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**Sant Gadge Baba Amravati University, Amravati**  
**B. Sc. Geology**

**Faculty: Science and Technology**

**Programme: B. Sc. Part I SEM I**

**POs:**

At the time of graduation, Students will be able to

PO1. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

**PSOs:**

Upon completion of the programme successfully, students would be able to

1. develop interests for Geology-Science of Earth as a specific subject of study.
2. Acquire the knowledge of various Physical Processes and work done by natural agencies
3. Acquire the knowledge of various kinds of minerals.
- 4 Study crystal structure and classification of crystals.
- 5 Undertake Field Visits to introduce and develop field based Geological skills and knowledge

**Employability Potential of the Programme:**

- After successful completion of B.Sc. I, Sem I exam, the students will acquire the knowledge about the earth and its composition.
- Students will acquire knowledge of Mineralogy and Crystallography along with formation physical and chemical properties of minerals.
- Students will have good opportunities as mineralogist in various mineral industries and gem industries.
- They can determine exact composition and how to best extract valuable minerals and natural resources.
- Using geological data, they can advise on how to best approach resource extraction from certain sites or how to approach particular kinds of minerals.
- Mineralogist exploring new resources of valuables minerals in fields.
- A Mineralogist may act as a consultant to their employer, which involves effectively communicating their findings.
- In the lab Mineralogist utilize various advanced technologies to examine and analyze various minerals.
- Mineralogist also have role in water resource engineering as they can analyze the data from relevant data. Also, in various civil engineering sites like dam, tunnels, bridges, buildings mineralogist can advise about quality of minerals.

**Syllabus Prescribed for First Year UG Programme****Programme: B. Sc. Part 1****Semester 1**

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
GOG-1	<b>General Geology, Physical Geology, Mineralogy, Crystallography and Field Geology</b>	72

**COs**

Upon completion of this course successfully, students would be able to

1. Understand the basic idea about geology, branches, scope and origin of the earth system.
2. Explain the age determination methods and composition & constitution of earth.
3. Understand the rock weathering process.
4. Describe and interpret the development of landform geologic structures made by the various agents like river, wind, glacier etc.
5. Understand and explain the volcanism and earth quakes theory.
6. Define mineral and Describe Physical, Chemical and Optical properties of the minerals.
7. Explain the crystal and its characters and different Crystal system.
8. Understand and use of basic tools for the fieldwork and describe the topographic Maps.
9. Understand the Surveying and its types along with surveying equipments.

Unit	Content
Unit I	<b>General Geology:</b> definition of geology, branches and scope. Earth in the solar system Origin of the earth: Nebular, Planetesimal and Tidal hypothesis, Age of earth: relative and radioactive methods of age determination – U/Pb, Rb/Sr, K/Ar and Carbon-14 method. constitution of earth: crust, mantle and core. Lithosphere, hydrosphere, atmosphere and biosphere. <b>(12 periods)</b>
Unit II	<b>Physical Geology:</b> Rock weathering – physical weathering, chemical weathering and biological weathering. Geological work done by wind, Rivers, underground water and Glaciers. Volcanism: Structure of volcano, products of volcanoes. Types of volcanic eruption, Causes and distribution of volcanoes. Earthquakes: definition, terminology, Elastic rebound theory – causes, effects, magnitude and intensity; Seismogram and Seismograph. Classification of earthquake; Seismic belts of India. <b>(12 periods)</b>
Unit III	<b>Mineralogy:</b> Definition of mineral, rock forming & ore minerals, Physical properties of minerals: Determination of specific gravity by Walker's steelyard & Jolly's spring balance. Structure of Silicates, Physical, chemical, optical properties of Feldspar, Mica, Pyroxene, Amphibole, Garnet and Olivine groups mineral groups. <b>(12 periods)</b>
Unit IV	<b>Optical mineralogy</b> – Nature of light, Ordinary and plane polarized light; Reflection and refraction, total internal reflection and critical angle; Double refraction - Nicol prism, Becke line effect. Petrological microscope – its parts and functioning. Properties of minerals under ordinary and plane polarized light and between cross nicol <b>(12 periods)</b>
Unit V	<b>Crystallography</b> – Elementary idea about crystal structure: crystal, forms, faces, edges, solid angle and interfacial angle and its measurement. Laws of crystallography Crystal symmetry: planes, axes, centre, crystallographic axes. Miller's indices and Weiss Parameters. Classification of crystal in to seven systems with their symmetry elements of normal classes; Cubic, Orthorhombic, Tetragonal, Hexagonal, Monoclinic and Triclinic. <b>(12 periods)</b>
Unit VI	<b>Field Geology:</b> Significance of geological field work, Study of toposheet: numbering, latitude, longitude, scale and conventional

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sings. Surveying- various types, use and aim. Introduction to surveying equipment's. **(12 periods)**

**SEM**

1. Definition of Mineral, Physical properties of Minerals, Mineralogist works, The Industrial Use of Natural Non-Ore Minerals, Mineralogical Materials Science and Processing, Examining, analyzing and classifying minerals to determine their composition and internal structure, microscopic study of minerals, study of chemical analysis of minerals. Various Uses of Minerals.
2. Scope of the survey, Survey land areas and development of geological map, diagrams and charts, find reservoirs of natural resources, Types of Surveying Equipment & Their Uses:  
  
GPS, Chains and Tapes survey, Compasses and Clinometers, Transits and Theodolites, Dumpy Levels, Safety Gear, Prisms and Reflectors, Magnetic Locators, Poles, Tripods, and Mounts.

- COs: 1. To improve the knowledge of mineral and its uses  
2. To works as surveyors for natural resources.

- \*\*Activities**
1. Assignment/ Seminar
  2. Class test
  3. Field work
  4. Visit to the various organization.

**Course Material/Learning Resources****Text books:**

1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhina.
2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta.
3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi.
4. Text Book of Physical Geology: G.B.Mahaptra- Pub. C.B.S., New Delhi.
5. Physical Geology: Datta A.K., Kalyani Pub.
6. Rutley's Elements of Mineralogy: H.F.Read
7. A Text Book of Mineralogy: Dana, E.S. and Ford, W.E.(1949) Wiley Eastern Ltd.
8. Optical Mineralogy: Roger and Kerr:
9. Field Geology: Frederic H. Lahee. CBS Publishers & Distributers 4596/1A, 11 Darya Ganj, New Delhi-110002 (India)

**Reference Books:**

1. Dynamic Earth: Skinner Potter: Pub. John, Wiley.
2. Fundamentals of Geology: Vol. I, II, Borges, Gwalani et al., Himalaya Pub., Bombay.
3. Concepts in Geology: Chakranyan, Kulkarni, Scientific Publication, Pune.
4. Fundamentals of Mineralogy and Petrology: M. A. Koregave, Pub.Book World Enterpress- Bombay.
5. Principal of Physical Geology: Arthur Holmes 1992, Chapman and Hall, London

Weblink to Equivalent MOOC on SWAYAM if relevant:

Weblink to Equivalent Virtual Lab if relevant:

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

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## Sant Gadge Baba Amravati University, Amravati

Faculty: Science and Technology

Programme: B. Sc. Part I SEM II

## Syllabus Prescribed for First Year UG Programme

Programme:

Semester II

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods)
GOG-2	Igneous, Sedimentary and Metamorphic Petrology	72

## COs

Upon completion of this course successfully, students would be able to

1. Explain and describe the formation, classification, and structure of igneous rocks.
2. Explain and describe the formation, classification and structure of sedimentary rocks.
3. Explain and describe the formation, classification and structure of metamorphic rocks.
4. Identify and describe common Igneous, sedimentary and metamorphic rocks
5. Describe the depositional environment of sedimentary rocks.

Unit	Content
Unit I	Definition of petrology, petrography, petrogenesis. Concept of rock cycle, Igneous rocks: Magma and its composition, pyrogenetic minerals, formation of crystals and glass; intrusive – concordant and discordant forms of igneous rocks. Extrusive forms. Texture in Igneous rocks: definition, types and controlling factors- crystallinity, granularity, shape of crystals and mutual relations, equigranular (granitic), inequigranular (porphyritic), directive and intergrowth, glassy. Structure in Igneous Rocks: vesicular, amygdaloidal, blocky, pillow, flow and columnar joints; distinction between textures and structures. <b>(12 periods)</b>
Unit II	Evolution of Magma: Differentiation, Fractional Crystallization, Magmatic assimilation. Classification of Igneous rocks: IUGS Classification. Other aspects of classification – Plutonic, Hypabyssal and Volcanic, Chemical, Silica based, Silica saturation, CIPW, mineralogical, Colour Index and Tabular Classification. Bowens Reaction series, Characteristics of acidic, alkaline and basic igneous rocks. Characters of some common igneous rocks and their Indian occurrences <b>(12 periods)</b>
Unit III	Concept of phase Rule: system, phase, component. Degree of freedom. Equilibrium. One component system of augite and quartz, two (Binary) component system, Binary system with complete solid solution – plagioclase feldspar, mixed crystal, diopside- anorthite eutectic system, ternary system and their petrogenetic significance. Ternary system of diopside, albite and anorthite. Distribution of Igneous rocks in time and space. <b>(12 periods)</b>
Unit IV	Sedimentary Rocks: formation of sedimentary rocks – erosion, transportation and deposition, diagenesis and lithification. Classification of sedimentary rocks, sedimentary structures, sedimentary depositional environment, concept, types of environments – Aeolian, Fluvial, Glacial, Near shore and Deep sea. <b>(12 periods)</b>
Unit V	Sedimentary Petrology: Deposit of chemical origin – concretions, secretions, colloids, siliceous, carbonate, ferruginous, salts. Deposits of organic origin; organic rocks of calcareous origin, phosphatic deposits of organic/siliceous. Deposition of organic origin and carbonaceous deposits. Characters of common sedimentary rocks.

- (12 periods)**
- Unit VI Metamorphic Rocks: Agents of metamorphism; kinds of metamorphism; classification of metamorphic rocks, textures and structures of metamorphic rocks, cataclastic, thermal, dynamothermal and plutonic metamorphism. Metamorphic Petrology; Stress and Antistress minerals, Metasomatism – types and additive processes. Injection, pneumatolytic and autometamorphism. Characters of common metamorphic rocks. **(12 periods)**

**SEM**

Unit I- Collection & Identification of Rock samples in Field. Sample collection method, Important characteristic of Rock's, Field knowledge for collection of sample, Physical and chemical properties of rock

Unit II- Use of various rock in construction material - Application of Igneous, Sedimentary & Metamorphic rock in making cement, building material, roofing material, statue, Ornamentation, Decoration, Road material. Petrology knowledge useful in civil engineering, Geological museum

**COs:**

1. To improve the knowledge of various rocks and their identification in field
2. Uses of various rock as building material, roofing material, statue, Ornamentation, Decoration, Road material and cement industry.

**\*\*Activities**

1. Assignment/ Seminar
2. Class test
3. Field work
4. Visit to the various organization.

**Course Material/Learning Resources****Text books:**

1. Text Book of Engineering Geology: Parbin Singh, Katson Publishing, Ludhiana.
2. Text Book of Geology: P.K.Mukerjee - World Press Pub., Calcutta.
3. Text Book of Geology: Santosh Garg - Khanna Publ., Delhi.

**Reference Books:**

1. Dynamic Earth: Skinner Potter - Pub. John, Wiley.
2. Concepts in Geology: Chakranarya, Kulkarni, Pub. Scientific Publication, Pune. 101 102
3. Fundamentals of Mineralogy and Petrology: M. A .Koregave, Pub. Book World Enterpress- Bombay.
4. Principles of Petrology: G.W. Tyrell (1998) B.I. Publications Pvt. Ltd., New Delhi.
5. Geology of Maharashtra: Deshpande, G.G. (1998). Geological Society of India, Bangalore.
6. Geology of India: D. N. Wadia (1998) Tata McGraw Hill, India.
7. Optical Mineralogy; Winchell
8. A study of rock in thin section: W. W. Moorhouse, Harper and sons Publication
9. Igneous and Metamorphic Petrology: Turner, F. J and Verhoogen, J, McGraw Hill
10. Sedimentary petrology: Pettijohn, H. J, Harper and Brothers.

Weblink to Equivalent MOOC on SWAYAM if relevant:

Weblink to Equivalent Virtual Lab if relevant:

Any pertinent media (recorded lectures, YouTube, etc.) if relevant:

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## Sant Gadge Baba Amravati University, Amravati

## Syllabus Prescribed for First Year UG Programme

## Programme: B. Sc Part 1

## Semester 1

Code of the Course/Subject	Title of the Course/Subject	(No. of Periods/Week)
GOG- Lab 1	Mineralogy, Crystallography and Topographic map	06 Period per week

## COs

Upon completion of this course successfully, students would be able to perform/demonstrate

1. Megascopic identification of mineral
2. Microscopic identification of mineral
3. Study of element of symmetry in crystal
6. Reading of Topographic map

## \* List of Practical/Laboratory Experiments/Activities etc.

- 1 **Mineralogy** : Megascopic identification of common minerals – Quartz and its varieties, Microcline/ Orthoclase, Albite, Apatite, Dolomite, Graphite, Natrolite, Stilbite Chlorite, Augite, Garnet Topaz, Labradorite, Hypersthene, Tremolite, Biotite, Muscovite, Calcite, Hornblende, Kyanite, Talc, Dolomite, Olivine, Tourmaline, Corundum, Gypsum, Hematite, Chromite, Chalcopyrite, Asbestos, Barite, Fluorite, Chlorite and magnesite.
- 2 Microscopic identification of common minerals : Quartz, Hornblende, Muscovite, Biotite, Garnet, Calcite, Orthoclase, Microcline, Plagioclase, Augite, Olivine, Hypersthene, Tourmaline, Chlorite, Epidote
- 3 **Crystallography**  
Study of elements of Symmetry in the crystals of normal seven classes. Study and reading of wooden crystallography models belonging Normal class of seven major crystal systems.
- 4 **Toposheets identification**  
Toposheets: reading of toposheet with reference to toposheet number, latitude, longitude, state, district, scale, adjacent toposheet numbers and conventional signs.

**Practical Examination will be of 50 Marks and comprises Internal and external examination.**

**Practical Internal will have 25 Marks and Practical examination will be of 25 Marks.**

**Practical Internal Examination will include class test, field work, Collection of samples MCQ, etc.**

**Practical Examination will be of 3 hours duration and Carry 25 Marks.**

**The Distribution of marks for Practical will be as follows.**

## Semester – I

- |  |          |
|--|----------|
| i) Megascopic identification of Minerals (10 samples)  | 05 marks |
| ii) Microscopic identification of Minerals (05 slides) | 05 marks |
| iii) Symmetry of elements of crystals :                | 05 marks |
| iv) Toposheet reading and interpretation :             | 05 marks |
| v) Record  | 03 marks |
| vi) Viva-voce  | 02 marks |

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Total – 25 marks

## Sant Gadge Baba Amravati University, Amravati

## Syllabus Prescribed for first Year UG Programme

Programme: B. Sc. Part 1

Semester 2

Code of the Course/Subject	Title of the Course/Subject	(No. of Periods/Week)
GOG- Lab 2	Igneous, Sedimentary and Metamorphic	06 Periods per week

## COs

Upon completion of this course successfully, students would be able to perform/demonstrate

1. Megascopic identification of Rock
2. Microscopic identification of Rock
3. Construction of paragenetic triangular graphs.

## \* List of Practical/Laboratory Experiments/Activities etc.

- |   |   |
|---|---|
| 1 | Megascopic identification of igneous, sedimentary and metamorphic rocks (At list 25 rock) |
| 2 | Microscopic study of igneous, sedimentary and metamorphic rocks (15 slide)                |
| 3 | Exercise on ACF, AKF and AFM diagrams   |

**Practical Examination will be of 50 Marks and comprises Internal and external examination.**

**Practical Internal will have 25 Marks and Practical examination will be of 25 Marks.**

**Practical Internal Examination will include class test, field work, Collection of samples MCQ, etc.**

**The Practical Examination will be of 3 hours duration & carries 25 Marks.**

**The distribution of Marks for Practicals will be as follows :**

- |      |   |          |
|------|---|----------|
| i)   | Megascopic identification of igneous, sedimentary and metamorphic rocks (As in theory) (08 samples) | 08 marks |
| ii)  | Rocks in thin section (As in theory) (03 slides)  | 06 marks |
| iii) | Exercise on ACF, AKF and AFM diagrams   | 06 marks |
| iv)  | Record  | 03 marks |
| v)   | Viva-voce   | 02marks  |

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Total – 25 marks

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