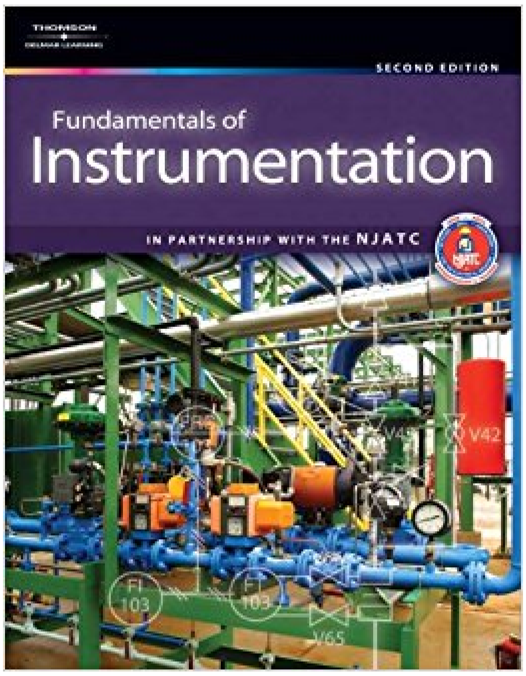
Fundamentals Of Instrumentation



Synopsis

Using a distinctive blend of theory-based explanations and real-world applications, Fundamentals of Instrumentation, 2E will guide users through the basics of instrumentation - from installation to wiring, process connections, and calibration. The updated edition has improved readability and six new chapters covering the most critical topics in the industry such as loop checking, loop turning, troubleshooting, testing techniques, and more. This excellent learning tool can be used by anyone entering the field, or by a seasoned professional as a valuable reference on-the job. With the help of the book's detailed illustrations, diagrams, and practical examples; users will gain proficiency in mounting, wiring, impulse tubing, and the calibration principles of instrumentation. Check out our app, DEWALT Mobile Proâ„¢. This free app is a construction calculator with integrated reference materials and access to hundreds of additional calculations as add-ons. To learn more, visit dewalt.com/mobilepro.

Book Information

Hardcover: 432 pages

Publisher: Cengage Learning; 2 edition (March 19, 2008)

Language: English

ISBN-10: 1418073512

ISBN-13: 978-1418073510

Product Dimensions: 10.8 x 8.9 x 1.1 inches

Shipping Weight: 3.1 pounds

Average Customer Review: 4.1 out of 5 stars 12 customer reviews

Best Sellers Rank: #342,588 in Books (See Top 100 in Books) #41 inÂ Books > Textbooks > Engineering > Electrical & Electronic Engineering #42 inÂ Books > Engineering & Transportation > Engineering > Reference > Measurements #236 inÂ Books > Crafts, Hobbies & Home > Home Improvement & Design > How-to & Home Improvements > Electrical

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Introduction Historical Background Key Elements Summary Review Questions SECTION 1 Chapter 1: Elements of Control and Process Systems Introduction 1.1 Signaling/Sensing 1.2 Controller 1.3 Converter 1.4 Final Control Element 1.5 Process Loops Summary Review Questions Chapter 2: Loop Checking Process Control System 2.1 Loop Checking Process Control Systems Chapter 3: Troubleshooting Process Control Systems 3.1 Troubleshooting Process Control Systems 3.2 New Systems 3.3 Active Process Control Systems Chapter 4: Start Up and Loop Tuning Process Control

NJATC develops and standardizes training for National Electrical Contractors Association and the International Brotherhood of Electrical Workers, which represents more than 780,000 members working in a wide variety of fields around North America.

I would not recommend this book if you are planning to become a process controls engineer. However, if all you plan on doing is instrument maintenance, this book plus the three Purdy's handbooks is all one needs.

Exactly the book I needed

I know I have long being searching for a book that combines theory and practical knowledge . I have come across books that had lot of I&C theory but were either outdated or with no practical knowledge . This book has color diagrams of all major instruments encountered TODAY . Tell me another book which does that . It teaches you most of the instruments with excellent practical advice , tips and knowledge . You need books like this on your everyday job -- troubleshooting tips , practical knowledge , common errors and fixes . You might know great deal of control theory but if you can't fix a problem , you are nothing . This book is written by Delmar Learning , a great authority on education AND NJATC (which teaches electricians) . Now you tell me another book which combines both theory and practical knowhow . Buy this and keep it !! It is used everywhere in the industry .

Great product, even though the author goes in to a bit of stretched out details beyond need for knowledge.over all excellent

The second edition of this book is an improvement over the first edition. The illustrations are generally of good quality, and the photographs are excellent. Some of the factual errors in the first edition have been removed. However, this book still has a long way to go before it will be a valuable learning tool for students.My critique of the first edition noted poor writing quality, confusing math notation, and factual errors. This critique addresses those same three areas, listing specific problems by chapter and/or page number.[Writing quality]When I say this writing quality is poor, I refer to clumsy prose and illogical statements. The author(s) struggle to convey concepts in clear language. Instead, the reader must interpret phrases such as these:"In instrumentation, calibration must be accurate, and accuracy is a direct method of determining if an instrument must be calibrated. This form of circular reasoning is intended to show the importance of an instrument’s calibration expressed in accuracy." (page 21)"Pressure is a universal processing condition because all forms of life depend on pressure for survival." (page 37)"The specific gravty of alcohol is 0.79, and if we find the equivalent water-filled tank, we can use the specific gravity value to find the specific gravity of the alcohol." (page 46)"A displacer is often called a float. A float [displacer] never floats." (page 95)"Electrical capacitance is a fundamental concept for electricians that helps to explain the level measuring form of capacitance." (page 95)"With the large number of data points being monitored today, it is possible that a faulty reading on a thermocouple may not be faulty at all." (page 115)"After the input is received by the controller, the inputs are converted to a usable form, which is a letter of the alphabet converted into a series of digital commands. These digital commands, called bits, are grouped as bytes and then into words. When the computer wants information it can read, it is in the form of words." (page 147)"The derivative action corrects a final control element by opposing change by an amount that is proportional to the rate of change." (page 165)"Generally, analyzers involve some sort of chemical as a process variable or as a means to aid in the measurement of the analyzer." (page 173)Mark Twain once said that the difference between the right word and the "almost" right word is the same difference between lightning and a lightning bug. I can’t help but reflect on this wisdom repeatedly as I read this book. So often it seems the author(s) choose words that don’t quite convey the full meaning of the concept. Consider the following examples:"A calibration procedure is only as accurate as the equipment used. Rosemount recommends using an input reference at least three times as great as the model 1151 DP." (page 203) I think what they are trying to say here is that the reference tool must be at least three times *more accurate* than the instrument being calibrated, but the word they used instead ("great") falls so short of the mark it may very well lead the reader to the wrong conclusion ("Three times bigger?").Another example from the previous page: "Sensor trim exacts the digital process variable to a precision pressure input . . ." (page 202). What they mean to say is that sensor trim forces the digital process variable to *match* the known input value. Instead, they force a novel definition on the word "exact" in its use as a verb.On page 96, a section begins discussing radar and ultrasonic level measurement, but the author seamlessly switches from talking about radar gauges (first two paragraphs on page 97) to talking about ultrasonic gauges (last paragraph on page 97) with no cue that the switch has been made. Although it is possible for the reader to figure out a switch has been made, this is potentially confusing.[Math]Page 46 fails to properly cancel units of feet (describing a pressure in pounds per *cubic* feet instead of pounds per *square* feet. The same paragraph also confuses "inches" with "pounds per square inch."Page 75 presents two equations for calculating volumetric and mass flow, respectively. These equations use Newtonian "dot" notation, which is never explained. Worse yet, the volumetric flow equation is plainly wrong, with an extra term ("head loss") that is never explained. The sentence following these equations contains a typographical error as well: the Greek letter "pi" is given for density, when it should be "rho".Page 94 incorrectly shows density figures in an equation when it should show weight figures. The equation purports to calculate the apparent weight of an object experiencing a buoyant force, but instead confusingly subtracts densities to arrive at an equivalent density. The result is described as a force, though, not a density. The numerical values are identical because the object in question has a volume of 1 cubic foot, but the different concepts of density versus weight are needlessly muddled.A misleading graph appears on page 110, showing the derivative of Seebeck voltage versus temperature for a variety of different thermocouple wire metals. What would be more informative (especially to a reader unfamiliar with calculus) would be a simple voltage-versus-temperature plot.Page 226 gives an incorrect formula for calculating current in a parallel DC circuit (!), with one of the branch currents subtracted instead of added to make the total.The chapter on flow measurement grossly over-simplifies the equations used to describe fluid flow (pages 59 and 62 especially) by asserting that velocity (and volumetric flow rate) is equal to the square root of differential pressure for an orifice, when in fact this is merely a proportionality and not an equality. The complete form of Bernoulli's equation is never shown, but instead is confused with the continuity principle (V1A1 = V2A2).Page 343 contains advice on controller tuning, where it is mentioned that a 100% proportional band "forces the gain to a minimum". Actually, a PB of 100% forces the gain to a value of 1, which is typically neither the minimum nor the maximum gain for a controller.[Factual errors]Reference is made to the "National Bureau of Standards" on page 24. This agency hasn't been known by that name for that last 20 years! After 1988 it has been known as the "National Institute of Standards and Technology" or NIST.Page 31 discusses the calibration error known as "deadband," but makes the dubious claim that its effects may be reduced by altering the instrument's gain. While this will reduce the error as measured in percent of span, it does absolutely nothing to reduce the error equivalent in real measurement units, which is what matters most.The chapter on flow measurement does a horrible job of classifying different flowmeter types. Dall tubes and pitot tubes are classified as velocity meters (actually, they are differential pressure meters) while Coriolis, Hot-Wire, electromagnetic, ultrasonic, and flow nozzles are classified as area meters (actually, these should fall into multiple categories of mass flow, velocity, and differential pressure). These distinctions are not merely academic. These classifications predict flowmeter behaviors under different operating conditions, which is important for troubleshooting. These same classifications also help technicians determine whether or not square-root extraction is required for proper flow measurement.Page 121 properly explains the purpose of a 4-wire RTD circuit (which completely negates the effect of cable length), but then goes on to make the claim that long cables are better than short cables in a 4-wire circuit because their additional resistance opposes more current. While it is true that longer cables will contain more resistance, and thus oppose current to a greater degree, the four-wire configuration renders this fact completely irrelevant (which indeed is the very point of having a 4-wire circuit -- to make cable length irrelevant).The explanation for flapper/nozzle mechanisms is entirely wrong. On page 130 we are told that air pressure controls flapper position (when just the opposite is true: flapper position controls air pressure). The illustration on page 131 of an I/P mechanism is also missing a critical component: the restriction between supply air pressure and the nozzle.On page 132 the claim is made that an I/P transducer's action may be reversed by swapping the signal wires and recalibrating. While this is true for purely analog transducers, it is not true for the more sophisticated transducer shown in figure 7-4 on that same page (the Fisher-Rosemount model 846). The same error is repeated on page 247, along with the same photograph of a Fisher-Rosemount model 846.On page 137 the statement is made that pneumatic actuators "are and will continue to be the only process elements with a force strong enough to position." Apparently the author has never heard of motor-operated valves (MOVs), a conclusion made all the more likely by the conspicuous absence of MOVs throughout the book.In chapter 15 (Fundamentals of Control Valve Maintenance), piston actuators are incorrectly characterized as being weaker (generating less force) than diaphragm actuators, and requiring [sic] "levers and angles of lever movement" to multiply the force so that they can adequately move the valve (page 243). This is patently false. Piston actuators are capable of generating more force than diaphragm actuators because they can handle much higher operating pressures (Force = Pressure x Area). The reason for this is the use of pressure-sealing rings in piston actuators instead of a rolling diaphragm which can tear with high air pressures. Unfortunately, the reader will never figure this out because they are directed to an erroneous illustration on page 244 which merely shows a different type of diaphragm actuator -- not a piston actuator at all!The same chapter makes the claim that pneumatic diaphragm actuators are inherently nonlinear, which is untrue. Pages 245 and 246 attempt to explain this alleged nonlinearity by appealing to increased spring tension at the far end of the valve's stroke, which is false because Hooke's Law (the relationship between stress and strain for elastic materials) is linear. Then, this explanation is followed by an appeal to diaphragm deformation as the cause of nonlinearity, which is absurd given the extremely low restoring force of a rubber diaphragm. In reality, nonlinear valve travel is a sign of a problem within the valve, as actuator diaphragm and springs are designed to operate linearly.A chapter on troubleshooting process control systems -- all 6 pages of explanatory text -- contains an hypothetical example of a liquid level control process and how a technician might begin diagnosis. Although the example problem is realistic, the diagnostic advice is sorely lacking. When any recorded or indicated measurement is in question (as is the hypothetical case here), the very first thing a technician should do is verify that the measurement is actually correct by checking against a different measurement device (or manual measurement). However, the idea of actually verifying the measurement does not come up until half-way through the scenario, where the reader is simply told there is no way to visually observe liquid level. Really? Not a single sightglass on the vessel? No level alarm switches to verify the low level? No inlet pressure gauges on the pump which could be used to validate decreased head? Even the conclusion (a badly corroded control valve that cannot move) doesn't fit the symptoms: the level trend shows a liquid level that *suddenly* took a downward trend, and we were told that the process has been running trouble-free for a long time before that. Corrosion bad enough to seize a valve does not suddenly present, but rather slowly gets worse over time (unless process conditions suddenly changed, which the scenario fails to consider).The chapter on loop tuning recommends the Ziegler-Nichols "ultimate" method which requires over-tuning of the controller to the point where the process oscillates at a steady amplitude. Although this method is terribly impractical (the process must be brought to the brink of total instability), it is hard to fault the author(s) because the technique is so widely recommended. An odd twist introduced to the technique, however, is the recommendation "to set the derivative and integral (reset) settings equal to each other" once the ultimate gain and period values have been determined (page 344). This is a recipe for disaster in many processes, as derivative control mode strongly reacts to process noise and must be used sparingly; whereas integral mode is often necessary in moderate-to-aggressive doses, especially for fast self-regulating processes such as liquid flow control.At the end of this chapter, it is said that proportional+integral (PI) control "may experience some offset at a steady-state point of operation" which is false because it is the very purpose of integral mode control to eliminate offset. Full PID control us said to be "the most expensive type of control" which used to be true 30 years ago when you paid extra to have integral and/or derivative modes included in an analog controller, but is a ridiculous statement in the digital age when practically every controller sold is capable of full PID operation.Page 356 defines Boolean logic as a type of diagram, when it is actually a mathematical system. Oddly, the definition of Boolean in the page margin gets this right.I could go on, but by now I think you get the point. As an instructor of Instrumentation, I feel compelled to warn any other instructors that they will have a lot of error-correcting to do if their students use this textbook. I have provided this detailed critique of the book in the hope that the publisher will revise their text very soon. Many of the problems mentioned here were present in the first edition as well, which does not speak well for their editing process.

I teach an instrumentation course and am required to use this text. That's too bad, because it is full of technical type errors. These errors are not just typos, but factual errors. Unfortunately, a beginner in the field of study wouldn't know that and would end up believing many things that are incorrect.

You can understand very easily aboutn fundamental of instrumentation and latest technology and method.If you are beginner of Plant instrumentation business, this book will be a greate help.

Textbook.

Fundamentals of Periodontal Instrumentation and Advanced Root Instrumentation Workbook for Phillips/Sedlak's Surgical Instrumentation (Phillips, Surgical Instrumentation) Coherence, Counterpoint, Instrumentation, Instruction in Form (Zusammenhang, Kontrapunkt, Instrumentation, Formenlehre) Surgical Instrumentation, Spiral bound Version (Phillips, Surgical Instrumentation) Instrumentation for the Operating Room: A Photographic Manual (Instrumentation for the Operating Rooom, 5th ed) Surgical Instrumentation Flashcards Set 3: Microsurgery, Plastic Surgery, Urology and Endoscopy Instrumentation (Study on the Go!) Fundamentals of Industrial Instrumentation and Process Control Fundamentals of Instrumentation Fundamentals of Periodontal Instrumentation Plastic Injection Molding: Product Design & Material Selection Fundamentals (Vol II: Fundamentals of Injection Molding) (Fundamentals of injection molding series) Plastic Injection Molding: Mold Design and Construction Fundamentals (Fundamentals of Injection Molding) (2673) (Fundamentals of injection molding series) Instrumentation/Orchestration (Longman music series) Medical Instrumentation: Application and Design Ultrasound Physics and Instrumentation, 4th Edition (2 Volume Set) Examination Review for Ultrasound: Sonography Principles & Instrumentation Polysomnography for the Sleep Technologist: Instrumentation, Monitoring, and Related Procedures, 1e Instrumentation and Orchestration Treatise on Instrumentation (Dover Books on Music) A

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