

Department of Liberal Education Era University, Lucknow Course Outline Effective From: 2023-24

| Name of the | B.A. / B.Sc. (LIBERAL EDUCATION) | | | Year/ Semester: | 3 rd / 6 th | | |
|-------------|--|--------------|-------------|---------------------------|-----------------------------------|---------------|--|
| Program | Difference | | | T | TI | | |
| Nomo | Differential | Course M1300 | | i ype: | ineory | | |
| Credits | Geometry | | | Total Sessions Hours | | | |
| Evaluation | Internal | 50 Marks | | Fnd Term Evem. | 50 Morks | | |
| Spread | Continuous | SU IVIALKS | | | 50 Marks | | |
| Spread | Assesment: | | | | | | |
| Type of | - | | | _ | _ | | |
| Course | C Compulsory | Core | | C Creative | O Life Skill | | |
| Course | Differential Geometry uses calculus to study geometry. It is a subject with a number of | | | | | | |
| Objectives | really beautiful results and many applications to pure mathematics, applied mathematics, | | | | | | |
| | and engineering. O | ur course | will focus | on the geometry of curve | es and su | urfaces in 3- | |
| | dimensional Euclid | ean space. | We'll lean | n about such things how | to find | the shortest | |
| | distance between tw | vo points, | how to me | easure curvature, and how | to find | and use the | |
| Course Oute | shoriest pains on a s | urlace. | sful course | completion learners w | ill daval | on following | |
| attributes | omes (CO). Ajter | ine succes | sjui course | completion, learners w | ili ueven | op jouowing | |
| Course | | | | | | | |
| Outcome | | | At | tributes | | | |
| (CO) | | | | | | | |
| CO1 | Students will learn the concept of Covariant, Contravariant and mixed tensor. | | | | | | |
| CO2 | Learn about Vector field, tangent vector and use to generate some base for the real life | | | | | | |
| | application. | | | | | | |
| CO3 | Use calculus with geometry and learn differential functions and surfaces . | | | | | | |
| CO4 | Gaussian curvature, First fundamental form and second fundamental form. | | | | | | |
| Pedagogy | Interactive, discussion-bases, student-centered, presentation. | | | | | | |
| Internal | Mid-term Examination: 20 Marks | | | | | | |
| Evaluation | Activity: 10 Marks | | | | | | |
| Mode | Class test: 05 Marks | | | | | | |
| | Online Test/Objective Test: 05 Marks | | | | | | |
| | Assignments/Presentation: 05 Marks | | | | | | |
| Session | Topic Hours | | | | | Manned | |
| Details | | | ropic | | nours | CO | |
| Unit 1 | Coordinate transf | ormation. | Covaria | nt. Contravariant and | 15 | C01 | |
| | Mixed tensors. Tensors of higher rank. Symmetric and Skew- | | | | | | |
| | symmetric tensors. Tensor algebra. Contraction Inner | | | | | | |
| | product. Riemann | nian metr | ic tensor. | Christoffel symbols. | | | |
| | covariant derivativ | es of tenso | ors. | J · ; | | | |
| | Activity: Assignm | ent based | activity. | | | | |
| Unit 2 | Space curves. Ex | amples. | Differentia | able curves and their | 15 | CO2 | |
| | parametric repres | entations. | Vector f | ields, Tangent vector. | | | |
| | Principal normal. | Binormal | , Curvatu | e and torsion. Serret- | | | |
| | Frenet formula, Covariant differentiation, The structural | | | | | | |

| | | equations. Involutes and Evolutes, Fundamental Theorem for space curves. Activity: Assignment based activity. | | | | | | | | <mark>ı for</mark> | | | | |
|------------------|---------------------|--|--|--|--|---|---|--|---|--|---------|---------|-------|------|
| Unit 3 | | Surfaces, Differentiable functions on surfaces, Differential15CO3forms, Normal vector fields, First fundamental form, Normal curvature, Principal curvatures, Gaussian curvature, Second fundamental form on a surface.15CO3 | | | | | | | | O3 | | | | |
| Unit 4 | | Gaussian equations, Weingarten equation, Codazzi-Mainardi15cquations, Totally umbilical surfaces, Geodesic on surface, Index form of a geodesic. Riemannian manifolds, Riemannian connection, Geodesic in a Riemannian manifold, Riemannian curvature tensor, Submanifolds.15Activity: Assignment based activity.Activity: | | | | | | | | 04 | | | | |
| CO-PO | O and I | PSO Ma | apping | | | | | | | | | | | |
| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 |
| CO1 CO2 | 1 | | | 3 | | 1 | | | 1 | 1 | 2 | 3 | | I |
| CO3 | 1 | | | 1 | | | | | 1 | 1 | | | | 1 |
| CO4 Strong co | 1 1 1 | 1-3. | Avera | ge contril | bution-2. | L | ow contrib | 1 1 | 1 | | | | | |
| Sugge | Suggested Readings: | | | | | | | | | | | | | |
| Text- | Books | s 1. Hicks, N. J., Van, D., Notes on Differential Geometry, Nostrand Company Inc. | | | | | | | | | | | | |
| | | 2. Bai | ret O' | Neill. | (2006) | . Elem | entary] | Differ | ential (| Geome | trv. Ac | ademic | Press | |
| | | 3. A. | Goetz: | Differ | ential | Geome | etry, Sp | ringer | Verlag | <u>y</u> . | 5 | | | |
| Refer | rence | 1. De. | U. C., | Shaik | h. (200 |)7) Di | ifferent | ial Ge | ometry | v of ma | nifolds | s. Narc | osa | |
| Boo | oks | Publishing House Pyt. Ltd. | | | | | | | | | | | | |
| | | 2. Whilmore, T. J., (1993). An Introduction to Differential Geometry. New Delhi: | | | | | | | | lhi: | | | | |
| | | Oxford University Press. | | | | | | | | | | | | |
| | | 3. Mishra, R. S.,(1984). Structures on a Differentiable manifold & their | | | | | | | | | | | | |
| | | 3. Mi | shra, R | . S.,(1 | ×, × | Structu | res on a | a Diffe | erential | ole ma | nifold | & their | | |
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| Recapitulation & Examination Pattern | | | | | | |
|--------------------------------------|-------|--|--|--|--|--|
| Internal Continuous Assesment: | | | | | | |
| Component | Marks | Pattern | | | | |
| Mid Semester | 20 | Section A: Contains 10 MCQs/Fill in the blanks/One Word | | | | |
| | | Answer/ True-False type of questions. Each question carries 0.5 | | | | |
| | | mark. | | | | |
| | | Section B: Contains 07 descriptive questions out of which 05 | | | | |
| | | questions are to be attempted. Each question carries 03 marks. | | | | |
| Activity | 10 | Will be decided by subject teacher. | | | | |
| Class Test | 05 | Contains 05 descriptive questions. Each question carries 01 | | | | |
| | | mark. | | | | |
| Online Test/ Objective Test | 05 | Contains 10 multiple choice questions. Each question carries 0.5 | | | | |
| | | mark. | | | | |
| Assignment/ Presentation | 05 | Assignment to be made on topics and instruction given by subject | | | | |
| | | teacher. | | | | |
| Attendance | 05 | As per policy. | | | | |
| Total Marks | 50 | | | | | |

Course created by:

Dr. Sheeba Rizvi

Dr. Toukeer Khan

Approved by: Prof. Nadeem Ur Rahman

Iman -

Signature:

Signature: