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Number: 00-32A

Department Physics

Department Chair

Syllabus of Record for EOP

safety will be

and operation of an

energy-level diagrams and

discussed. The spatial and

temporal properties of laser beams will be investigated along with other

characteristics

investigated. This course includes a lab component.

Laser

energy-level diagram of a HeNe laser

5. Explain th

Lectures (28 hrs)

oherent Light Sources and their Characteristics (2 h)

A. In

1. Broadband So

spectrum

B. Introduction to Laser Safety (2 hrs)
   1. Physiological Effects
   2. American National Standards Institute (ANSI) Standards.

C. Optical Power Meter (2 hrs)
   1. Relationship Between the Power and the Irradiance of the Laser.
   2. Wavelength Calibration curves.

D. Emission and Absorption of Light (3 hrs)
   1. Bohr Theory of the Atom
   2. Units of Energy: Wavenumber, Erg, Joule, Electron Volt, Reciprocal Centimeter
   3. Absorption, Spontaneous Emission, and Stimulated Emission of a Photon

[redacted]

a Solid.

[redacted]

1. Normal Population Distribution and Population Inversion.

1. Energy-Level Diagram of a HeNe Laser and the Energy-Transfer Processes in the Active Medium.
2. Suppression of Unwanted Laser Lines.
3. Gas Ratio and Pressure.
4. Optimization of Tube Current.
5. Electrical Characteristics of Gas Discharges.
6. Feedback Mechanism and Output Coupler.

Testing (2 hrs)

III-B. Course Outline for Labs (14 labs, 3 hours per lab)

A. Introduction (1 lab)
   1. Lab Safety
   2. Lab Practice
   3. Technical Writing
      a. Notebooks
      b. Lab Reports
   4. Rules and Regulations

E. Emission and Absorption of Light (1.5 labs)
   1. Using a spectroscope observe and measure the wavelengths of the emission spectra of Helium, Hydrogen, Neon, and Mercury.
   2. Using Bohr's Theory of the Atom Compare the Experimental and Theoretical Results for Hydrogen and Helium.
   3. Using an incandescent light bulb and a spectroscope measure the absorption spectrum of a Nd:YAG Laser Rod and a Nd:Glass rod.

F. Measurement of Output Parameters of Pulsed Lasers (1 lab).
   1. Using a HeNe laser, a light chopper, a light detector, a power meter, and an oscilloscope make the following measurements:
      a. The time between pulses.
      b. The full width of the pulse at half maximum height.
      c. The average power.
      d. Change the pulse repetition rate and repeat the above measurements.

G. Spatial Characteristics of Lasers (1.5 labs).
   1. Beam Diameter by Transmission Through an Aperture.
   2. Beam Diameter by Scanning Beam Profile
      a. Scan the beam with a small-aperture, fiber-optic probe and plot the beam profile.
      b. Find the beam diameter by measuring the distance between $1/e^2$ points on the graph.

H. Laser Applications (3 labs)
   1. Reflective laser audio design maker
   2. Laser pulse viewer.
   3. Reflective-light wheel-alignment device.
   4. Reflective-light electroscope.
   5. Reflective-light galvanometer.
   6. Pulse width modulation
   7. Distance measurements.

I. Take a field trip to an industrial site at which lasers are used. (1 lab)

50% Tests. Three tests (two during the semester and the final) consisting of solving word problems and writing short essays.

35% Laboratory assignments

[redacted]

7.5% Quizzes in the laboratory on the laboratory assignments

Grading Scale:

[redacted]

Attendance Policy: The attendance policy will conform to the University wide attendance criteria.

V Required textbooks, supplemental books and readings

3. Electro-Optics Catalogs: e.g., *Newport, Melles Griot, and Edmond*
4. Handouts

VI. Special resource requirements

None

VII. Bibliography

Agranal, G. and Sutta, N., *Semiconductor Lasers*, Kluwer Academic, 1993

Davis, C., *Lasers and Electro Optics: Fundamentals and Engineering*, Cambridge Univ. Pr., 1996

Hecht, Jeff, *The Laser Guidebook, 2nd Ed.*, McGraw Hill, 1992

Hecht, Jeff, *Understanding Lasers, an Entry-Level Guide, 2nd Ed.*, IEEE Press, 1992

Iga, K.; Miles, R., *Fundamentals of Laser Optics (Lasers, Photonics, and Electro-Optics),* Plenum, 1994

[redacted]

Course analysis Questionnaire
EOPT 220. Introduction to Lasers

Section A: Details of the Course

A1 This course is a requirement for the proposed degree Associate in Applied Science in Electro-Optics (A.A.S.E.O.) and as a choice of 2 out of 3 courses for the proposed degree Associate in Science in Electro-Optics (A.S.E.O.). This course is not intended for inclusion in the Liberal Studies program.

10. Vincennes University; Vincennes, Indiana
TLO 240 Introduction to Lasers

A7 As far as I know, the contents or skills of this proposed course are not recommended or required by a professional society, accrediting authority, law or

[redacted]

incorporated into an existing course. The material is not covered by any of the existing courses.

Section B: Interdisciplinary Implications

B1 This course will be taught by one instructor.

B2 This course does not overlap with any course offered by any other department at

[redacted]

C4 This course will be offered once a year, usually in the Fall semester.

C5 One section of this course will be offered at a time.

C6 Twenty-four students will be accommodated in this course. The nature of the lab activities restricts enrollment to this number.

[redacted]

for a course of this nature.

Section D: Miscellaneous

[redacted]