

【講義名】

相対論的物理学

【開講学期・曜日・時間】

後期

【単位数】

2

【担当教員（連絡先）】

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【初回開講日時・場所】

平成 25 年 10 月 17 日

【講義のねらい】

場の量子論の関する初歩的事項を理解する。

特に、スカラー場・電磁場の量子化と、ファイマン規則を用いた散乱断面積の計算、及び場の量子論における繰り込み法の理解を目指す。

【講義計画】

別紙参照

【成績評価】

出席及びレポートの結果により評価する。

【テキスト等】

特になし

【履修の条件】

特になし

【言語】

英語

Title: Relativistic Quantum Physics

| | Contents | Mathematics used |
|----|---|---|
| 1 | Analytical Mechanic of a mass point (1) Preliminaries | Differential calculus Variational technique Legendre transformation |
| 2 | Analytical Mechanic of a mass point (2) General mechanics | Differential geometry Differential forms Symplectic geometry |
| 3 | Analytical Mechanic of a mass point (3) Informational treatment | Probability theory Information theory |
| 4 | Analytical Mechanic of a mass point (4) Uncertainty relation | Fourier transformation Orthonormal functions Information theory |
| 5 | Analytical Mechanic of a mass point (5) Quantization | Hilbert space Differential geometry |
| 6 | Analytical Mechanic of a mass point (6) Relation between classical and quantum mechanics | Differential geometry Information theory |
| 7 | Analytical Mechanic of fields (1) Preliminaries | Differential calculus Variational technique |
| 8 | Analytical Mechanic of fields (2) Geometrical treatment | Differential geometry |
| 9 | Analytical Mechanic of fields (3) Yang-Mills theory | Differential geometry Differential forms |
| 10 | Classical theory of field (1) Electromagnetic field | Differential geometry Differential forms Lie group |
| 11 | Classical theory of field (2) Fermion field | Differential geometry Differential forms Lie group/Spinor |
| 12 | Classical theory of field (3) Interactions | Differential geometry Differential forms |
| 13 | Classical theory of field (4) Examples 1 | Differential geometry Differential forms |
| 14 | Classical theory of field (5) Examples 2 | Differential geometry Differential forms |
| 15 | Quantum theory of field (1) Quantization of field (conventional method) | Path integral |
| 16 | Quantum theory of field (2) Quantization of field (geometrical method) | Differential geometry Differential forms |
| 17 | Quantum theory of field (3) Quantization of field (information theoretic view) | Differential geometry Differential forms Information theory |
| 18 | General quantum space Quantum mechanics on Galois field | Algebra of ring and field C^* algebra |