NORTH JERSEY SECTION

IEEE FELLOWS AND AWARD RECIPIENTS



SVEN H. DODINGTON IEEE Fellow



IEEE Fellow



JOHN C. LOZIER IEEE Fellow



JACK A. MORTON IEEE David Sarnoff Award



LOUIS POLLACK IEEE Fellow



STEPHEN O. RICE IEEE Mervin J. Kelly Award



MORGAN SPARKS IEEE Fellow



P. K. TIEN IEEE Fellow



To be Honored at

ANNUAL BANQUET & DANCE Governor Morris Hotel, Morristown, N. J. Saturday, February 19, 1966, 6 P.M.

See page 17 for banquet reservations



SECTION MEETING — POWER GROUP

JANUARY 19, 1966

PUBLIC SERVICE TERMINAL BLDG., NEWARK

Electrogasdynamic Power Generation - Dr. Meredith Gourdine



A FULLY AUTOMATIC BRIDGE

You Just Insert a Capacitor and Read the Answer In 1/2 Second or So



New Type 1680-A Automatic Capacitance Bridge ...\$4850 in U.S.A.

Type 1680-P1 Test Fixture ... \$75 in U.S.A.

RANGES

Frequency	120c/s	400c/s	1kc/s	
Capacitance	100pF to	0.01 pF to	0.01pF to	
	1000µF	100µF	100µF	
	4 ranges	7 ranges	7 ranges	
Conductance	1µt to 1t	0.1nt to 1t	0.1nt to 1ts	
	4 ranges	7 ranges	7 ranges	

Dissipation Factor: 0.0001 to 1.0 in one range

- **Easy to Use:** Direct reading in C and D (or G) . . . in-line readout locates decimal points and presents correct units of measurement.
- Wide Range: Measures up to 1000μ F; resolution is 0.01 pF on lowest range.
- **Accurate:** $\pm 0.1\%$ of reading for C and G; $\pm 1\%$ of reading for D.
- **Fast:** Balance is completed in a fraction of a second less than $\frac{1}{2}$ second at 1kc/s. Both capacitance and loss are measured simultaneously.
- **Stable:** The instrument is a true bridge, not a fussy modified digital voltmeter. Accuracy is completely independent of generator voltage variations and phase-sensitive detector stability. Stability is dependent only upon passive standards and fixed transformer ratios.
- **Three Terminal:** Stray capacitance from connecting cables is automatically eliminated from the measurement. Ideal for remote measurements and environmental testing.
- **Versatile:** Choice of operating mode to suit the measurement . . . high-volume capacitor measurements, sorting components close in value, tracking changing capacitance, comparisons, reliability studies, and environmental testing. The Type 1680-A Capacitance Bridge can also be used to measure L and R in terms of negative capacitance and conductance.
- **BCD Output:** Binary coded decimal output for data transmission to printers, limit comparators, and to converters for tape and card punches.
- **Tests Itself:** Built-in test positions locate most instrument malfunctions without auxiliary test equipment. All circuit boards are plug-in types and can be easily replaced.

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The IEEE Newsletter

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ABOUT ADDRESS CHANGES

It is not necessary to inform the North Jersey Section when you change your mailing address. The NEWSLETTER and other section mailings use a list provided by IEEE's national headquarters in New York. This means the Section has no need to maintain a mailing list or addressing plates. Section membership records are changed when Headquarters notifies us.

REPORT ALL ADDRESS CHANGES TO: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS INC., 345 EAST 47th STREET NEW YORK, N. Y. 10017

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Executive Committee Meeting

at Verona Public Library January 5

North Jersey Section IEEE Executive Committee

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Wheeler Laboratories, Inc. Subsidiary of Hazeltine Corporation Consultation — Research — Development Radar and Communication Antennas Microwave Assemblies and Components Laser Devices and Applications Harold A. Wheeler and Engineering Staff Main office: Great Neck, N. Y. HUnter 2-7876 Antenna Laboratory: Smithtown, N. Y.

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CALENDAR

Thursday, January 13

N. J. ELECTRON DEVICES

8:00 P.M.-"Hot Electron Transistors"

Dr. C. R. Crowell, Bell Telephone Labs. At International Telephone & Telegraph Labs., Nutley, N. J.

6:00 P.M.-Pre-meeting dinner - Copperhood Restaurant

GAES

8:00 P.M.—"LEM Guidance and Control Systems"

Mr. Christopher J. Witt, Grumman Aircraft Engineering Corp. At Wilkie Memorial Auditorium, 20 West 40th Street, N. Y. C.

6:30 P.M.-Pre-meeting dinner - Old Seidelburg Restaurant

Tuesday, January 18

N. Y. COMPUTER

7:00 P.M.—"Can Computers Monitor and Control the Power Grid?" Moderator: Mr. Gordon Friedlander

At National Cash Register Auditorium, 50 Rockefeller Plaza, N. Y. C. 5:30 P.M.—Pre-meeting dinner at Schraffts Restaurant

Wednesday, January 19

N. J. POWER GROUP

7:30 P.M.—"Electrogasdynamic Power Generation"

Dr. Meredith Gourdine, Gourdine Systems Inc. At Public Service Terminal Building, 80 Park Place, Newark, N. J.

N. Y. COMTEC

7:00 P.M.—"The Stored-Program Calculator As An Engineering Tool" Robert L. Price, Emtech Research Products Corp.

At N. Y. Telephone Co. Little Theatre, 140 West Street, N. Y. C.

N. J. COAST

8:15 P.M.—"Holography — Fundamentals and Demonstrations" Herwig Kogelnik, Bell Telephone Labs. At Bell Telephone Labs, Holmdel, N. J., Auditorium Pre-meeting dinner at Crystal Brook Inn

Thursday, January 20

ENGINEERING MANAGEMENT GROUP

8:00 P.M.—"Predictions — Fact or Fancy?" Mr. A. J. Finocchi, ITT Federal Labs. At United Engineering Center, N. Y. C.

Wednesday, January 26

N. J. COMPUTER GROUP

8:00 P.M.—"Mass Magnetic Memories" Dr. Rabah Shahbender, RCA Labs. At Arnold Auditorium, Bell Telephone Labs., Murray Hill, N. J. 6:00 P.M.—Pre-meeting dinner at Wally's Tavern on the Hill

The Newsletter, January 1966

NEW FELLOWS OF THE IEEE

SVEN H. DODINGTON

For contributions and leadership in the development of radio navigational aids.

Mr. Sven H. Dodington, Vice President — Research and Development, ITT Federal Laboratories, joined the International Telephone and Telegraph Corporation in 1941 and was elected vice president in 1958.

Since 1945 he has concentrated on the research and development of radio navigation aids, systems which are presently undergoing evolutionary redesign at ITTFI. to incorporate microelectronic circuitry.

Mr. Dodington's name is particularly associated with the development of crystal-controlled receivers and transmitters in the 1,000-megacycle band. He devised the plan for pairing DME and VOR frequencies for the Vortac system.

Mr. Dodington was born in Vancouver, British Columbia, Canada. After receiving a B.A. degree from Stanford University in 1934, he spent six years with Scophony Ltd., England, working on television system development. At the end of that period he participated in the work of the U. S. National Television Systems Committee.

Approximately 40 patents in the fields of television, countermeasures and radio navigation are held by Mr. Dodington.

An Associate Fellow of the American Institute of Aeronautics, he also is a member of the Institute of Navigation. He is presently serving as chairman of the board of directors of the National Aerospace Electronics Conference which will be held in May, 1966, in Dayton, Ohio. He is secretary of the IEEE Group on Aerospace and Electronic Systems.

Mr. Dodington lives at I Briarcliff Road, Mountain Lakes, N. J.

HANS K. JENNY

For contributions to the development of Microwave Devices.

Mr. Jenny is Manager, Advanced Development Engineering at RCA and has overall responsibility for all applied research and advanced development effort in support of MPDOD product lines (which include Traveling-wave Tubes; Microwave Solid State; Pencil Tubes; Power Devices and Super Power Devices). He is responsible for conception, development and execution of long range programs aimed at evolving new and novel products for MPDOD. His responsibilities cover activities based in Harrison, N. J., Princeton, N. J. and Lancaster, Pa.

Mr. Jenny joined RCA in 1946 and was given the responsibility for the development of CW magnetrons and frequency modulating schemes for magnetron oscillators. In 1950 he was promoted to the position of engineering manager which he held until 1965. In this responsibility he covered the development of magnetrons, traveling-wave tubes, backward wave tubes, pencil tubes, special microwave tubes, tunnel oscillators, amplifiers and downconverters, transistor oscillators and amplifiers, varactor multipliers and tuners, laser modulators and detectors.

In his present position as manager of Ad-

vanced Development Engineering, MPDOD, Mr. Jenny is responsible for advanced programs in the fields of high efficiency and low noise traveling-wave tubes, very low noise and high power solid state devices (tunnel devices, varactor devices, transistor devices, etc.), microwave ferrite devices and quantum modulators, detectors and mixers.

Mr. Jenny received his MSEE from the Swiss Federal Institute of Technology in 1943. He was then associated with the institute as assistant professor, where for a period of two years he did research work on klystrons and reduction of their noise figure.

Mr. Jenny holds a dozen patents in the fields of magnetrons, cavity tuning and modulation, crossed field amplification and radar systems. He has publications in many areas pertaining to microwave devices.

JOHN C. LOZIER

For contributions in the field of automatic controls and the use of digital computers in real time control systems.

John C. Lozier, a Member of Technical Staff at Bell Telephone Laboratories, supervises a group engaged in research and consulting activities in guidance and control systems in the Control Systems Analysis Department.

He was born in Bayside, New York. He received his AB degree from Columbia in 1934. Subsequently, he studied physics at Princeton University and worked for RCA in Camden.

Mr. Lozier joined Bell Telephone Laboratories in 1936, and for five years engaged in transmission development work on radio and carrier telephone systems. During World War II, he was concerned with the theory and design of servo-mechanisms, with emphasis on homing missiles.

After the war, he did research and exploratory development both in Transmission Systems and in Nonlinear Feedback Controls. This work included the development of temperature control systems for transistor crystal growing and zone refining machines. He assumed his present supervisory position in 1952.

In this capacity, he worked on the TRADIC and LEPRECHAUN digital computers and led a research program in digital feedback control systems. For project Telstar, his group designed and built the control system with which the big horn antenna in Andover, Maine, automatically tracks Telstar and other communication satellites.

Mr. Lozier holds a number of patents and is the author of articles on transmission theory and on control systems. He is co-author of a book "Transistor Technology".

He is a former chairman of the IEEE Professional Group on Automatic Control, and past President of the American Automatic Control Council. From 1962 to 1964 he was a member of the Technical Advisory Committee of the Board of Governors of the ARGONNE National Laboratories. He is a member of the Executive Council of IFAC, the International Federation for Automatic Control. For his work on Telstar, the French Government made him a "Chevalier of the Legion of Merit Postale".

LOUIS POLLACK

For pioneering design and development of communications, satellite earth terminals, used in moon reflection relaying.

Mr. Louis Pollack, Director of the Space Communication Laboratory at ITT Federal Laboratories, headed the overall engineering design and development of the ITTFL universal transportable satellite communication earth terminals.

These terminals have communicated via Early Bird, Syncom, Telstar and Relay satellites.

Since joining the International Telephone and Telegraph Corporation in 1943, he has been responsible for the design of a number of major military and commercial television and microwave radio projects. He directed I'TT's engineering effort in the development of the communication ground and satellite checkout equipment for the U. S. Army Signal Corps' Courier satellite program in 1960.

Mr. Pollack also headed the engineering team at ITTFL which participated in NASA's Relay satellite communication program.

An engineering graduate of the College of the City of New York. he is a senior member of the IEEE.

Mr. Pollack holds one patent and has authored numerous technical papers in space communications and other communications areas.

He and his family live in Livingston, N. J.

MORGAN SPARKS

For contributions to semiconductor science and technology and for leadership in development of solid state electronics.

Morgan Sparks is Executive Director, Components and Solid State Device Division of Bell Telephone Laboratories.

He received the B.A. and M.A. degrees from Rice Institute in 1938 and 1940, respectively. He was awarded a University of Illinois Rockefeller Foundation Fellowship for 1940-42 and received the Ph.D. degree from Illinois in 1943. While studying at Illinois he was employed by the National Defense Research Committee.

He joined Bell Laboratories in 1943 and for five years was engaged in electrochemical research on primary batteries, electrolytic capacitors and rectifiers. In 1948 he entered the field of semiconductor research, specializing particularly in research into the properties of p-n junctions and junction devices.

He was appointed Director of Solid State Electronics Research in 1955, Director of Transistor Development in 1958, and assumed his present position in 1959.

Dr. Sparks is the author of numerous technical articles on transistors, p-n junctions and the properties of semiconductors, and has been granted ten patents in the general area of semiconductor electronics.

He is a senior member of the IEEE. He is also a member of the American Physical Society, the American Chemical Society, Phi Beta Kappa, Sigma Xi, and Phi Lambda Upsilon.

Continued on Page 18

Hazeltine is a familiar sight along the length of Long Island.



Our electronic expertise extends a lot further.

Our IFF Systems...Radar Systems and Displays...ASW and Sonar Systems...Data Processing Systems...and Spacecraft Imaging Devices are only a part of our broad electronics expertise used by government agencies, NATO and foreign governments, and by industries here and abroad.

Our greatest asset is the quality of our engineering staff. They've represented the United States at international scientific conferences on more than one occasion. And they've received their share of awards.

If you like working in small groups on large electronic problems where unconventional approaches are called for, and if you are qualified in any of the areas listed below, let us hear from you.

RADAR ENGINEERING Senior openings in Radar and ECM systems design. Intermediate and junior openings in RF and IF solid state circuit design. Junior openings in general solid state circuit design.

CIRCUIT DESIGN BS in EE (MS preferred), with 2 or more years experience in the design and development of solid state circuitry for military electronic systems. Assignments in diversified program working from specification to prototype.

SYSTEMS ENGINEERING Graduate EE required with several years experience in design of military systems involving RF, data processing and display components. Background in logic or equipment design and familiarity with MIL specs desirable.

FIELD ENGINEERING Engineering representative at field site where Hazeltine equipment is installed. BS in EE or Physics required, with one or more years practical experience in installation, maintenance or servicing electronic systems and equipment. Military experience in electronics preferred.

Write in confidence to Mr. W. Speer



HAZELTINE CORPORATION

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Ballantine AC-DC Digital Voltmeter

Model 355 Price: \$590



¹/₄% Accuracy f.s. for AC & DC Voltages up to 500 and for mid-band AC Frequencies

Measures Full Scale ac to 10 mV ...ac & dc from 0 to 1,000 V

Ballantine's Model 355 is the only digital voltmeter of its type in the U.S.A. . . with a versatility that makes it ideal for production line and quality control applications.

Use the 355 in place of analog instruments, for example, in reducing personnel errors, for speeding up production. You can depend on Ballantine's high standards of accuracy, precision, and reliability to reward you with savings of time and money the first day you place it in service.

The instrument features a servo-driven, three-digit counter with over-ranging... combines many virtues of both digital and analog voltmeters in one small, compact, economical package. Its large, well-lighted readout with illuminated decimal point, range and mode information, allows fast, clear readings, while the indicator can follow and allow observation of slowly varying signals. The position of the last digit can be interpolated to the nearest tenth, thus avoiding the typical " \pm 1 digit" restriction of a fully digitized display.

Desire even faster production? An optional foot-operated switch of the Model 355 retains voltage readings, and enables you to cut materially the time between readings. Another aid in reducing personnel errors is provided by an over-range indicator that signals excessive input of the wrong polarity.

PARTIAL SPECIFICATIONS

Voltage Range O Full scale, most sensitive range	AC to 1000 10 mV	DC 0 to 1000 100 mV	Accuracy is of Full Sca 1 mV to 500 V	n % ale ¼%, 50 Hz ½%, 30 Hz 1%, 50 kHz	AC to 10 kHz to 50 kHz to 250 kHz	DC 1/4 %
Optional Model 600	250 kHz Resistors	DC	Power Rec	uirements 50-60 Hz	, 52 W	/230 V,
are av curren	ailable for t directly i	measuring n volts	Relay Raci	mounting	, . Model 8 g kit is opti	onal
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NORTH JERSEY SECTION MEETING SPONSORED BY THE POWER GROUP

Topic:	Electrogasdynamic Power Generation
Speaker:	DR. MEREDITH GOURDINE
Date:	January 19, 1966
Time:	7:30 P.M.
Place:	Room 3171A Public Service Terminal Building 80 Park Place Newark, New Jersey

An advanced look at a new and startling method of power generation will be provided those who attend this meeting. Dr. Gourdine will exhibit and demonstrate a working model of an electrogasdynamic power generator. The EGD generator takes the thermal energy stored in compressed air, converts it into kinetic energy by means of a supersonic nozzle, and then converts the gas kinetic energy directly into high voltage electricity by means of EGD coupling. Dr. Gourdine will discuss the theory and practical applications of his generator.

ELECTRON DEVICES HOT ELECTRON TRANSISTORS

Speaker:	DR. C. R. CROWELL Bell Telephone Laboratories, Inc. Murray Hill, New Jersey
Date:	January 13, 1966
Time:	8:00 P.M.
Place:	International Telephone and Telegraph Laboratories Nutley, New Jersey
Pre-meeting	Copperhood Restaurant
Dinner:	(6:00 P.M.) South of Route 3 at Park Avenue Exit

The principles underlying the operation of the semiconductor - metal - semiconductor (SMS) or hot electron transistors will be outlined. A comparison will be made between ultimate SMS performance and that of the bipolar transistor. Some physical limitations to the current gain will be discussed from both the experimental and theoretical viewpoints.

DR. CROWELL is a graduate of McGill University (B.A. Math-Physics, 1949, M. Sc. Physics, 1951, and Ph.D. Physics, 1955). Since 1960 he has been at the Bell Telephone Laboratories in Murray Hill where he has been involved in studies of several aspects of hot electron transport in metals and metalsemiconductor (Schottky) barriers. PLEASE POST ON BULLETIN BOARD-ALL COURSES ARE OPEN TO THE PUBLIC

N. Y. Section, IEEE



EDUCATIONAL PROGRAM - SPRING - 1966

Power and Industrial Div.

REVIEW STUDY GROUPS — FOR PROFESSIONAL ENGINEER EXAMINATIONS

This program is designed to prepare candidates for Professional Engineer License examinations in New York and New Jersey. The N. Y. State Board permits graduates of approved schools to take Parts I and II and qualify for "Engineer-in-Training".

ENDORSED BY NYSSPE

STRUCTURAL PLANNING AND DESIGN (IEEE-ASME)

Review for Part I, N. Y. Exam., Part II, N. J. Exam. Planning, design, construction of buildings and similar structures in timber, steel and concrete, including beams, columns, foundations, piles, girders, riveted and welded sections. Intensive work in problem solving techniques with emphasis on the AISC and ICI codes. Printed notes available.

MONDAYS, Starting Feb. 14, 1966, 6:15-8:30 P.M., 18 Sessions North Cafeteria, 19th fl., Con Edison Co., 4 Irving Place, N. Y. C.

BASIC ENGINEERING SCIENCES (ASME-15EE)

Review for Part II, N. Y. Exam., Part I, N. J. Exam. Practical applications of hydraulics, thermo-dynamics, mechanics and electrical principles.

TUESDAYS, Starting Feb. 8, 1966, 6:30-8:30 P.M., 19 Sessions Auditorium, 19th fl., Con Edison Co., 4 Irving Place, N. Y. C.

MECHANICAL ENGINEERING (ASME)

Review for Mechanical Engineering Section of Part III, N. Y. Exam. Application of mechanical engineering principles to modern practice, shafts, flywheels, springs, gears and other machine elements, steel and heat treatment, internal combustion engines, air compressors, gas turbines, steam power plant cycles and equipment, refrigeration, heat transfer, air conditioning and other special subjects.

WEDNESDAYS, Starting Feb. 9, 1966, 6:30-8:30 P.M., 18 Sessions Rm. 240, Ebasco Bldg., 2 Rector St., N. Y. C.

ELECTRICAL ENGINEERING AND APPLICATIONS (IEEE)

Review for Electrical Engineering Section of Part III, N. Y. Exam. Electrical Engineering Principles and Applications of: transformers, a-c and d-c machines, transmission lines, filters, networks, impedance matching, bridges, coupled circuits, resonance, harmonics, transients, three phase power, amplifiers, and *electronic circuits*. Features methods of problem solution based on examinations of past 7 years. Printed notes and past examinations available.

WEDNESDAYS, Starting Feb. 9, 1966, 6:30-8:45 P.M., 18 Sessions Rm. 1427, Con Edison Co., 4 Irving Place, N. Y. C.

ENGINEERING ECONOMICS AND PRACTICE (IEEE-ASME)

costs, accounting and cost analysis, valuations, contracts, etc. THURSDAYS, Starting Feb. 10, 1966, 6:30-8:30 P.M., 18 Sessions Auditorium, 19th fl., Con Edison Co., 4 Irving Place, N. Y. C.

Instructors: P. ZARAKAS, Engineer, Consolidated Edison Co., Inc. and J. F. BATES, Electrical Engineer, Gibbs & Hill, Inc.

COURSE NO. 20

COURSE NO. 19

Review for Engineering Economics Section of Part III, N. Y. Exam. Economic comparisons, fixed and operating

Instructor: S. DUBLIN, Director of Research & Asst. Professor in Management, Newark College of Engineering

REGISTRATION

FEES: For all courses except course No. 21 & 22 \$20 — to members of I.E.E.E., A.S.M.E., A.S.C.E., A.I.Ch.E., A.I.I.E., N.Y.S.S.P.E. 30 - to all others.

> For course No. 21 & 22 \$30 — to members (as above). \$40 — to all others.

FOR ADVANCE REGISTRATION (MAILED ONE WEEK BEFORE 1st SESSION) DEDUCT \$5.00 FROM FEE.

Registration: Fill out ONE form (see back page) for EACH course attended & mail with payment to the following:

For courses No. 12 to 15

make checks or money order payable to: "POWER & IND. GROUP, N.Y. SECT., I.E.E.E."

and mail to: R. A. Olsson, Vice Chairman Educational (REG. FORM ON BACK PAGE)

Committee, I.E.E.E. Long Island Lighting Co., 175 E. Old

For courses No. 16, 19, 20, 21 & 22 make checks or money order payable to:

Country Road, Hicksville, N. Y. 11801

"POWER & IND. GROUP, N.Y. SECT., I.E.E.E."

and mail to: I. M. Berger, Vice Chairman, Educational Committee, I.E.E.E., N.Y.C. Transit Authority, 3311 Giles Place, Bronx, N. Y. 10463, Tel. 852-5000 Ext. B 4247.

For courses No. 17 & 18

make checks or money order payable to:

"ASME METROPOLITAN SECTION"

and mail to: G. Evans, Vice Chairman Educational Committee A.S.M.E., Zurn Industries, P.O. Box 1099, Mountainside, N. J.

Instructor: O. ONDRA, Professor of Civil Engineering

Instructors: T. ELIADES, Consolidated Edison Co., Inc.

and P. ZARAKAS, Consolidated Edison Co., Inc.

Instructor: E. STAMPER, Assoc. Professor

Newark College of Engineering



Metropolitan Section

Manhattan College

COURSE NO. 17

COURSE NO. 18

NEW YORK SECTION IEEE POWER & INDUSTRIAL DIV.

EDUCATIONAL PROGRAM

COURSE NO. 12

AUTOMATION IN INDUSTRY AND GENERATING STATIONS

MONDAYS, 6:30 to 8:30 p.m. Starting Feb. 28, 1966 Ebasco Auditorium, 2 Rector Street, New York, New York Course Coordinator: E. ELDRIDGE, Thomas & Betts Co. Tel. (201) 354-4321

A comprehensive review of a wide range of automated industries is offered in this course. The use of computers and other control devices in manufacturing and production facilities will be covered. Computers and their operations in the specific application in these industries along with practical applications to various areas.

1. Feb. 28. Principles of Automatic Control

Speaker: DR. H. A. FERTIK, Leeds & Northrup, North Wales, Pa.

2. Mar. 7. Process Control Components and Applications

> Speaker: D. VANDEVENTER, Leeds & Northrup, North Wales, Pa.

3. Mar. 14. Digital Computers — Application to an Automated System

Speaker: B. MURPHY, Westinghouse Elec. Co., Pittsburgh, Pa

4. Mar. 21. Analog Computers — Applications to an Automated System

> Speaker: DR. R. VICHNEVETSKY, Electronics Associates, Princeton, N. J.

- 5. Mar. 28. Numerical Control of Machine Tools
- 6. Apr. 4. Automatic Control of a Major Production Line Speaker: G. MURIE, Ford Motor Co., Birmingham, Michigan
- 7. Apr. 11. Automatic Control of a Generating Station Speaker: E. N. SCHWALJE, Public Service Elec. & Gas Co.
- 8. Apr. 18. Automation of an Aircraft Production Line Speaker: from Grumman Aircraft Engineering Corp.
- 9. Apr. 25. Automation in the Electronic Components Industry

Speaker: W. E. BAHLS, Radio Corp of America

10. May 2. Trip to Con Edison Automated Warehouse— Astoria Plant

COURSE NO. 13

SPECIFICATIONS AND ESTIMATING

TUESDAYS, 6:30 to 8:30 p.m. Starting March 1, 1966

Brooklyn Union Gas Co. Auditorium, 195 Montague Street, Brooklyn, N. Y.

Course Coordinator: M. Isaacs, Amman & Whitney Tel. (212) WA 4-8282

This course will cover the basic role specifications play in the total construction concept. Discussions will follow on a general outline, specifications and estimating. Lectures will be given by a panel of speakers from the Metropolitan New York Chapter of the Construction Specification Institute except as noted.

- Mar. 1. Requirements of Specifications
 Relation to and part of general contract. Role of spec-ifications in construction concepts.
- 2. Mar. 8. Bidding Concepts

Information and requirements for making and submitting bids.

- Mar. 15. General Considerations
 Insurance, Payments, Extras, Partial and Final Completion.
- 4. Mar. 22. General Specifications Work required, Condition, Precautions, Safety, Governmental Regulations, Workmanship, Inspection, and Material Approval.

Mar. 29. Construction Specifications Owners detailed requirements for construction. Divided by type and class of work.

- Apr. 5. Drawings
 Relation to specifications Types and Classes of drawings.
- 7. Apr. 12. Estimating Part I Preliminary, comparative, Engineers estimates — use of drawings and specifications. Speaker: from Bechtel Corporation
- 8. Apr. 19. Estimating Part II Special precautions, temporary facilities, labor units.
- 9. Apr. 26. Estimating Part III Pricing, labor and job costs, profit, overhead, extras, design changes. Speaker: from Bechtel Corporation
- 10. May 3. Estimating Part IV Specific estimating problem—The Kitchensink Building.

The Institute of Electrical and Electronics Engineers, Inc. North Jersey Section

SPRING 1966

LECTURE SERIES

APPLICATION OF DIGITAL COMPUTERS

A Series of Nine Lectures

Starting on Thursday, February 17 and Ending on Thursday, April 21

TIME - 7:00 - 9:00 P.M.

LOCATION — N. J. Bell Telephone Company — Vail Hall 540 Broad Street, Newark, New Jersey

> PLEASE POST ON BULLETIN BOARD ALL COURSES OPEN TO THE PUBLIC

The Institute of Electrical and Electronics Engineers - North Jersey Section

Spring 1966 Lecture Series

APPLICATION OF DIGITAL COMPUTERS

The use of digital computers has found application in many varied parts of engineering practice today. The purpose of this lecture series is to show how digital computers may be used to facilitate solution of problems facing the engineering community. The course is not intended to teach computer design. This series will consist of nine lectures starting on February 17.

Lecture Number 1 . . . Thursday, February 17 Prof. Charles Doersam, Brooklyn Polytechnic Institute

Lecture Number 2 . . . Thursday, February 24 Prof. Charles Doersam, Brooklyn Polytechnic Institute

Lecture Number 3 . . . Thursday, March 3 To be announced Two lectures on the basic principles and concepts of stored program digital computer systems. They will include both the hardware and software aspects of computers and are intended to form a background of understanding and to familiarize the audience as to how computers may be used, their advantages and disadvantages.

Generalized data processing, contrasting the requirements of scientific vs. business computing systems.

Lecture Number 4 . . . Thursday, March 10 Robert Webber, Communications Systems, Inc.

Lecture Number 5 . . . Thursday, March 17 R. M. Graham, Project MAC, Massachusetts Institute of Technology

Lecture Number 6 . . . Thursday, March 31 W. B. Couch, IBM Corporation

Lecture Number 7 . . . Thursday, April 7 H. Mills, ITT Data and Information Systems Division

Lecture Number 8 . . . Thursday, April 14 Bates Murphy, Westinghouse Company

Lecture Number 9 . . . Thursday, April 21 J. Stuart Voorhis, Public Service Electric & Gas Company **Simulation.** How computers are used to simulate for the solution of engineering problems. Types of simulation, problems solved in simulation, simulation in real time systems.

Subscriber data processing, the time sharing concept. A computer utility. Operational problems. Present status and future trends.

Design automation, the use of computers to automate engineering design, manufacturing and testing.

Message Switching. Description of torn tape and electromechanical present day centers. Application of computers with emphasis of real time aspects. Communication center economics.

Process Control. Requirements. Computer application. Case study.

Power Distribution and Control. Background of power system problem. Use of central computer and data acquisition system. Operations control. Planning and accounting.

Place: N. J. Bell Telephone Company — Vail Hall

Time: 7:00 - 9:00 P.M.

Price:

Members: \$20.00, Non-members: \$30.00, \$5.00 discount for advance registration.

see next page for information.

Registration Information for IEEE North Jersey Section Spring 1966 Lecture Series "Application of Digital Computers"

Registration limited to 120 registrants.

Time:

7:00 - 9:00 P.M. starting Thursday, February 17, 1966

No lecture will be held on March 24, 1966 due to the IEEE Convention. Final lecture on Thursday, April 21, 1966.

Location:

N. J. Bell Telephone Company — Vail Hall, 540 Broad Street, Newark, New Jersey.

Registration Fee:

\$20.00 to Members IEEE, ASME, ASCE, AIME, NJSSPE, etc.

\$30.00 to Non-members. Non-members wishing to join IEEE may apply \$10.00 of their registration fee if they join IEEE during the duration of the Lecture Series. Please apply at door for refund.

For advanced registrants (registration received at least one week before the first session) there will be a \$5.00 discount, reducing the cost of the course to \$15.00 for Members and to \$25.00 for Non-members.

ADVANCED REGISTRATION FORM

Name	Position		Technical Society Affiliation
Company Affiliation		Location	
Telephone	Member \$15.00	□ Non-member \$25.00	

Send Registration Forms to and/or call the following for copy:

Mr. Charles G. Gorss Hewlett-Packard — Boonton Division Green Pond Road Rockaway, New Jersey 07866 627-6400 — Ext. 231 Mr. E. K. Van Tassel 3E-131 Bell Telephone Laboratories Whippany Road Whippany, New Jersey 887-1000 — Ext. 2414

Please make checks payable to: North Jersey Section IEEE

- Special Study Groups

SPRING — 1966

COURSE NO. 14

SWITCHGEAR AND CIRCUIT BREAKERS

WEDNESDAYS, 6:30 to 8:30 p.m. Starting March 2, 1966

Con Edison Co., Rm. 1701, 4 Irving Place, New York, N. Y. Course Coordinator: R. K. SULLIVAN, Con Edison Co. Tel. (212) 460-4689

This course provides a comprehensive review of the fundamental theory behind circuit interruption and familiarizes him with the electrical properties, mechanical operation, application and development of switchgear and circuit breakers.

1. Mar. 2. Introduction

Arc ionization, fundamentals of circuit breakers and switchgear.

Speaker: L. J. HOLLANDER, New York University

2. Mar. 9. Circuit Interruption

Voltage recovery, natural frequency of system, effects of resistors and asymmetrical currents. Speaker: L. J. HOLLANDER, New York University

3. Mar. 16. Switchgear Rating

Ratings — current, voltage and frequency. Speaker: from ITE Circuit Breaker Co.

4. Mar. 23. Kinematics of Switchgear

Closing and opening movement, speed, mechanical advantage, link pressure and stored energy.

Speakers: R. S. SMITHLEY AND W. G. HARLOW, Federal Pacific Electric Co.

5. Mar. 30. Medium Voltage Applications

Air magnetic, air blast, oil and vacuum breakers. Speaker: G. SAKATS, General Electric Co., Philadelphia, Pa.

6. Apr. 6. High Voltage Applications

Air blast, oil, sulfur hexafluoride and vacuum breakers. Speaker: R. A. BEDNARIK, Consolidated Edison Co.

7. Apr. 13. Switchgear Testing & Maintenance

Design, factory, and field testing. Speaker: R. E. BAUER, Consolidated Edison Co.

8. Apr. 20. Relays & Circuit Breakers-Part I

Protective and supervisory — line relaying, relay and breaker operating times and schemes. Speaker: J. L. BLACKBURN, Westinghouse Elec. Corp.

- 9. Apr. 27. Relays & Circuit Breakers-Part II Speaker: J. L. BLACKBURN, Westinghouse Elec. Corp.
- 10. May 4. New Development in EHV Switchgear Design Speaker: R. J. KATES, General Electric Co., Philadelphia, Pa.

COURSE NO. 15

MANAGEMENT

THURSDAYS, 6:30 to 8:30 p.m. Starting March 3, 1966

Consolidated Edison Co., Rm. 1101S, 4 Irving Place, New York, N. Y. Course Coordinator: R. CASTENSCHIOLD, Automatic Switch Co. Tel. (201) 377-4600

The course will be given by men from top industry management and outstanding academic institutions. Their knowledge and personal experiences will benefit those already in management and also provide a guide to individuals aspiring to become part of management.

1. Mar. 3. General Nature of Management Objectives and responsibilities of management to its owners, employees, customers and community. Speaker: L. E. THOMPSON, Associate Director Research Institute of America

2. Mar. 10. Organization

Principles of good organization and coordination of departmental functions.

Speaker: D. J. MCLAUGHLIN, Associate, McKinsey & Company, Inc.

3. Mar. 17. Effects of Business Size Differentiating problems and solutions for small, medium and large business. Adjusting to company growth. Speaker: PROF. S. RANHAND, Ph.D., C.P.A. City College of New York

 Mar. 24. Qualifications and Selection of Managers Executive qualifications, recruiting and developing managers.

Speaker: J. A. VAUGHN, Vice President Maxson Electronics Corp.

- 5. Mar. 31. Delegation of Authority Matching authority to responsibility for efficient performance. Criteria for sufficient and effective authority. Speaker: PROF. J. W. LORSCH, Harvard Business School, Boston, Mass.
- 6. Apr. 7. Human Relationship Psychology of personnel and labor-management relations. Speaker: PROF. J. H. METZLER, Newark College of Engineering
- 7. Apr. 14. Motivation of Employees Participative management, work procedures, incentives, communication and recognition. Speaker: PROF. J. H. METZLER, Newark College of Engineering
 - Apr. 21. Utilization of New Tools Where and how new computer techniques and data processing equipment should be applied. Speaker: W. H. MORROW, JR., Marketing Coordinator, International Business Machines Corp.

9. Apr. 28. Engineering Management

8.

Organizational setups and new programs for greater utilization of engineering and technical talent.

Speaker: W. M. GORYL, Associate Director, Esso Research & Engineering Co.

10. May 5. Planning Future Strategy

Planning for present operation, growth, change and emergency — and implementing the decision.

Speaker: PROF. R. T. LIVINGSTON, Columbia Univ. and The Livingston Institute PLEASE POST ON BULLETIN BOARD-ALL COURSES ARE OPEN TO THE PUBLIC

N.Y. Section, IEEE

EDUCATIONAL PROGRAM — SPRING — 1966

Power and Industrial Div.

GROUP IMPROV EMENT STUD

COURSE NO. 21

Speed Reading for Engineers

THURSDAYS, 6:30-8:30 p.m. Starting Feb. 24, 1966

Room 1806-S Con Edison Co., 4 Irving Place, N. Y. C.

Instructor: E. E. COING

Assistant to Director of Educational Work, Public Service Electric & Gas Co. Former member of NYU School of Commerce faculty. Has over 25 years experience teaching courses for business and industry.

This course is designed to help engineers to keep abreast of the literature in their fields, and of their general reading. It improves reading speed and retention through skills taught and practiced. It releases reading power held back by inefficient habits and attitudes. Engineers may expect improved speed in their reading, greater comprehension and retention of information, and an insight into the process of reading which will foster continuing individual growth.

- 1. Feb. 24. Introduction to Speeded Reading Objectives of the course; variables relative to rate, materials, and comprehension; Test for diagnosis of individual rate, comprehension, and vocabulary.
- Mar. 3. The First Step Individual analysis; using different methods to find the structural patterns of written materials.
- 3. Mar 10. Mechanics of Reading Role of the eyes and eyespan; using verbal and printed clues to structure.
- Mar. 17. Paragraph Patterns and Functions Using paragraph functions and patterns to identify organization and structure in materials.
- 5. Mar 24. Adjusting Rate Using paragraph functions as an aid to achieving optimal rate.
- Mar. 31. Article Patterns 6. Using the author's organization to get ideas more quickly.
- Apr. 7. Article Patterns 7. Using the author's organization to organize ideas into useful sequences and patterns for greater retention.
- Apr. 14. Summarizing Reducing ideas to basic components for more rapid and greater retention.
- Apr. 21. Broadening Horizons Reading to "keep up" and "get ahead". Evaluation and planning for continued improvement.
- 10. Apr. 28. **Evaluation and planning for continued** improvement

COURSE NO. 22

Theory and Mechanics of Jechnical Reports

WEDNESDAYS, 6:30-8:30 p.m. Starting Feb. 23, 1966

Room 1806-S Con Edison Co., 4 Irving Place, N. Y. C. Instructor: E. ALCOSSER, Sperry Gyroscope Co. A Study Group designed to provide training in the preparation and presentation of technical reports.

- Feb. 23. Introduction 1.1 Course description, purpose, communication of ideas.
- 2. Mar. 2. Written Communication Types, purpose and for whom.
- 3. Mar. 9. The Outline Purpose, value, mechanics—Use of
- Mar. 16. First Draft-Part | (General)—Style, grammar, effectiveness.
- 5. Mar. 23. First Draft—Part II (Specific)—Choosing the media, layout, illustrations.
- Mar. 30. Final Report 6. Draft review, production, final check.
- 7. Apr. 6. Oral Reports Principles of speaking, outline, presentation.
- Apr. 13. Preparation of Oral Report 8. Use of index cards, timing, use of aids.
- Apr. 20. Delivery of Student Reports Prepare short report (term project) for presentation and discussion.
- 10. Apr. 27. Delivery of Student Reports Prepare short report (term project) for presentation and discussion.

ADVANCE-REGISTRATION FORM

Name (printed)			
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I intend to apply	Dato By		



Metropolitan Section

COMPUTER GROUP

MASS MAGNETIC MEMORIES

Speaker:	DR. RABAH SHAHBENDER
Date:	Wednesday, January 26, 1966
Time:	8:00 P.M.
Place:	Arnold Auditorium Bell Telephone Laboratories Murray Hill, New Jersey

The integration of integrated magnetic structures with integrated semi-conductor circuitry is the key to realizing all-electronic mass memories. Monolithic ferrite arrays are being developed for operation in word organized systems with drive currents less than 50 milliamps. Particularly simple integrated semi-conductor structures are being investigated for driving the arrays.

A description of the magnetic stack and semi-conductor circuitry for a memory system with a capacity in excess of 10 million bits will be presented. Test data showing expected performance characteristics will be discussed.

DR. SHAHBENDER received his Ph.D. degree from the University of Illinois in 1951. He is presently Head of the Magnetic Memories and Devices Group in the Computer Research Laboratory of RCA Laboratories, Princeton, New Jersey. Dr. Shahbender has published a number of technical papers and holds several U. S. patents.

Pre-meeting Films:

The following films on magnetic cards and disks will be shown at ARNOLD AUDITORIUM starting at 7:15 P.M.

NCR's 315 System featuring CRAM — 26 minutes

IBM's 1301 Disk Storage Unit — 12 minutes

Pre-meeting Dinner: Time: 6:00 P.M. WALLY's Tavern on the Hill 154 Bonnie Burn Road Watchung, New Jersey GUESTS ARE WELCOME

STUDENT AFFAIRS

Recruiters Advise Students

"The senior is responsible for his own success."

- "The senior should prepare himself for the interview."
- "The recruiter is truly a friend and an advisor."

These comments together with many other valuable ideas were offered to seniors from Stevens, NCE, and Fairleigh Dickinson at the Annual Students Night of our section. About 100 visitors gathered in the FDU gymna6ium

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in Teaneck on December 3 to hear five speakers discuss "Recruiter: Roadblock or Booster?"

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Three industrial firms, one utility, and one of the Federal government's installations were represented at the meeting. Bob Donsi, Vice-Chairman of the FDU Student Chapter, moderated the program which began about 7:30 P.M. After the speakers had presented their views, questions from the audience were answered by the panel. The seniors had an additional opportunity to discuss recruiting with some of the section's members who attended the program and who joined the seniors for refreshments.

Ray Christiansen, of FDU, received an RCA Radiotron Designer's Handbook as the door prize winner.

General Electric's Mr. Norton noted that the recruiter represents all of his company's agencies when he interviews a senior. Thus the recruiter's interest in people, and fairness to the senior must be more than a personal preference.

Ed Gill from Western Electric Company's College Placement Department outlined some of the criteria applied by recruiters:

Class ranking (taking into consideration the college);

Extra-curricula activities (including leadership ability);

Previous work experience; and Motivation to work.

"The recruiter makes only one judgment," stated Clyde Ruffle from Public Service Electric and Gas Company's College Relations office. This decision includes additional meetings with the seniors at the company. These in-company interviews enable more people to size-up the student, and, in turn, permit more observations by the senior of what the company offers.

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Mr. Van Dyke of Picatinny Arsennal advised the seniors to be honest, to be prepared, and not to try to outguess the recruiter. The speakers agreed there are no set patterns for an interview but that open questions ("Tell me about your plans.") rather than closed questions ("Did you enjoy your circuit analysis course?") are normally used. Therefore he must take an even broader interest in his relationship to people and the colleges.

The student should never fear to ask questions, the answers to which will greatly influence his future.

Electronic Associates' Mr. Founs discussed the values of an advanced degree and of graduate study. Either way a senior should discuss with the interviewer his scholastic ambitions.

Summary. The recruiter can be an extremely valuable guide for a senior. He not only does his job for his employer, but he fcels obliged to aid the student so that eventually both the graduate and the new employer benefit from their association.

The entire N. J. Section offers a vote of thanks to Mr. James Earle of the NCE Electrical Engineering Department staff, for his efforts in organizing this program.

NEW FELLOWS OF THE IEEE

Continued from Page 4

P. K. TIEN For creativity and leadership in

advanced electronics. P. K. Tien is Head of the Electronics

Research Department at Bell Telephone Laboratories, Murray Hill, New Jersey.

Dr. Tien joined Bell Laboratories in 1952 and was concerned with microwave tube research, particularly traveling wave tubes. He has engaged in research work on electromagnetic propagation, non-linear theory, noise studies, parametric amplifiers, ferrite, ultrasonic waves, gas lasers and superconductors. He assumed his present post in 1962.

A native of Checkiang, China, Dr. Tien is a graduate of L'Institute Technique Franco-Chinois in Shanghai and received a B.S. degree in electrical engineering from National Central University, China, in 1942. He also received the M.S. and Ph.D. degrees in electrical engineering from Stanford University in 1948 and 1951, respectively.

Dr. Tien has been granted ten patents and has 4 patent applications pending. He is the author of a large number of published technical articles.

He is a member of the IEEE, the American Physical Society and is a delegate to the International Scientific Radio Union (U.R.S.I.). He is also a member of the scientific honor society Sigma Xi.

IEEE AWARD WINNERS

STEPHEN O. RICE Stephen O. Rice

To be presented

Mervin J. Kelly Award by IEEE

The Institute of Electrical and Electronics Engineers has announced that the 1965 Mervin J. Kelly Award will be presented to Stephen O. Rice of Bell Telephone Laboratories, Murray Hill, New Jersey.

Mr. Rice is a member of the technical staff and has been with Bell Laboratories, the research and development unit of the Bell System, since his graduate student days at California Institute of Technology. He has been concerned with nonlinear circuit theory and telephone transmission theory.

The Kelly Award, which also carries a stipend of \$1000, is being presented to Mr. Rice with this citation:

"For his outstanding and fundamental contributions in the field of communications, particularly in the understanding of the effects of noise."

Mr. Rice is a Member of the Technical Staff investigation of noise and his early paper on random noise is considered a classic in its field. The findings of Mr. Rice's work have been applied to many other problems.

In the spring term of 1958, Mr. Rice served as a Gordon McKay Visiting Lecturer in Applied Physics at Harvard University.

JACK A. MORTON Jack A. Morton To be presented David Sarnoff Award by IEEE

Jack A. Morton, Vice President of Electronic Components Development for Bell Telephone Laboratories, was awarded the Institute of Electrical and Electronics Engineers' David Sarnoff Award for 1965.

Mr. Morton, who has been with the Bell Telephone Laboratories for 29 years, is being presented the IEEE's award because of his "outstanding leadership and contributions to the development and understanding of solidstate electron devices."

After studying electrical engineering at Wayne University and receiving the B.S. degree in 1935, Mr. Morton received the M.S. degree in Engineering from the University of Michigan in 1936. He joined Bell Laboratories in 1936 but continued his post-graduate studies at Columbia University until 1941.

During the early part of his career with Bell Laboratories, Mr. Morton did research on coaxial cable repeaters and microwave amplifiers. During World War II, he concentrated on the development of radar receivers. After the war, he turned to electron tube development for the Bell System and designed the microwave tube which is the heart of the present transcontinental radio relay system for telephone and television transmission.

In 1948, Mr. Morton took charge of all development work on semiconductor devices. He assumed increasing responsibilities and in 1958 was elected Vice President of Electronic Component Development.

Mr. Morton has been awarded the honorary Doctor of Science degree by two universities; Ohio State University in 1954 and his alma mater, Wayne University, in 1956. He has been granted 14 patents and is the author of numerous articles.

IEEE GROUP CORRESPONDENCE Engineering Management Group PREIDICTIONS — FACT OR FANCY?

Some of the hazards faced by management people in predicting the reliability of components in a hardware system will be discussed by Mr. A. J. Finocchi, Director of Reliability Engineering for I.T.T. Federal Laboratories on January 20, 1966 at the United Engineering Center. This will be the subject of a meeting of the Engineering Management Group and is set for 8:00 P.M. in Room 125.

Mr. Finocchi, will stress above all the accuracy, dependability and usefulness of predictions rather than the methods by which the predictions are formulated. As an example, he will cite the problems of predicting system component behavior based on the previously established failure rates of the component piece parts.

Mr. Finocchi was the project engineer of the first commercial microwave link in the U. S. He is presently also the vice chairman of the I.T.T. International Reliability Committee.

NORTH JERSEY COMTEC MEETINGS

Date:	Tuesday, February 15, 1966
Subject:	Adaptive Communications
Speaker:	MICHAEL J. DITORO Cardion Electronics, Inc.
Place:	Bell Telephone Laboratories Murray Hill, New Jersey
Date:	Tuesday, April 19, 1966
Subject:	Cable Communications
Speaker:	F. T. ANDREWS, JR. Bell Telephone Laboratories
Place:	Communication Systems, Inc. Paramus, New Jersey

NEW JERSEY COAST

Wednesday,
January 19, 1966, 8:15 P.M.
Bell Telephone Laboratories Auditorium Holmdel, New Jersey
HERWIG KOGELNIK Bell Telephone Labs., Murray Hill, N. J.
Holography — Fundamentals and Demonstrations
Crystal Brook Inn
State Highway No. 35 Eatontown, N. J. For reservations call (201) 542-1441

N. Y. COMTEC

The Stored-Program Calculator As An Engineering Tool

The Meetings and Papers Committee of the Communications Technology Group will present a talk by Robert L. Price of Emtech Research Products Corporation on "The Stored-Program Calculator As An Engineering Tool" at the New York Telephone Company Little Theater, 140 West Street, on January 19th, 1966 at 7:00 P.M.

Mr. Price will include in his paper a brief description of the internal organization and operating speeds for a typical stored-program calculator. Programming philosophy, logic and machine language will also be discussed. There will be available a typical Mathatron desk top computer configuration which will demonstrate some of the principles discussed.

MR. PRICE received the Bachelor of Electrical Engineering Degree from Rensselaer Polytechnic Institute. He joined Emtech Research Products Corporation in 1964 as a systems sales engineer. At the present time Mr. Price is Manager of Systems Development for Emtech.

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Model 1416A speeds and simplifies such measurements as attenuation versus frequency or reflection coefficient versus frequency, when the indicator's horizontal circuits are swept by sweep oscillator in a test array, and its vertical circuits respond to the output of an appropriately connected detector. Reflection coefficients as low as 0.05 are easily read.

X and Y outputs are provided to make permanent records on an X-Y recorder. The Model 1416A Swept Frequency Indicator is priced at \$675.00.



MOSELEY INTRODUCES 11" STRIP-CHART RECORDERS.

Models 5702A/5703A are dual and single channel industrial strip-chart recorders designed for installation on industrial panels. They are supplied with a single span and single speed. The spans are provided by a plug-in range card which may be easily changed. This has the advantage of span variation without removing the instrument from the panel.

Isolated operation for long periods of time is possible with 185 foot roll charts and an ink reservoir capable of supplying ink for up to 135 rolls. High reliability is achieved by the all new solid-state circuitry, Zener reference and Moseley developed multi-contact flat mandrel potentiometers.

The tilt-out chart magazine locks in two extended positions, 30° and 45°. The chart may be manually advanced or rewound. A chart paper supply indicator and tear off device are standard features on both models.

The Models 5702A/5703A are 19" wide, 12-1/4" high and 13-3/4" deep. Model 5702A-2 Pen costs \$1895.00 and Model 5703A-1 Pen costs \$995.00. For complete information on both models, contact your RMC Field Engineer.



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