

BASIC PHYSICS I (Code:.....)  
**Syllabus**

**Science Education Study Program  
Faculty of Mathematics and Science**

**Instructor** : Dr. Dadan Rosana, M.Si.  
**Office** : Science Education Study Program  
**Office hours** :  
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**Course Description:**

This course is a study of basic concepts of physics including kinematics, dynamics, gravity and circular motion, energy and momentum, rotary motion, equilibrium, fluids, oscillations, and sound. The mathematics used includes algebra, trigonometry, and vector analysis. A primary course goal is to build a functional knowledge that will allow the student to more fully understand the physical world and to apply that understanding to other areas of the natural and mathematical sciences. Conceptual, visual, graphical, and mathematical models of physical phenomena will be stressed. Students will build critical thinking skills by engaging in individual and group problem solving sessions.

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BASIC PHYSICS II is a calculus-based course covering the principles of electricity, magnetism, and electromagnetic waves. Topics include: the electric field and potential, current and resistance, the magnetic field, electromagnetic induction, DC and AC circuits, the electromagnetic field and waves, and wave and ray optics. The course emphasizes both the conceptual understanding of these fundamental principles of physics and the development of the calculational skills needed to apply these principles in practice.

BASIC PHYSICS I LABORATORY (Code:.....)  
**Syllabus**

This course is a study of experiment basic concepts of physics including kinematics, dynamics, gravity and circular motion, energy and momentum, rotary motion, equilibrium, fluids, oscillations, and sound. Lecture, small group discussions, laboratory experiments with

written reports, computer-based laboratory experiments, demonstrations, videos, daily reading and problem-solving assignments, section examinations, and a comprehensive final examination. Conceptual, visual, graphical, and mathematical models of physical phenomena will be stressed. Students will build critical thinking skills by engaging in individual and group problem solving sessions.

**BASIC PHYSICS II LABORATORY (Code:.....)  
Syllabus**

This course is a study of experiment the principles of electricity, magnetism, and electromagnetic waves. Topics include: the electric field and potential, current and resistance, the magnetic field, electromagnetic induction, DC and AC circuits, the electromagnetic field and waves, and wave and ray optics. Lecture, small group discussions, laboratory experiments with written reports, computer-based laboratory experiments, demonstrations, videos, daily reading and problem-solving assignments, section examinations, and a comprehensive final examination. Conceptual, visual, graphical, and mathematical models of physical phenomena will be stressed. Students will build critical thinking skills by engaging in individual and group problem solving sessions.

Applied Statistics (Code: ....)

**Course Description:**

This course serves two purposes. The first purpose of this course is to provide you with a background in statistical principles in order for you to be a good user of statistical analysis. We will learn how to describe data effectively, how to run a simple regression, and how to interpret the results. The second purpose of this course is to provide you with the basic knowledge in probability theories, such as expected values or probability distributions, which are necessary in understanding other courses in physics education research.

**RESEARCH METHODOLOGY IN SCIENCE EDUCATION (Code:.....)**

**COURSE DESCRIPTION**

This is an introductory course in research methods and proposal writing of Physics Education. The course is designed to give students experience in hypothesis and specific aims development and an overview of the use of the scientific study design for solving education problems. The governing principle of the course is to provide students with an interactive “how to” learning experience during which they receive regular feedback on their work. The course objectives will be accomplished through didactic lectures and small group and individual assignments. Ultimately, each student will write a brief research proposal that follows a similar format to the Yogyakarta State University Investigation proposal. This will

be accomplished through a series of individual assignments. In addition, students will present a research proposal from work accomplished through small group assignments to peers and Mathematics and Science faculty in a poster session at the end of the semester.

### **Assessment of Learning Achievement (Code: ....)**

#### **Course Description**

Achieving greater access to and participation in science and mathematics education by a broad cross section of students is a central theme guiding reform of curriculum and instruction in elementary to college level classrooms. Accompanying this challenge with the challenge of integrating mathematics, science and technology presents an even broader challenge. Assessment and evaluation is a major factor in achieving this goal of science and mathematics "for all" as well as integrating science, mathematics and technology.

While the terms 'assessment' and 'evaluation' are used interchangeably in colloquial usage, an important distinction has been made between them in education; **Assessment** has traditionally played a role in education analogous to the bottom line in business. Assessment refers to the collection of evidence to measure the degree of attainment of objectives. **Evaluation** refers to judgments made based on selected criteria using the results of assessments. For instance, at the end of the course, what point values are assigned what letter grades?

Reform minded science and mathematics educators must take a critical look at the role of assessment and the kinds of information used in making evaluations, particularly when stretching to integrate science, mathematics and technology.

### **MEASUREMENT THEORY & TECHNIQUE (Code:.....)**

#### **Course Description:**

This course introduces classical test theory, including definitions and formulas for test reliability, standard error of measurement, and related statistics. Additional topics include test validity, item statistics useful in test construction, score scales and norms commonly used in educational testing, item bias and test bias, and ideas of fairness and equity in educational and psychological testing. Factor analysis as well as the major extensions and alternatives to classical test theory, generalizability theory and item response theory (latent trait theory), are briefly introduced.

This course is intended to equip students to read the literature in their own substantive areas more critically, to use tests more intelligently in research, and to pursue further studies in psychometrics. It is prerequisite to Education (Item Response Theory) and Education (Generalizability Theory). Although the focus of the course is on paper-and-pencil measures of cognitive abilities and academic achievement, most of the concepts and methods developed apply equally to performance testing, as well as the assessment of attitudes and personality constructs, ratings based on systematic observations, and other kinds of assessments of individuals or groups.

## **Earth Science**

### **Course Description:**

This course will explore the origins and the connections between the physical, chemical, and biological processes of the Earth System. The course will investigate the earth system, energy in the earth system, cycles in the earth system, and geologic history. This course will focus on topics associated with matter, energy, crystal dynamics, cycles, geochemical processes, and the expanded time scales necessary to understand events in the earth system. This course will also provide the knowledge, prerequisite skills, and habits of mind needed for problem solving and ethical decision making about matters of scientific and technological concern, as well as, provide a basic foundation for advanced studies in biology, chemistry, physics, and personal career choices

## **Class Room Action Research & Research and Development**

### **Course Description:**