VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in Applied Geology

SYLLABUS

MASTER OF SCIENCE
(I to IV Semester)

With effect from
2021-22

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

POST GRADUATE CENTRE, JNANASAROVARA CAMPUS,

NANDIHALLI-SANDUR-583119

Department of Studies in Applied Geology

Programme: Master of Science (M.Sc.) in Applied Geology

Duration: 2 Years (4 semesters)

Programme Overview:

M.Sc. in Applied Geology programme is framed in such a way that to impart more Knowledge in the field of Earth Science and which focuses on preparing the students for research, as well as for application of geological knowledge in a variety of field settings. The basic aim of Earth Science education is to understand the atmosphere, biosphere, hydrosphere, lithosphere in a holistic manner and the interactions among them to address some of the most urgent societal problems. Realizing this, curriculum is instituted with the following objectives:

Programme Educational Objectives (PEOs):

1. To shape skilled and qualified Geoscientist to serve the industrial, management, educational and developmental sectors of the society, worldwide and the country.
2. To contribute to the existing knowledge bank in Earth sciences with an interdisciplinary approach.
3. To bring subjects like environmental geology, disaster management, mineral dressing, water security, resource management, applications of geoinformatics in the field of Earth Sciences etc., as academic subjects into the mainstream.
4. To develop in-depth knowledge and skills in qualitative and quantitative research methods through laboratory, field and web modes of learning.

Programme Outcomes (POs):

After completion of M.Sc. Programme in Applied Geology, students can study around the globe with new ideas and approaches that not only aim at addressing Earth's origin and evolution but also play a key role in understanding the controls of climate change and allow us to prepare our society for future environmental changes.

The programme M.Sc. in Applied Geology, students are skilled to serve as a Geoscientist in industrial management, educational and developmental sectors of the society in our country and worldwide.

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

Distribution of Courses/Papers in Postgraduate Programme as per Choice Based Credit System (CBCS) in

Applied Geology

M.Sc. I – SEMESTER

Semester	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	SEE	Total	L	T	P		
FIRST	DSC1	21APG1C1L	Mineralogy	30	70	100	4	-	-	4	3
	DSC2	21APG1C2L	Geoinformatics	30	70	100	4	-	-	4	3
	DSC3	21APG1C3L	Geomorphology and Structural Geology	30	70	100	4	-	-	4	3
	DSC4	21APG1C4L	Stratigraphy and Palaeontology	30	70	100	4	-	-	4	3
	SEC1	21APG1S1LP	Field Geology and Cartography	20	30	50	1	-	2	2	2
	DSCP	21APG1C1P	Mineralogy Lab	20	30	50	-	-	4	2	4
	DSCP	21APG1C2P	Geoinformatics Lab	20	30	50	-	-	4	2	4
	DSCP	21APG1C3P	Geomorphology and Structural Geology Lab	20	30	50	-	-	4	2	4
Total Marks for I Semester						**600**				**24**	

M.Sc. II-SEMESTER

Semester	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	SEE	Total	L	T	P		
SECOND	DSC5	21APG2C5L	Igneous Petrology	30	70	100	4	-	-	4	3
	DSC6	21APG2C6L	Metamorphic Petrology	30	70	100	4	-	-	4	3
	DSC7	21APG2C7L	Sedimentary Petrology	30	70	100	4	-	-	4	3
	DSC8	21APG2C8L	Applied Ore Geology	30	70	100	4	-	-	4	3
	SEC2	21APG2S2LP	Digital Image Processing	20	30	50	1	-	2	2	2
	DSCP	21APG2C4P	Igneous and Metamorphic Petrology Lab	20	30	50	-	-	4	2	4
	DSCP	21APG2C5P	Sedimentary Petrology Lab	20	30	50	-	-	4	2	4
	DSCP	21APG2C6P	Applied Ore Geology Lab	20	30	50	-	-	4	2	4
Total Marks for II Semester						**600**				**24**	

M.Sc. III-SEMESTER

Semester	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	SEE	Total	L	T	P		
THIRD	DSC9	21APG3C9L	Exploration Geology	30	70	100	4	-	-	4	3
	DSC10	21APG3C10L	Hydrogeology	30	70	100	4	-	-	4	3
	DSE1	21APG3E1AL	A. Indian Mineral Deposits	30	70	100	4	-	-	4	3
		21APG3E1BL	B. Experimental Mineralogy and Petrology								
		21APG3E1CL	C. Marine Geology								
	DSE2	21APG3E2AL	A. Ore Dressing Technology	30	70	100	4	-	-	4	3
		21APG3E2BL	B. Watershed Management								
		21APG3E2CL	C. Energy Resources								
	GEC1	21APG3G1AL	A. Study of Geoscience	20	30	50	2	-	-	2	2
		21APG3G1BL	B. Geoinformatics								
		21APG3G1CL	C. Study of Minerals and Rocks								
	SEC3	21APG3S3LP	Research Methodology	20	30	50	1	-	2	2	2
	DSCP	21APG3C7P	Exploration Geology Lab	20	30	50	-	-	4	2	4
	DSCP	21APG3C8P	Hydrogeology Lab	20	30	50	-	-	4	2	4
Total Marks for III Semester						**600**				**24**	

M.Sc. IV-SEMESTER

Semester	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	SEE	Total	L	T	P		
FOURTH	DSC11	21APG4C11L	Advanced Geoinformatics	30	70	100	4	-	-	4	3
	DSC12	21APG4C12L	Petroleum Geology	30	70	100	4	-	-	4	3
	DSE3	21APG4E3AL	A. Mining Geology	30	70	100	4	-	-	4	3
		21APG4E3BL	B. Engineering Geology								
		21APG4E3CL	C. Oil Exploration and Production								
	DSE4	21APG4E4AL	A. Mineral Evaluation and Management	30	70	100	4	-	-	4	3
		21APG4E4BL	B. Groundwater Exploration								
		21APG4E4CL	C. Industrial Geology								
	GEC2	21APG4G2AL	A. Water Resource Management	20	30	50	2	-	-	2	2
		21APG4G2BL	B. Remote Sensing and GIS for all								
		21APG4G2CL	C. Mining and Society								
	DSCP	21APG4C9P	Advanced Geoinformatics Lab	20	30	50	-	-	4	2	4
	Project	21APG4C1R	Research Project work	30	70	100	-	-	8	4	4
Total Marks for IV Semester						**600**				**24**	

(I-IV semester)- Total Marks: 2400 Total credits: 96

DSC – Department Specific Core, DSE – Discipline Specific Elective, SEC – Skill Enhancement Course, GEC – Generic Elective Course, IA – Internal Assessment, SEE – Semester End Examination, L – Lecture, T – Tutorial, P – Practical.

M.Sc. Applied Geology First Semester

Course: Mineralogy	**Course Code:** 21APG1C1L
Teaching Hours/Week (L-T-P): 4 - 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. To Understand Crystal Symmetry and Atomic structure.
2. To learn about the optical properties of the minerals and its characteristics Features.
3. To describe in detail about the various mineral groups and its properties.
4. To understand the nature of geological framework with time and space and to review the potentiality of economic resources for exploration.

Unit 1: Elements of Crystallography: **10 Hrs**

Introduction: Definition of mineral. References on crystallography and mineralogy, Concept of crystal, translational symmetry, Point symmetry, 32 point groups, crystal faces, crystallographic directions, zones, crystal forms, forms in six crystal systems, crystal habit.

Unit 2: Advanced Mineralogy: **10 Hrs**

The Atomic Structure of Minerals. Rock-Forming Minerals. Physical properties of minerals: Density & specific gravity, mechanical cohesion, colour and lustre, magnetism, electrical properties. Mineral Preparation for Microscopic study; Types of Preparation, Materials for Thin Section, The Mineral Slice and Cutting.

Unit 3: Mineral Groups: **12 Hrs**

Silicates: crystal structure and classification of silicates, Crystallization occurrence of Minerals in igneous, metamorphic and sedimentary rocks. Ortho silicates, Ring & Di silicates, Chain silicates, Sheet silicates and Framework silicates, Carbonates, Sulfates, Phosphates, Oxides, Hydroxides, Halides and Native elements. Mineral Groups: Chemical, Physical, Optical Properties of minerals.

Unit 4: Optical Mineralogy: **10 Hrs**

Polarizing Microscope; General Features, Parts of Microscope, Phase Microscopy and its Examination. Adjustment of Polarizing Microscope. Plane polarized and cross polarized light; Isotropic and Anisotropic minerals; Behavior of minerals in cross polarized light-Birefringence – Uniaxial minerals – Uniaxial and Biaxial Indicatrices; Optical accessories like mica, gypsum and quartz plates – Determination of Optic sign: uniaxial and biaxial minerals-Absorption of light by minerals – Scheme of pleochroism

Unit 5: Mineralogical investigations methods **10 Hrs**

X- ray diffraction- Electron Probe Micro Analysis (EPMA), Scanning Electron Microscope (SEM), Mossbauer Spectroscopy, Thermal Analysis, Gas source Mass spectrometry, Back scattered electron detectors. IR spectroscopic method and Raman Spectroscopy

Reference Books:

1. Dana, (1991) Textbook of Mineralogy, Fourth Edition, William E. Ford Edward Salisbury
2. Berry Mason, L.G, (1985), Elements of Mineralogy, Reprint, W.H. Freeman &Co.
3. Paul F. Kerr (1959), Optical Mineralogy- Third Edition. McGraw-hill book company.
4. Frye Keith (May 1974): Modern Mineralogy. Prentice Hall; First Edition edition
5. Perkins, (2010) Dexter Mineralogy,3rd Edition, Prentice Hall.
6. Ravell Phillips, W.M. & Dana. T. Griffen, (2004), Optical Mineralogy-The Non-Opaque Minerals, CBS publishers & Distributors.
7. Winchell. Elements of Optical Mineralogy part I and II. John Wiley and Sons (1956)
8. W. H. Blackburn and W. H. Dennen.Principles of mineralogy. Dubuque, IA: Wm. C. Brown Publishers. 1993)
9. William D Nesse. Introduction to Optical Mineralogy. Oxford University Press, USA; 3 edition (August 21, 2003)
10. Rutley - Mineralogy. Springer; 27th edition (November 30, 1988).

Course Outcomes:

On completion of course, the students should be able to

1. Discuss about the Description Mineralogical investigations methods.
2. Demonstrate the Optical Mineralogy.
3. Mineral Preparation for Microscopic study.
4. Explain the Advanced Mineralogy, Descriptive Mineralogy.

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M.Sc. Applied Geology First Semester

Course: Geoinformatics	**Course Code:** 21APG1C2L
Teaching Hours/Week (L-T-P): 4 - 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. To understand the principles and types of remote sensing.
2. To know in detail how Electromagnetic Spectrum is related to the field of remote sensing.
3. To introduce about the satellites and sensors and their characteristic features.
4. To illustrate about the principles and components of RS, GIS and GPS.

Unit 1: Elements of Remote Sensing: 12 Hrs

An Introduction: History and Development of Remote Sensing, Fundamental Principles of Remote Sensing- Stages in Remote Sensing Process. Types of Remote Sensing- Advantages of Remote sensing, Aerial Photographs, Basics, Stereo models, Photo Mosaics and Photo scale. Electro Magnetic Radiation (EMR): EMR Spectrum – EMR Interaction with Atmosphere: Absorption, Scattering & Atmospheric windows.

Unit 2: Satellites and Sensors: 10 Hrs

Platforms- Satellite Orbits: Geostationary, Sun synchronous Satellites - Landsat Series, SPOT Series, Indian Remote Sensing Satellites, Quick bird Satellite, World View, Geo Eye, ASTER, MODIS, NOAA.

Unit 3: Resolutions and Scanning 10 Hrs

Resolution: Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal Resolution, Multispectral Resolution. Scanning Mechanisms: Across Track Scanning, Along Track Scanning.

Unit 4: Geographical Information System (GIS): 10 Hrs

Introduction to GIS. Type of data – spatial and non spatial data – data structure – vector and raster formats – hardware for GIS — scanner – digitizer – standard GIS packages - database concepts – data input – retrieval – Assigning rank and weightage for geologic studies, overlay analysis

Unit 5: Global Positioning System (GPS): 10 Hrs

Introduction – Satellite, Control and User Segments – Signal Components, Errors in GPS observations, PS positioning, Differential GPS. GPS Mapping: Conventional Static, Kinematic GPS Semi kinematic (Stop & Go) – Rapid static Mobile mapping

Reference Books:

1. D.R.Lueder. Aerial photographic interpretation, Principles and applications. McGraw-Hill New York. (1959)
2. Anji Reddy, M. (2012) Textbook of Remote Sensing & GIS, BS Publications,Hyderabad
3. Photogeology - Miller, J.C.
4. Manual of colour aerial photography -Ed. Smith, J.T.Jr. American society of photogrammetry. 1968
5. Manual of photogrammetry - Ed: MorrieM.Thompson.
6. Manual of Remote sensing - Ed: Robert G Reeves.

7. Theory of pattern recognition and modern forecasting - V.Karpin and Wright Pattern.
8. Remote sensing in Geology - Parry S. Siegal& Alan. R.Gillespie
9. Manual of photographic interpretation - Ed: Colwell, R.N.
10. Thomas M Lillesand, R W Kieffer, J W Chipmas. Remote sensing and image interpretation. John Wiley & Sons, 2009

Course Outcomes: On completion of course, the students should be able to

1. Describe the basic principles of Remote Sensing
2. Categorize insight into different kinds of sensors, systems and satellite platforms
3. Formulate the relationship between electromagnetic radiation, geo objects and the generation of geo metadata information
4. Predict the basic principles of GIS and GPS.

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M.Sc. Applied Geology First Semester

Course: Geomorphology and Structural Geology	**Course Code:** 21APG1C3L
Teaching Hours/Week (L-T-P): 4- 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. To understand the natural processes which act on the earth' s surface and the landforms.
2. To Build knowledge about the landforms formed due to tectonic activity.
3. To Demonstrate about the Coastal geomorphic features and its associated landforms.
4. To introduce students about the basic principles, methods and characteristics of Structural geology, concepts of Stress and strain, deformation, types of folds, faults, joints

Unit 1: Geomorphology-1: 10 Hrs

Geomorphic Processes; Exogenetic and Endogenic processes. Weathering; Physical weatheiring, Chemical Weathering, Biological Weathering. Soil Processes; Soil Profile, Climate and Soil Formation, Soil Types. Mass Wasting; Soil Creep and Solifluction, Earth and Mud Flows and Slides. Karst Topography, Tectonic Geomorphology, Fluvial Geomorphology and Depositional Landforms, Drainage Systems.

Unit 2: Geomorphology-2: 10 Hrs

Shorelines; Classification of Coast and shoreline; Johnson's Classification of shorelines, Shepard's Classification of coast, Davies Classification. Shoreline Erosional Features, Transportation by Sea, Deposition by Sea. Features of Ocean basin floor (Mid Ocean Ridge, Deep Ocean Trenches, Abyssal Plains, Sea Mounts). Coral Reefs. Aeolian Geomorphology; Wind Erosion, Erosional Features, Wind Transport, Wind Deposits

Unit 3: Geomorphology-3: 10 Hrs

Types of Sand Dunes. Loess. Types of Eruption, Features of Lava fields, Features Associated with Volcanoes; Ash Showers, Volcanic Mudflows or Lahars, Plug Domes. Depression Forms; Craters, Calderas, Volcanic Tectonic Depression. Volcanic Plateaus and Plains. Glacial Geomorphology: Types of Glaciers, Movement of Glaciers, Glacial Erosion, Transport by Glaciers, Glacial Deposits. Geomorphology of India; Peninsular, Extra Peninsular, Indo Gangatic Plain

Unit 4: Structural Geology: 11 Hrs

Objectives of Structural Geology – Deformation Mechanisms: Mechanical Properties of rocks - Concepts and types of Stress and Strain. Introduction, Slaty cleave or schistosity, Fracture cleavage, Shear cleavage, Slip cleavage, Bedding cleavage, Axial plane cleavage. Foliation: Primary and secondary foliation. Lineation: Definition and kinds of lineation: Slickenside, Boudinage, Quartz rods, Mullion structure. Folds: Mechanism of Folding: Introduction – Types of folding- Causes of folding: Tectonic process - Non-tectonic process. Depressions and Culminations - Domes and Saddles - Profile of a Fold – Recognition of Folds in the field and map, Fault: Mechanism of faults. Joints: Mechanism of Joints.

Unit 5: Unconformity: 11 Hrs

Introduction - Kinds of Unconformities - Recognition of Unconformities - Distinguishing Faults from Unconformities – Radiogenic dating - Tectonism and sedimentation. Diapirs and Salt Domes – Recognition of Unconformity in the field and map. Lineament: Mapping and Analysis - Basin Tectonics - Microstructures and Structures of Sedimentation and Intrusion- Structural analyses - Principle and elements of Structural Analyses - Geometrical Analyses of

simple and complex structure on mesoscopic and macroscopic scale. Geotectonics: Tectonic features of the Earth - Continental drift – Sea floor spreading - Plate Tectonics –Elements of Tectonism - Characteristics of Plates - World Plates - Plate Boundaries - Assumptions and Problems - causes and mechanism - Convection – Plate Tectonics

Reference Books:

1. Physical Geology. Carla. W Montgomery, Wm C. Brown Publishers, 1990
2. A Text Book of Geomorphology.Dayal.P, Rajesh Publication, New Delhi 2007
3. Principles of Geomorphology, W.D ThornburryWiley, 1969
4. Geomorphology. Charley, R.J., Suhumm, S.A &Sugden, D.E, Routledge, 1985
5. Earth: An Introduction to Physical Geology (10th Edition), Tarbuck, E.J., Lutgens,F.K& Dennis Tasa. Prentice Hall, 2010
6. Billings, M.P. Structural Geology. Prentice-Hall; 3Rev e. edition (April 1972)
7. Lahee. Field Geology. RareBooksClub.com (May 19, 2012)
8. Ramsay,J.G. Folding and fracturing of rocks. The Blackburn Press (February 2004)
9. Whitten,E.H.T. Structural Geology of folded rocks. Chicago, Rand Mcnally. 1966)
10. Badgley,P.C. Structural methods for the exploration geologist. Harper; First Edition edition (1959)
11. Martin Bott, H.P. The interior of the Earth. Edward Arnold (1971)
12. Manual of Field Geology- Robert R Compton. ohn Wiley & Sons, Inc. (1962)

Course Outcomes: On completion of course, the students should be able to

1. Describe the Fundamental concepts of Geomorphology, Weathering, Soil processes and Karst Topography
2. Discuss the geological structures formed by the Tectonic activities and the geological work done by a river and the various drainage systems
3. Predict the various forces acting in the earths and its resultant structural changes. The Geometry, Types and Mechanism of Folding, Faulting, Joints
4. Assess the theory of plate tectonics and describe how the outer part of the earth is broken into large fragments (plates) that are constantly in motion relative to each other.

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M.Sc. Applied Geology First Semester

Course: Stratigraphy and Palaeontology	**Course Code:** 21APG1C4L
Teaching Hours/Week (L-T-P): 4- 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. To introduce the students about the basic principles of stratigraphy, its classification, Geologic timescale and various types of correlation.
2. To learn about the origin and significance Indian Stratigraphy.
3. To know the past life and history the study of the Earth through remains of animals and plants entombed within the rocks.
4. To study in detail about the paleobotany and microfossils.

Unit 1: Geological Time Scale: 10 Hrs

Geological Time Scale and Indian Time Scale, Paleogeography and life of each period. Correlation: Physical and paleontological correlation method – Homotaxic, Contemporaneity and Syntaxis, Lateral variation and facies– code of stratigraphic nomenclature. Stratotypes and its requirements. Geological Succession, Structure, Tectonics and Economic Importance

Unit 2: Elements of Stratigraphy: 10 Hrs

Principles and Classification of Stratigraphy– Litho-, Bio-, chrono-, Magneto stratigraphy and their Applications– Elements of – Cyclostratigraphy, Allo-, Pedo-, Chemo- and Seismic Stratigraphy. Basic ideas of Sequence stratigraphy and Quaternary Stratigraphy. Bouma sequence. Stratigraphy Succession, Structure, Tectonics and Economic Importance

Unit 3: Indian Stratigraphy: 11 Hrs

Stratigraphic Distribution of the following; – Archaean system –Cuddapah system –Kurnool system – Vindhyan system – Aravalli system of India, Dharwar system– Sargur Supergroup, Sakoli Group – Sausar Group – Iron ore Group of Karnataka, Bihar and Orissa – Bundelkhand Group – Banded Gneiss complex, The Paleozoic Group. Deccan Traps: Distribution - Classification - Structure - Geological Succession – Inter- Trappean and Infra-Trappean beds- Bagh Beds, – Origin- Economic importance - Lameta beds - Age and Economic importance.

Unit 4: Palaeontology: 10 Hrs

Brief out line of Geological time scale and Life through Ages - Fossils and Their Modes of Preservation - Origin and Evolution of life – Recent Theories - Species concepts – Phylogeny- Antogeny – Palingenesis - Invertebrate Paleontology: Morphology, Evolutionary Trends, Stratigraphic importance and application of: Trilobites - Graptolites – Corals – Brachiopods - Cephalopods.

Unit 5: Vertebrate Palaeontology: 11 Hrs

Classification of Vertebrates – Study of evolution of Horse - Elephant and Man - Extinction of Dinosaurs. Palaeobotany: Methods of preservation of fossil plants - Objective and limitation of fossil Plants – Classification. Micropaleontology: Definition and Applications of Micropaleontology – Field and laboratory techniques of micropaleontology - Types of Microfossils - Foraminifers and Ostracods – General Morphological Characters - Classification.

Reference Books:

1. Krishnan, M.S. (2009), Geology of India and Burma, 6th Edition, CBS Publishers and distributors.
2. Parbin SINGH. (1978), Engineering & general geology, fourth edition
3. Wadia, (1893) Geology of India, McGraw Hill Book Co.
4. Boggs,S (1987). Principles of Sedimentology and Stratigraphy, Merill Publishing Co. New York.
5. Ravindra Kumar, (2010) Fundamentals of Historical Geology and Stratigraphy of India, New Age International (p) Ltd.
6. Weller. A.K. (1988) Principles of Stratigraphy. Asia Publishing House. Delhi.
7. Gignoux, M (1960) Stratigraphical Geology, Mc Graw hill publications.
8. Henry Woods, (2005) Paleontology Invertebrate, The University Press
9. David M. Raupsteven, M., Stanley, Principles of Paleontology, New Delhi, 2004
10. Jain, P.C and Anantharaman, M.S., Paleontology: Evolution and Animal Distribution, 6th Edition, Vishal Publishing Co, New Delhi, 2005
11. Moore, R.C, Lalicker, C.G & Fisher, A.G., Invertebrate Fossils, 1st Indian Edition, CBS Publishers & Distributors, New Delhi, 1997
12. Raup And Stanely, Principles of Paleontology, CBS, 2004
13. Shrock & Twenhofel, Principles of Invertebrate Paleontology, CBS Publishers & Distributors, New Delhi, 2005

Course Outcomes: On completion of course, the students should be able to

1. Evaluate the principles of advanced Stratigraphy, and details of Geological Time
2. scale
3. Identify Indian stratigraphic systems of Archean, Dharwar, Cuddapah, Kurnool, Vindhyan and Aravalli systems, The Paleozoic Group, The Tertiary Groups
4. Plan ways to systematic study of ancient forms of the life (fossils) and to Evolutionary Principles, and Paleontological Techniques
5. Outline of vertebrate palaeontology and micropaleontology.

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M.Sc. Applied Geology First Semester

Course: Field Geology and Cartography	**Course Code:** 21APG1S1LP
Teaching Hours/Week (L-T-P): 1- 1 - 0	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Objectives:

1. To Understand Field techniques.
2. To learn about the identification of rocks and minerals
3. To understand the various types of geological maps.

Unit 1: Introduction: **08 Hrs**

Introduction of geological fields, types of geological maps, field softwares, GPS way points, Types of Scales, geological field equipments, readings of toposheets, line department maps, thematic maps, and field safety and measurements, field recordings, field notebook and documentation.

Unit 2: Field Geology: **10 Hrs**

Understanding of the compass and clinometers. Topographic maps, field observations at different scales, basic field procedures, specimens and samples, fossils and biogenic structures, recording features of sedimentary rocks and constructing graphic logs, recording features of igneous rocks, recording structural information, recording features of metamorphic rocks, making a geological mapping, recording numerical data and use of instruments in the field, photography, mineral investigation and identification

Unit 3: Cartography: **08 Hrs**

Principles of cartography, Understanding the cartography, Cartography software's, free downloading of various cartography maps, important of maps, uses of maps, preparation of layout maps, legend, scale, arrow, title, grids etc.

Reference Books:

1. Lahee. Field Geology, CBS Publishers, 1987
2. SM Mathur, Guide to Field Geology, PHI Learning Pvt. Limited, New Delhi-110092, Revised Edition 2010
3. Angela. L. Coe, Geological Field Techniques, Wiley-Blackwell publishing Ltd., UK, 2010

Course Outcomes: On completion of course, the students should be able to

1. Discuss about the description of rocks and mineral investigations techniques.
2. Demonstrate the field equipments.
3. Explore the types of maps and cartography information.

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M.Sc. Applied Geology First Semester

Course: Mineralogy Lab	**Course Code:** 21APG1C1P
Teaching Hours/Week (L-T-P): 0 - 0 - 4	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Objectives:

1. To examine the megascopic properties of rock forming Minerals.
2. To Determine the optical properties of minerals
3. To discriminate the structural formulae for various mineral groups.
4. To identify the various crystal models

List of Experiments

1. Study of rock- forming minerals in hand specimen
2. Optical properties of uniaxial and biaxial minerals- pleochrism, extinction, interference colours and optical angle
3. Study of rock- forming minerals in thin sections
4. Calculation of structural formula for important rock forming mineral groups
5. Determination of anorthite content and twin law in plagioclase feldspars
6. Stereographic projections – axial ratios – Napier's theorem and problems

Course Outcomes: On completion of course, the students should be able to

1. Discuss Students will have good training on identification of rock forming minerals and economic ores.
2. Identify the physical properties of industrial minerals.
3. Analyze the Ore minerals quantitatively.

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M.Sc. Applied Geology First Semester

Course: Geoinformatics Lab	**Course Code:** 21APG1C2P
Teaching Hours/Week (L-T-P): 0- 0 - 4	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Learning Objectives:

1. To understand on various Open source GIS Softwares.
2. To skilled on georeference of various digital image maps and toposheet
3. To training of 2D data extraction from parcel maps, toposheets etc.
4. To train as a expert of creating maps in GIS software

List of Experiments

1. Introduction GIS software
2. Familiarization with GIS Software
3. Geo Referencing and Projections
4. Digitization of Map/ Toposheet
5. Creation of Thematic Maps
6. Base Map Preparation
7. Data Conversion – Vector to Raster, Raster to Vector
8. Adding Attribute Data – Querying On Attribute Data
9. Map Composition
10. Preparation of final output map and settings in the plotter

Course Outcomes: On completion of course, the students should be able to

1. Hands on training of georeferenceing the maps, digitization of maps using GIS software.
2. Trained on various GIS tools.
3. Expert on prepare the maps using GIS tools.

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M.Sc. Applied Geology First Semester

Course: Geomorphology and Structural Geology Lab	**Course Code:** 21APG1C3P
Teaching Hours/Week (L-T-P): 0- 0 - 4	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Objectives:

1. Practical training to the students on various geological kits.
2. To identification of topographical and structural features
3. To training of geological mapping techniques.
4. Aanalytical and interpretational skills with better understanding to the students on various structural elements and geological maps

List of Experiments

1. Identification and interpretation of geomorphology and structural elements in maps.
2. Preparation of drainage network maps, geological maps and section maps
3. Exercises on preparation of contours for different land forms
4. Determination of strike, true dip and apparent dip
5. Measurement of thickness and width of outcrops
6. Interpretation of three point problems, drawing of profiles
7. Exercises on construction of geological cross-sections, stratum contours, isopach maps
8. Study of geological map of Karnataka and India
9. Interpreting underground structure from borehole data
10. Recording and plotting of field data

Course Outcomes: On completion of course, the students should be able to

1. Hands on training to use of various geological kits and toposheet readings.
2. Trained on professional aspects of geological mapping.
3. Expert on prepare the field structural maps.

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