## DIFFERENTIAL GEOMETRY

| Semester | Subject Code | Category | Lecture | | Theory | | Practical | Credits |
|---|---|---|---|---|---|---|---|---|
| II | 21CPMA2D | Core | Hrs/week | Hrs/Sem | Hrs/week | Hrs/Sem | 0 | 5 |
| | | | 6 | 90 | 6 | 90 | | |

**COURSE OBJECTIVES**

The students will be able to

- This course introduces space curves and their intrinsic properties of a surface and geodesics.
- The non – intrinsic properties of surface and the differential geometry of surfaces are explored**.**

**COURSE OUTCOMES:**

On the successful completion of the course, the students will be able to

| CO Number | CO Statement | Knowledge Level (K1-K4) |
|---|---|---|
| **CO1** | Acquire knowledge on the concept of Space Curves | K2 |
| **CO2** | Understand the intrinsic properties of Surfaces | K2 |
| **CO3** | Study the concept of Geodesics and its properties | K3 |
| **CO4** | Understand and discuss the importance of the concepts non intrinsic properties of surface | K4 |
| **CO5** | Analyze the surface theory | K4 |

*Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.*

**MAPPING WITH PROGRAMME OUTCOMES:**

| COS | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|
| **CO1** | S | M | S | M | S | M |
| **CO2** | M | S | M | M | S | M |
| **CO3** | S | S | M | S | M | S |
| **CO4** | M | M | S | S | M | S |
| **CO5** | M | S | S | M | S | S |

S- Strong; M- Medium; L- Low

**UNIT – I - SPACE CURVES** **18 Hours**

Definition of a space curve – Arc length – Tangent – Normal and Binormal – Curvature and torsion – contact between curves and surfaces – Tangent surface – Involutes and evolutes – Intrinsic equations – Fundamental Existence Theorem for Space curves – Helices.

**Chapter 1: Section 1 to 9.**

**UNIT –II - INTRINSIC PROPERTIES OF A SURFACE** **18 Hours**

Definition of a surface – Curves on surface – Surface of revolution – Helicoids – metric – Direction coefficients – Families of curves – Isometric correspondence – Intrinsic properties.

**Chapter 2: sections 1 to 9.**

**UNIT –III – GEODESICS** **18 Hours**

Geodesics – Canonical geodesic equation – Normal property of geodesics – Existence theorem - geodesics parallels – geodesics Curvature-Gauss-Bonnet Theorem- Gaussian curvature –Surface of constant curvature.

**Chapter 2: sections 10 to 18.**

**UNIT –IV - NON INTRINSIC PROPERTIES OF A SURFACE** **18 Hours**

The second fundamental form – Principal curvature – Lines of curvature – Developable – Developable associated with space curves and with curves on surface – Minimal surfaces –Ruled surfaces.

**Chapter 3: sections 1 to 8.**

**UNIT – V - DIFFERENTIAL GEOMETRY OF SURFACES** **18 Hours**

Fundamental equations of surface theory – Fundamental Existence theorem for surfaces – Compact surfaces whose points are umblics – Hilbert's lemma – Compact surface for constant curvature – Complete surfaces.

**Chapter 3: sections 9 and 10.**

**Chapter 4: sections 1 to 5.**

**DISTRIBUTION OF MARKS: THEORY 80% AND PROBLEMS: 20%**

**TEXT BOOKS:**

| S.NO | AUTHORS | TITLE | PUBLISHERS | YEAR OF PUBLICATION |
|---|---|---|---|---|
| 1. | T.J.Wilmore | An Introduction to Differential Geometry | Oxford University Press | 2012 |

**REFERENCE BOOKS:**

| S.NO | AUTHORS | TITLE | PUBLISHERS | YEAR OF PUBLICATION |
|---|---|---|---|---|
| 1. | J.A. Thorpe | Elementary Topics in Differential Geometry | Springer | 1994 |
| 2. | D. Somasundaram | Differential Geometry | Alpha Science International Limited. | 2005 |

**WEB SOURCES:**

1. www.pmp-book.org/download/slides/Differential_Geometry.pdf
2. https://mgarland.org/class/geometry/topics/diffgeom.pdf

**TEACHING METHODOLOGY**

1. Class room Teaching
2. Assignments
3. Seminars
4. Discussions
5 .PPT Presentations

**SYLLABUS DESIGNER:**

1. Mrs.Dr.T.Ranjani, Assistant Professor of Mathematics.