Course objective:

Tensor analysis contains tools and definitions used within modelling of continuous media, field equations in physics, electromagnetism, elasticity theory and theory of general relativity.

PROGRAMME OUTCOME – PG

After completion of the programme, the student will be able to

PO1 : Students acquire sound analytical and practical knowledge to formulate and solve challenging problems.

PO2 : Students will be able to read and identify mathematical and computational methods in order to solve comprehensive problems.

PO3 : Students are well prepared to take jobs in schools and colleges as Mathematic Teachers and Professors, Software Industries, Research and Development Organizations.

PO4 : Students to pursue higher studies in Mathematical and Computing Sciences and to clear Competitive exams like SET/ NET/ TET etc.

PO5 : Students to learn and apply Mathematics in real life situations aiming at service to the society.

PROGRAMME SPECIFIC OUTCOME

The students at the time of graduation will

PSO1 : Provide Strong foundation and inculcate ample knowledge on topics in pure and applied mathematics, empowering the students to pursue higher degrees at reputed academic institutions.

PSO2 : Advanced mathematical topics provide opportunities to research students for communication and discussion.

PSO3 : Demonstrate the highest standard of ethics in research.

PSO4 : Provide scope for interaction with international researchers and developing collaborations.

PSO5 : Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.

PSO6 : Nurture problem solving skills, thinking, creativity through assignments, project work.
Upon the successful completion of the course, students will be able to

<table>
<thead>
<tr>
<th>CO Number</th>
<th>CO Statement</th>
<th>Knowledge Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understand concept of tensor variables and difference from scalar or vector</td>
<td>K2</td>
</tr>
<tr>
<td></td>
<td>variables.</td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>Derive base vectors, metric tensors and strain tensors in an arbitrary</td>
<td>K3</td>
</tr>
<tr>
<td></td>
<td>coordinate system.</td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>Investigate the Christoffel symbols which provide a concrete representation</td>
<td>K4</td>
</tr>
<tr>
<td></td>
<td>of the connection of (pseudo-)Riemannian geometry in terms of coordinates on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the manifold.</td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>Apply Riemann-Christoffel tensor to problems of differential geometry,</td>
<td>K5</td>
</tr>
<tr>
<td></td>
<td>electrodynamics and relativity.</td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>Interpret tensor representation from interdisciplinary areas.</td>
<td>K6</td>
</tr>
</tbody>
</table>

**Unit 1**

Introducing Tensors, Scalars or Vectors, Vector Division, Moment of inertia.

**Unit 2**

Redefining scalars and vectors, Cartesian Tensors, Scalars, Tensors, Summation Convention.

**Unit 3**

Quotient Rule, Non-Cartesian Tensors, Metric Tensors, Spherical Polar Co-ordinate System, Cylindrical coordinate system.

**Unit 4**

Algebraic Operation of Tensors, Definition of Contravariant and Co variant vector, Co variant vector, Addition & Subtraction of Tensors, Symmetric and Anti Symmetric Tensors, Contraction, Outer Product or Direct Product.

**Unit 5**

Pseudo Scalars and Pseudo Vectors and Pseudo Tensors, Pseudo Vectors, Pseudo scalars, General Definition, Pseudo Tensor

**Text Book:**

Tensor Calculus by A. A. Shaikh, U.C. De, J. Sengupta

**Evaluation Pattern:**

- **Internal Assessment:**
  - Midterm exam: $1 \times 30 = 30$
  - Quizzes, assignments, etc: $= 20$
  - $= 50$

- **End-semester Examination:** $= 50$

- **Total:** $= 100$