**ANDHRA UNIVERSITY**

**DEPARTMENT OF GEOLOGY**

**COLLEGE OF SCIENCE AND TECHNOLOGY**

Scheme of Instruction and Examinations

**V SEMESTER, M.Sc. (TECH) APPLIED GEOLOGY**

(With effect from the admitted batch 2016-2017)

**V SEMESTER, M.Sc. (TECH) APPLIED GEOLOGY**

Scheme of Instruction and Examinations

(With effect from the admitted batch of 2016-2017)

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| --- | --- | --- | --- | --- | --- | --- | --- |
| S. No | Course | Teaching/Lab Hours  Per week | Duration of Examination hours | Allotment of Marks | | Total Marks | Subject Credits |
| Final | Mid-Exam |
| 01. | Paper - I  Mineral Processing Engineering | 4 | 3 | 80 | 20 | 100 | 4 |
| 02. | Paper – II  Fuel Geology | 4 | 3 | 80 | 20 | 100 | 4 |
| 03. | Paper – III  Geo-Informatics | 4 | 3 | 80 | 20 | 100 | 4 |
| 04. | Paper – IV  Mine legislation & Mine Planning | 4 | 3 | 80 | 20 | 100 | 4 |
| 05. | Paper - I  Mineral Processing Engineering *(Practical)* | 4 | 3 | 50 | | 50 | 2 |
| 06. | Paper – II  Fuel Geology *(Practical)* | 4 | 3 | 50 | | 50 | 2 |
| 07. | Paper – III  Geo Informatics *(Practical)* | 4 | 3 | 50 | | 50 | 2 |
| 09. | Viva-Voice | - | - | 50 | | 50 | 2 |
| **TOTAL** | | | | | | **600** | **24** |

***SYLLABUS***

**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER- I, MINERAL PORCESSING ENGINEEING**

**(With effect from the admitted batch of 2016-2017)**

**UNIT – I**

Introduction fundamentals of mineral processing. Importance of mineral processing, economics of mineral processing, occurrence of ores in nature, justification for mineral processing, Role of geologist in mineral processing.

**UNIT –II**

Crushing, type of crushers, cone crushers, Hammer mill, stamp mill, recent advances in crushing, principles of grinding, dry and wet grinding, trembling mills – Ball mill, types of ball mills, rod mill, types of rod mills.

**UNIT – III**

Classification in mineral processing. types of classifiers, screening, types of screening, statitionary screens, vibrating screens, laboratory screens, wet and dry screening.

**UNIT- IV**

Hydrocyclones, types of hydrocyclones, densemedia separation, flocculation and dispersion application, Floatation and agglomeration application, Jigging, types of Jigging, tabling, types of tables, application. Magnetic separation, types of magnetic separators.

**UNIT-V**

Flow sheet design, miscellaneous processes – hydro metallurgy, heap leaching, hot water drying of coals, radiometric methods of coal separation. Flow sheets of beach sand separation, copper, lead, zinc separation of Khetri and Jawar mines, coal washery design.

**PRACTICALS:**

1. Horse power (HP) calculation.
2. Mass balance of a flow sheet.
3. Flow sheet design.
4. Performance of a jaw crusher.
5. Performance of a hand jig.
6. Assignment on a topic of mineral processing design and presentation.
7. Visit to a mineral processing industry.

**TEXT BOOKS:**

1. Principles of mineral dressing – A.M. Gaudin.
2. Elements of ore dressing – A.F. Taggart.
3. Course in mining geology – R.N.P. Araogyaswamy.
4. Mineral processing – E.J. Pryor.
5. Ore Processing – S.K. Jain.
6. Ore deposits of India – Their distribution and processing – K.V.G.K. Gokhale and T.C. Rao.

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**MODEL QUESTION PAPER**

**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER – I, MINERAL PROCESSING ENGINEERING**

**(Effective from the Admitted Batch of 2016-2017)**

**Time: 3Hrs Max. Marks: 80**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Write about operations involved in mining and mineral processing.

**OR**

1. Answer any **TWO** of the following:

a) Occurrence of ores. b) Role of geologist in mineral processing.

c) Economics of mineral processing.

**UNIT-II**

1. Write about different types of crushers and their operation.

**OR**

1. Write notes on any **TWO** of the following:

a) Ball mill. b) Rod mill.

c) Hammer mill

**UNIT-III**

1. Write in detail about different types of classifiers.

**OR**

1. How the sizing operation takes place by using screening operations.

**UNIT-IV**

1. Describe the method of Flotation.

**OR**

1. Write short notes on any **TWO** of the following:

a) Jigging. b) Tabling.

c) Flocculation and agglomerates.

**UNIT-V**

1. Write about the miscellaneous processes of mineral processing.

**OR**

1. Write short notes on the following:

a) Lead and Zinc concentration.

b) Case study of beach sand processing.

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**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER- II, FUEL GEOLOGY**

**(With effect from the admitted batch of 2016-2017)**

**UNIT – I**

Introduction; Occurrence of petroleum – surface occurrences: seepages, mud volcanoes and mud flows, occurrence of solid petroleum, kerogen shale; subsurface occurrences; minor showings pools, and provinces; Reservoir rocks – origin and classification; Reservoir pore space – origin and measurement of porosity and permeability.

**UNIT –II**

Reservoir traps – Structural, stratigraphic and miscellaneous traps; salt domes; Reservoir fluids – physical and chemical properties of oilfield water, oil and gas; Origin of petroleum – Inorganic and organic origin, organic source material and transformation of organic matter into petroleum.

**UNIT – III**

Migration and accumulation of petroleum – Primary migration and secondary migration; Exploration and exploitation of petroleum; Principles of well logging, various types of well logs; Evaluation of reserves and resources; Important petroliferous basins of India – K-G Basin, Cauvery basin Mahanadi basin, and Bombay High.

**UNIT- IV**

Introduction; Classification of coal; Physical and chemical properties of coal; Proximate and ultimate analysis of coal; Origin of coal; Peatification and coalification; Origin of peat swamps; Development of coal facies – type of deposition; Peat- forming plant communities; Depositional milieux; Nutrient supply; pH value, Bacterial activity, Sulfur; Temperature of the peat; Redox potential.

**UNIT-V**

Macerals of coal – Vitrinte group, Exinite group, and Inertinite group; Microlithotypes of coal; Coal preparation; Coal- bed methane; Application of coal petrography; Important coalfields of India – Gondwana group, Jharia coalfields, Raniganj coalfields and coalfields of Andhra Pradesh.

**(P.T.O)**

**PRACTICALS:**

Preparation of structural, Isopach and Isochore maps(contour maps), Facies maps, Fence diagrams, Isometric projections, Paleontologic range chart, Sediment maps, Cross sections; Computation of stratigraphic thickness; Drafting of columnar section in graphic symbols; Correlation of electric logs; Study of hand-specimens of different reservoir rocks and coal; Problems related to proximate analysis of coal; Study of thin sections of coal for macerals.

**TEXT BOOKS:**

1. Geology of Petroleum by A.I. LEVORSEN.
2. Petroleum Geology by F.K. NORTH.
3. Petroleum Geology by KENNETH K. LANDES.
4. Principles of Petroleum Geology by WILLIAM L. RUSSEL.
5. Petroleum Geology by RICHARD E. CHAPMAN.
6. Structural Geology for Petroleum Geologists by WILLIAM L. RUSSEL.
7. Important Journals related to Petroleum Geology.
8. Coal Petrology by Prof. E. STACH et al.

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**MODEL QUESTION PAPER**

**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER – II, FUEL GEOLOGY**

**(Effective from the Admitted Batch of 2016-2017)**

**Time: 3Hrs Max. Marks: 80**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Describe the various surface occurrences of petroleum drawing neat sketches wherever necessary.

**OR**

1. Write short notes on any **TWO** of the following:

a) Reservoir rocks. b) Porosity and permeability.

c) Kerogen shale.

**UNIT-II**

1. Describe the various types of structural traps with neat sketches.

**OR**

1. Write short notes on any **TWO** of the following:

a) Primary stratigraphic traps. b) Secondary stratigraphic traps.

c) Salt domes.

**UNIT-III**

1. Write an essay on the secondary migration of petroleum.

**OR**

1. Write short notes on any **TWO** of the following:

a) Primary migration of petroleum. b) Tectonics of Cauvery Basin.

c) Tectonic of K-G Basin.

**UNIT-IV**

1. Write an essay on the origin of coal.

**OR**

1. Write short notes on any **TWO** of the following:

a) Origin of peat swamps. b) Peat – forming plant communities.

c) Redox potential.

**UNIT-V**

1. Describe the Exinite group of macerals.

**OR**

1. Write short notes on any **TWO** of the following:

a) Microlithotypes of coal. b) Coal – bed methane.

c) Raniganj coal fields.

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**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER- III, GEOINFORMATICS**

**(With effect from the admitted batch of 2016-2017)**

**UNIT – I**

History of the art of map-marking. Different types of maps. Thematic map, Bathymetric, Oceanographic map. Topographical maps, Geological and Geographical maps. Different scales of maps. Projection of maps. World and India topographical maps and their numbering system. Representation of natural and manmade features on maps.

**UNIT –II**

Geographical information systems: Definition and introduction to GIS, Hardware and software requirements for GIS.

**UNIT – III**

Data base structures and data formats in GIS, Spatial data mode is (Raster and Vector). Methods of Data capturing, editing and topology creation and integration of spatial and non-spatial data.

**UNIT- IV**

Map projections and spatial analysis in GIS. Remote sensing and GIS data integration. Overview of recent GIS packages and their importance.

**UNIT-V**

Applications and uses of GIS particularly in geological studies.

**PRACTICALS:**

Scanning and Digitization, data export, import and data conversions. Geo-referencing. Overlay analysis and map display.

**TEXT BOOKS:**

1. Principals of Geographical Information Systems for Land Resources Assessment by P.A. Burrough, Clerendon Press, Oxford.
2. Geographic Information systems for Geoscientists; Malelling with GIS by Graem f. Bonham – carter, pergemon publisher.
3. Understanding GIS, the ARC / INFO METHOD ESRI Inc. USA.

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**MODEL QUESTION PAPER**

**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER- III, GEOINFORMATICS**

**(Effective from the Admitted Batch of 2016-2017)**

**Time: 3Hrs Max. Marks: 80**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Write notes on World and Indian Topographical maps and their numbering system.

**OR**

1. Write notes on different types of Maps, their similarities and differences?

**UNIT-II**

1. Answer any **TWO** of the following:

a) Elements of GIS. b) Data models in GIS.

c) Concepts in GIS.

**OR**

1. Define GIS? Explain its role in decision makings?

**UNIT-III**

1. Write an essay on Database structures and Data formats in GIS?

**OR**

1. Explain in detail Editing (Error detection and correction) and Topology creation in GIS?

**UNIT-IV**

1. Write an essay on integration of Remote Sensing and GIS data?

**OR**

1. Write an essay on current GIS packages and their importance?

**UNIT-V**

1. Explain in detail the application of GIS in Environmental Geology?

**OR**

1. Explain in detail the application of GIS in the Earth Sciences?

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***SYLLABUS***

**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER- IV, MINE LEGISLATION & MINE PLANNING**

**(With effect from the admitted batch of 2016-2017)**

**UNIT – I**

Mines and minerals (regulation and development) Act, 1957 – Introduction – Scope – Application – Mining lease – Minor minerals – Prospecting license – Renewal – Royally and dead rent – Preferential rights – Powers of government. The mineral concession rules (1960) – Introduction – Preliminary – Certification of approval – Grant of prospecting / Mining license for scheduled minerals – Prospecting license – Mining license – Dead rent of review – Statutory time limits.

**UNIT –II**

The Andhra Pradesh minor minerals concession Rules, 1966 – Introduction – Powers – Seizure of minerals – Leases – Quarrying – Grant of quarry lease – Period of lease – Renewal – Auction system – Sand Policy.

**UNIT – III**

Outline of mining plan – General – Geology and resources – Mining – Blasting – Mine drainage – Disposal of waste – Use of mineral – Mineral beneficiation – Surface transport – Site services – Employment potential – Environment management plan.

**UNIT- IV**

The forest conservation Act (1980) and rules (1981). Environmental impact assessment and environmental management planning – Experimentation – Report preparation – National standards.

**UNIT-V**

Prospecting requirements – Introduction – Sampling – Stages of exploration – Guidelines – Exploration – Classification of terminology of exploration of mineral deposits – Scope – Definition – Reserve classification – Resource potential - Confidence of estimation – Equipment for sampling – Methodology of sampling – Chemical analysis of different minerals / ores required. Granite conservation and development rules, 1999 – Prospecting and mining of granite – Prospecting operations – Mining plan – Mining operations – Systematic and scientific mining – Employment of qualified persons- Revision and penalty.

**TEXT BOOKS:**

1. P. Seshagiri Rao’s Law of Mines and Minerals – N. Hunaimy, Asia Law House, Hyderabad.
2. Indian bureau of Mines, Nagpur guidelines for mining plan preparation 1994.
3. Comprehensive guidelines on prospecting requirements. Published by Indian Bureau of Mines, Nagpur 1994.
4. Granite conservation and development rules, 1999. Published by Indian Bureau of Mines, Nagpur, 1999.
5. Indian Minerals year books, Published by Indian Bureau Mines, Nagpur.

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**MODEL QUESTION PAPER**

**V – SEMESTER, M. Sc. (TECH) APPLIED GEOLOGY**

**PAPER – IV, MINE LEGISLATION & MINE PLANNING**

**(Effective from the Admitted Batch of 2016-2017)**

**Time: 3Hrs Max. Marks: 80**

**Answer FIVE questions, choosing ONE from each Unit.**

**All questions carry equal marks.**

**UNIT-I**

1. Write essay on applications of Mining Lease, Mineral prospecting and royality.

**OR**

1. Write short notes on any **TWO** of the following:

a) Preferential rights. b) The mineral concession rules.

c) Statutory time limits.

**UNIT-II**

1. Briefly explain the Leases of quarrying grants and renewal process.

**OR**

1. Write short notes on any **TWO** of the following:

a) Sand policy. b) Seizure of minerals.

c) Auction systems.

**UNIT-III**

1. Briefly explain the Outlines of mine planning.

**OR**

1. Write short notes on any **TWO** of the following:

a) Mineral Beneficiation. b) Site services.

c) Environmental impact.

**UNIT-IV**

1. Briefly explain the Forest conservation rules.

**OR**

1. Write short notes on any **TWO** of the following:

a) Environmental impact assessment. b) Environmental management planning.

c) Report preparation – National standards.

**UNIT-V**

1. Briefly explain the equipment of sampling, methodology and chemical analysis.

**OR**

1. Write short notes on any **TWO** of the following:

a) Mining operations. b) Reserve classification.

c) Granite conservation.

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