2018)**

**M.Sc. Tech Mineral Resources and Management: 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** | **MRM101** | **Concepts and Techniques** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 2** | **MRM102** | **Igneous Mineralizations and Deposits** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 3** | **MRM103** | **Sedimentary Mineralizations and Deposits** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 4** | **MMR104** | **Industrial Mineralization** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 1** | **MMR105** | **Basic concepts Concepts and Techniques and Igneous Mineralizations and Deposits** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 2** | **MRM106** | **Sedimentary Mineralizations and Deposits, Industrial Mineralization** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development Course I** | **MRM107** | **Survey in Field** | **2-0-2** |  |  |  |  |
|  |  |  |  | **24** | **180** | **420** | **600** |

**M.Sc. Tech Mineral Resources and Management: 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** | **MRM201** | **Petroleum Geology** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 6** | **MRM202** | **Coal and Atomic Minerals** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 7** | **MRM203** | **Mineral Exploration** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course 8** | **MRM204** | **Mineral Management** | **4-0-0** | **4** | **30** | **70** | **100** |
| **Core course practical 3** | **MRM205** | **Petroleum Geology and Coal and Atomic Minerals** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Core course practical 4** | **MRM206** | **Mineral Exploration and Mineral Management** | **0-0-8** | **4** | **30** | **70** | **100** |
| **Skill Development course II** | **MRM 207 (any one)** | 1. **Minerals and rocks** | **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. Tech Mineral Resources and Management Syllabus**

**(2017-2018)**

**SEMESTER I**

**CORE PAPER MRM 101: CONCEPTS AND TECHNQUES**

**Unit I**

Brief history and modern concepts of Ore genesis. Classification of ore forming processes. Principal ore mineral groups. Formation of ore deposits in the light of plate tectonic theory.

**Unit II**

Modern analogue to ore forming processes. Evolution of Earth and Precambrian mineral deposits. Post-pre Cambrian mineralizations. Mineralogical provences. Mineralization on Moon. Metamorphism as ore forming process and metamorphosed deposits.

**Unit III**

Ore solutions formations, migration and accumulation chemistry of solutions and precipitation. Fluid inclusion technique, principles, limitations and applications. Geothermometrs and Geobarometers.

**Unit IV**

Chemical composition of ores and host rocks, bulk chemistry major, minor, trace and rare earth elements. Stable and radiogenic isotopes and its significance in economic geology.

**Unit V**

Ore microscopy its optical principles. Mineral identification in ore microscopy. Properties of important ore minerals. Ore textures. Applications of ore microscopy.

**Paper MRM 102: Igneous Mineralizations and Deposits**

**Unit I**

The process of Magmatic concentration for ore genesis. Indian magnetite and Cr-Ni deposits. Volcanogenic processes and deposits: characteristics, mode of occurrence and genesis. Mn-Nodules.

**Unit II**

Mineralizations associated komatite, kimberlite, carbonatite, peridotite and dunite, granite. Global and Indian examples.

**Unit III**

Pegmatite as rock and oreforming process. Simple and complex pegmatite. Important mineral deposits associated with pegmatites. Indian Pegmatite Belts, contact metasomatic process of ore genesis. Introduction of geology of Balda and Degana Tungsten and Belka Pahar Wollastonite deposits. Formation of Talc deposits.

**Unit IV**

Hydrothermal processes and deposits. Origin and nature of hydrothermal solutions. Cavity filling and metasomatic replacement type deposits. Hypothermal, Mesothermal, Epithermal, Telethermal, Xenothermal type deposts. Cyprus type Cu-Zn deposits, and Kuroko type Pb-Zn-Cu deposits. Porphyry type Copper deposits.

**Unit V**

Geology of Khetri Copper Belt, Singhbhum Copper Belt, Malanjkhand Copper deposit, Zawar Pb-Zn deposit, Dariba-Rajpura and Agucha Pb-Zn-Cu deposits. Kolar and Hatti Gold fields..

**Paper MRM 103: SEDIMENTARY MINERALIZATION AND DEPOSITS**

**Unit 1.**

Sedimentation as ore forming processes. Chemical and clastic sedimentation of iron and manganese deposits. Indian iron and manganese deposits. Clay deposit of Rajasthan.

**Unit 2.**

Residual concentration: process of ore formation. Formation of Bauxite, laterite (Blue dust) and Cr-Ni and Ni-Au profiles. Indian Bauxite deposits.

Mechanical concentration.

Eluvial, alluvial, colluvial, deluvial placers, Wind and beach placers. Gold, diamond, garnet phosphate deposits, uraniferous conglomerates and Indian thorium sand deposits.

**Unit 3.**

Evaporation process. Formation of K- Salt and halite deposits in desert lakes of geological past and present. Calcrete type uranium deposits. Indian prospects of calcrete type uranium deposits in thar desert.

**Unit 4.** Biogenic deposits. Role of biota in formation of ferrous and base metel deposits. Evidence of Biogenic processes. Textures and geochemistry. Framboids and formation of pyrite deposits.

**Unit 5.** Oxidation and supergene sulphide enrichment process. Process of ore formation. Gossans and their types. Gossan as guide in Indian sulphide deposits.

**Paper MRM 104: INDUSTRIAL MINERALS**

**Unit 1.**

Refractory industry and associated minerals. Physical properties, origin and mode of occurrence of Indian deposits and uses of following minerals: Kyanite, Sillimanite, Wollastonite.

**Unit 2.**

Cement industry and associated minerals. Paint and pigments industry and associated minerals. Physical properties, origin and mode of occurrence of Indian deposits and uses of following minerals: Gypsum, Limestone, Lignite, Clays, Ochur, Malachite, Azurite and Graphite.

**Unit 3.** Fertilizer industry and associated minerals. Ceramic and glass and associated minerals. Physical properties, origin and mode of occurrence of Indian deposits and uses of following minerals: Pyrite, Phosphate, Quartz, Feldspar and Apatite.

**Unit 4.** Abrasive industry and associated minerals. Physical properties, origin and mode of occurrence of Indian deposits and uses of following minerals: Garnet and Corundum.

Building stones: Marble, Sandstone and Granite. Important building stone of India.

**Unit 5.** Gemstone and semi precious stones industry and associated minerals. Electronic industry and associated minerals. Physical properties, origin and mode of occurrence of Indian deposits and uses of mica, asbestos, barite, talc, fluorite, beryl and zircon.

**MRM 105 : Core Practical 1:**

**Experiments related with Concepts and Techniques and Igneous Mineralizations and Deposits.**

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**MRM 106: Core Practical 2:**

**Experiments related with Sedimentary Mineralizations and Deposits and Industrial Mineralization**

**MRM 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: MRM 201 : PETROLEUM GEOLOGY**

**Unit 1.**

Introduction to geology, chemistry and application of petroleum. Origin of petroleum. Migration of petroleum. Geological time of petroleum formation.

**Unit 2.**

Characteristic source and reservoir rocks. Structural traps and Stratigraphic traps. Mixed traps and their examples.

**Unit 3.**

Geological techniques, Remote Sensing techniques and Geophysical techniques for exploration of petroleum in On shore and Off shore regions.

**Unit 4.**

Indian Petroleum Regions: Geology and petroleum geology of Northeastern Region. Geology and petroleum geology of Cambay basin region. Petroleum prospects in other basin of India.

**Unit 5.**

Indian Petroleum Regions: Geology and petroleum geology of Bombay offshore basin. Geology and petroleum geology of Barmer Sanchore basin. Geology and prospect of Godavari and Kaveri basin. Gas hydrates and its prospects in India.

**Paper: MRM 202: COAL AND ATOMIC MINERALS**

**Unit 1.** Coal and its properties: different varieties and ranks of coal. Coalification process and its causes. Lithotypes, microlithotypes and macerals: their physical, chemical and optical properties. Maceral analysis of coal: Mineral of coal: mineral and organic matter in coal . petrographical methods and tools of examination.

**Unit 2.** Fundamental of coal petrology, concept of coal maturity, peat, lignite, bituminous and anthracite coal. Application of coal geology in hydrocarbon exploration. Application of coal petrography. Proximate and ultimate analyses. Indian coal and lignite deposits. Industrial evaluation of coal characteristics with reference to coal classification.

**Unit 3.** Geology and coal petrography of different coalfield of India. Detailed geology of Raniganj and Jharia coal fields. Uses of coal for various industries e.g. carbonization, liquefaction, power generation, gasification and coal-bed methane production.

**Unit 4.** Atomic energy statusof India. Nuclear power stations of India and future scope. Mineralogy and geochemistry of radioactive minerals. Instrumental techniques of detection and measurement of radioactivity. Radioactive method for prospecting and assaying of mineral deposits. Radio active methods in petroleum exploration- well logging techniques. Nuclear waste disposal- geological constraints.

**Unit 5.** Various genetic types of uranium deposits. Geology of Jaduguda uranium deposit. Geology of offshore thorium sand deposits of India. Geology of Gobi uranium deposit. Important geological prospects of atomic mineral in india.

**Paper MRM 203: MINERAL EXPLORATION**

**Unit I** –

Resource, reserve definitions; mineral resource in industries – historical perspective and present. A brief overview of classification of mineral deposits with respect to processes of formation in relation to exploration strategies. Principles of mineral prospecting and exploration –conceptualization, methology and stages; sampling, subsurface sampling including pitting, trenching . Remote Sensing for exploration of minerals. Exploratory and underground mapping for exploration of minerals.

**Unit II-**

Geochemistry: geochemical explorarion – nature of samples anomaly, strength of anomaly and controlling factors, coefficient of aqueous migration, Pedo-, Litho-, Hydro-geochemical exploration..

**Unit III-**

Geophysics: Interrelationship between geology and geophysics- role of geological and geophysical data in explaining geodynamical features of earth. General and exploration geophysics- different types of geophysical methods; gravity , magnetic, electrical, seismic- their principles and applications. Geophysical field operations – different types of surveys, grid and route surveys, profiling and sounding techniques, scales of survey, presentation of geophysical data. application of geophysical methods – regional geophysics, ore geophysics, engineering geophysics. Geophysical anomalies: correction to measured quantities, geophysical, anomaly, regional and residual (local) anomalies, factors controlling anomaly, depth of exploration. Integrated geophysical methods – ambiguities in geophysical Interpretation, planning and execution of geophysical surveys.

**Unit IV-**

Drilling : principles of boring; selections of sites for boreholes ; surface layout ; method of percussive (solid hollow and ropes), rotary, (diamond , chilled shot, clay and other system), details of equipments, properties of drilling mud, core recovery wire line core barrel: interpretations of bore hole data, bore hole logging , maintenance of records , difficult boring, controlled directional drilling, deflection of boreholes, difficulties in boring, fishing tools and their uses. Principles of reserve estimation, density and bulk density, factors affecting reliability of reserve estimation based on geometrical models (square, rectangular, triangular and polygon blocks) regular and irregular grid patterns.

**Unit V-**

Geobotanical and Geostatical techniques in Mineral Exploration. Application of computer in Mineral Exploration.

**Paper MRM 204 : MINERAL MANAGEMENT**

**Unit I**

Principle type of sampling. Theory and precautions in sampling. Preparations of samples.

Basics of ore reserve estimation. Classification of ore reserve and resources. Methods of estimation of different type of deposits.

**Unit II**

Developing a new prospect as mine. Mine features and terminology shaft, drift, tunnel, ventilation, illumination, transportation and drainage.

**Unit III**

Explosives, their grades, uses and precautions. Mine machineries. Mining Hazards. Environmental mining.

**Unit IV**

Mining methods, their classification. Coal mines. Base metal mining.

**Unit V**

Strategic, critical and essential minerals. India’s status in mineral production vis a vis world scenario, changing patterns of mineral consumption. UNFC classification, National Mineral Policy. Mineral Concession Rules. Marine mineral resources and laws of Sea.

**MRM 205: Core Corse Practical 1**

**Experiments related with Petroleum Geology and Mineral**

**MRM 206: Core Corse Practical 2**

**Experiments related with Coal and Atomic Minerals and Mineral Management**

**MRM 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