

# The WE-Heraeus International Winter School on Gravity and Light

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## Central Lecture Course

1. [Lecture 1: Topology](#)
2. [Lecture 2: Topological Manifolds](#)
3. [Lecture 3: Multilinear Algebra](#)
4. [Lecture 4: Differentiable Manifolds](#)
5. [Lecture 5: Tangent Spaces](#)
6. [Lecture 6: Fields](#)
7. [Lecture 7: Connections](#)
8. [Lecture 8: Parallel Transport & Curvature](#)
9. [Lecture 9: Newtonian spacetime is curved!](#)
10. [Lecture 10: Metric Manifolds](#)
11. [Lecture 11: Symmetry](#)
12. [Lecture 12: Integration on manifolds](#)
13. [Lecture 13: Spacetime](#)
14. [Lecture 14: Matter](#)
15. [Lecture 15: Einstein Gravity](#)
16. [Lecture 16: Optical Geometry I](#)
17. [Lecture 17: Optical Geometry II](#)
18. [Lecture 18: Canonical Formulation of GR I](#)
19. [Lecture 19: Canonical Formulation of GR II](#)
20. [Lecture 20: Cosmology - The Early Epoch](#)
21. [Lecture 21: Cosmology - The Late Epoch](#)

22. [Lecture 22: Black Holes](#)
23. [Lecture 23: Penrose Diagrams](#)
24. [Lecture 24: Perturbation Theory I](#)
25. [Lecture 25: Perturbation Theory II](#)
26. [Lecture 26: How Quantizable Matter Gravitates](#)
27. [Lecture 27: Sources of Gravitational Waves](#)
28. [Lecture 28: How to Detect Gravitational Waves](#)

## [Tutorials A & B](#)

1. [Tutorial 1: Topology](#)
2. [Tutorial 2: Topological Manifolds](#)
3. [Tutorial 3: Multilinear Algebra](#)
4. [Tutorial 4: Differentiable Manifolds](#)
5. [Tutorial 5: Tangent Spaces](#)
6. [Tutorial 6: Fields](#)
7. [Tutorial 7: Connections](#)
8. [Tutorial 8: Parallel Transport Curvature](#)
9. [Tutorial 9 & 10: Metric Manifolds](#)
10. [Tutorial 11: Symmetries](#)
11. [Tutorial 12: Integration](#)
12. [Tutorial 13: Schwarzschild Spacetime](#)
13. [Tutorial 15: Cosmology](#)
14. [Tutorial 16: Diagrams](#)

## Evening Lectures

- 1.
- 2.

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