

## Semester Lecture Plan

|                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                    |  |                                           |                                          |                             |                           |                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--|-------------------------------------------|------------------------------------------|-----------------------------|---------------------------|----------------------------|
| <b>Name of the college: Government College of Arts, Science &amp; Commerce, Sanquelim-Goa</b>                                                                                                                                                                                                                                                                                                                                           |                                                    |  |                                           |                                          |                             |                           |                            |
| <b>Name of Faculty: DATTARAJ JAWDEKAR</b>                                                                                                                                                                                                                                                                                                                                                                                               |                                                    |  |                                           | <b>Subject: Geology</b>                  |                             |                           |                            |
| <b>Paper code: GEO 301</b>                                                                                                                                                                                                                                                                                                                                                                                                              |                                                    |  | <b>Program/Course: Structural Geology</b> |                                          |                             | <b>Division:</b>          |                            |
| <b>Academic year: 2026 – 2027</b>                                                                                                                                                                                                                                                                                                                                                                                                       |                                                    |  | <b>Semester: V</b>                        |                                          |                             | <b>Total Lectures: 45</b> |                            |
| <p><b>The objectives of this course are to:</b></p> <ol style="list-style-type: none"> <li>1. The objectives of this course are to:</li> <li>2. Illustrate the concept of stress, strain and rock deformation. CL2</li> <li>3. Classify folds, faults, lineations, joints and unconformities. CL2</li> <li>4. Infer structures from geological data. CL2</li> </ol>                                                                     |                                                    |  |                                           |                                          |                             |                           |                            |
| <p><b>At the end of the course the student will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Identify the kinds of folds, faults, lineations, foliations, joints and unconformities. CL3</li> <li>2. Interpret the geological history based on shear sense indicators. CL3</li> <li>3. Draw and describe geological maps. CL2</li> <li>4. Compare and Contrast between Ductile and Brittle deformation. CL3</li> </ol> |                                                    |  |                                           |                                          |                             |                           |                            |
| <b>Month</b>                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Lectures<br/>From:                      To:</b> |  | <b>No. of lectures<br/>allotted</b>       | <b>Topic, Subtopic<br/>to be covered</b> | <b>Learning<br/>outcome</b> | <b>ICT Tools</b>          | <b>Reference<br/>books</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                    |  |                                           |                                          |                             |                           |                            |

| MONTH | LECTURE    |            | No. of lectures allotted | Topic, Subtopic to be covered                                                                                                                                                                     | Learning outcome | ICT Tools       | Reference books                     |
|-------|------------|------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|-------------------------------------|
|       | FROM       | TO         |                          |                                                                                                                                                                                                   |                  |                 |                                     |
| JUNE  | 19/06/2026 | 20/06/2026 | 0                        |                                                                                                                                                                                                   |                  |                 |                                     |
|       | 22/06/2026 | 27/06/2026 | 3                        | Introduction, Non-Tectonic and Tectonic structures. Force: Definition, Units, Balanced vs unbalanced Force, Composition and Resolution of forces.                                                 | 1,3              | Chalk and Board | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
| JUNE  | 29/06/2026 | 30/06/2026 | 1                        | Stress: Definition, Stress on a plane (2D), stress at a point (3D), Stress Ellipsoid. Concept of rock deformation and Strain (Translation, Rotation, strain and volume change). Strain Ellipsoid. | 1,3              | Chalk and Board | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
| JULY  | 01/07/2026 | 04/07/2026 | 2                        | Mechanical behavior of rocks and the factors that control mechanical behavior in rocks.                                                                                                           | 1,3              | Chalk and Board | STRUCTURAL GEOLOGY BY M.P. BILLINGS |

|                 |            |            |   |                                                                                                                                                                                                                                          |     |                       |                                     |
|-----------------|------------|------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------|-------------------------------------|
|                 | 6/07/2026  | 11/07/2026 | 3 | STRAIN AND STRESS ELLIPSOID                                                                                                                                                                                                              | 1   | Chalk and Board       | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|                 | 13/07/2026 | 18/07/2026 | 3 | Folds: Nomenclature and geometry of simple folds. Genetic classification of folds: Fold mechanics: Active vs passive), types of folding: Bending, buckling, flexure slip folding, neutral surface folding, shear folding, flow folding). | 2,3 | Chalk and Board       | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|                 | 20/07/2026 | 25/07/2026 | 3 | Folds: Nomenclature and geometry of simple folds. Genetic classification of folds: Fold mechanics: Active vs passive), types of folding: Bending, buckling, flexure slip folding, neutral surface folding, shear folding, flow folding). | 2,3 | Chalk and Board       | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
| JULY/<br>AUGUST | 27/07/2026 | 31/07/2026 | 3 | Kinds of folds: Antiform,                                                                                                                                                                                                                | 2,3 | Chalk and Board, Demo | STRUCTURAL GEOLOGY BY M.P. BILLINGS |

|  |            |            |   |                                                                                                                                                                                                                                   |     |                       |                                     |
|--|------------|------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------|-------------------------------------|
|  |            |            |   | synform, isoclinal, recumbent, chevron, box, kink, open, close, similar, parallel and homocline. Anticline and Syncline. Determination of top of the beds. Drag folds                                                             |     |                       |                                     |
|  | 03/08/2026 | 08/08/2026 | 3 | Kinds of folds: Antiform, synform, isoclinal, recumbent, chevron, box, kink, open, close, similar, parallel and homocline. Anticline and Syncline. Determination of top of the beds. Drag folds                                   | 2,3 | Chalk and Board, Demo | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|  | 10/08/2026 | 15/08/2026 | 3 | Foliation: Tectonites, Types Secondary Foliations Rock cleavage, fracture cleavage, shear cleavage, slip cleavage. Mechanism of development of foliation in rocks. Relationship of cleavage and schistosity with major structure. | 2,3 | Chalk and Board, Demo | STRUCTURAL GEOLOGY BY M.P. BILLINGS |

|           |            |            |   |                                                                                                                                                                                                                                   |     |                                  |                                     |
|-----------|------------|------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------|-------------------------------------|
|           | 17/08/2026 | 22/08/2026 | 3 | Foliation: Tectonites, Types Secondary Foliations Rock cleavage, fracture cleavage, shear cleavage, slip cleavage. Mechanism of development of foliation in rocks. Relationship of cleavage and schistosity with major structure. | 2,3 | Chalk and Board, Demo            | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|           | 24/08/2026 | 28/08/2026 | 3 | Foliation: Tectonites, Types Secondary Foliations Rock cleavage, fracture cleavage, shear cleavage, slip cleavage. Mechanism of development of foliation in rocks. Relationship of cleavage and schistosity with major structure. | 2,3 | Chalk and Board, Demo            | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|           |            |            |   |                                                                                                                                                                                                                                   |     |                                  |                                     |
| SEPTEMBER | 31/08/2026 | 5/9/2026   | 3 | Foliation: Tectonites, Types Secondary Foliations Rock cleavage,                                                                                                                                                                  | 2,3 | Chalk and Board, Demo, Fieldwork | STRUCTURAL GEOLOGY BY M.P. BILLINGS |

|  |            |            |   |                                                                                                                                                                                                                                      |     |                                          |                                     |
|--|------------|------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------------------|-------------------------------------|
|  |            |            |   | fracture cleavage, shear cleavage, slip cleavage. Mechanism of development of foliation in rocks. Relationship of cleavage and schistosity with major structure.                                                                     |     |                                          |                                     |
|  | 07/09/2026 | 12/09/2026 | 3 | Joints: Terminology of joints: Systematic, Nonsystematic joints, Joint set, system, tensional and shear fractures. Development of Tensional and Shear fractures under different stress conditions. Genetic classification of joints. | 2,3 | Chalk and Board, Demo, Fieldwork, Videos | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|  | 21/09/2026 | 26/09/2026 | 3 | Joints: Terminology of joints: Systematic, Nonsystematic joints, Joint set, system, tensional and shear fractures. Development of Tensional and Shear fractures under                                                                | 2,3 | Chalk and Board, Demo                    | STRUCTURAL GEOLOGY BY M.P. BILLINGS |

|         |            |            |   |                                                                                                                                                                                                 |     |                       |                                     |
|---------|------------|------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------|-------------------------------------|
|         |            |            |   | different stress conditions.<br>Genetic classification of joints.                                                                                                                               |     |                       |                                     |
|         | 28/09/2026 | 30/09/2026 | 3 | Faults: Terminology and anatomy of Faults, Recognition of Faults, Brittle and Ductile faults. Shear sense indicators.<br>Genetic classification of faults: Anderson's classification of faults. | 2,3 | Chalk and Board, Demo | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
| OCTOBER | 01/10/2026 | 03/10/2026 | 3 | Faults: Terminology and anatomy of Faults, Recognition of Faults, Brittle and Ductile faults. Shear sense indicators.<br>Genetic classification of faults: Anderson's classification of faults. | 2,3 | Chalk and Board, Demo | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|         | 05/10/2026 | 10/10/2026 | 3 | Unconformities: Recognition of unconformities and distinction of faults from Unconformities in the field.                                                                                       | 2,3 | Chalk and Board, Demo | STRUCTURAL GEOLOGY BY M.P. BILLINGS |

|  |            |            |   |  |        |                       |                                     |
|--|------------|------------|---|--|--------|-----------------------|-------------------------------------|
|  | 12/10/2026 | 14/10/2026 | 3 |  | 1, 2,3 | Chalk and Board, Demo | STRUCTURAL GEOLOGY BY M.P. BILLINGS |
|  |            |            |   |  |        |                       |                                     |

**\* Assessment Rubrics**

| Component         | Max Marks |
|-------------------|-----------|
| ISA 1             | 10        |
| ISA 2             | 10        |
| Practical         | -         |
| Project           | -         |
| Semester End Exam | 80        |