



**C. U. SHAH UNIVERSITY**



**C. U. SHAH UNIVERSITY  
WADHWAN CITY  
FACULTY OF SCIENCES**

**B.Sc.**

**SEM – IV**

**Syllabi (CBCS) of  
Physics  
WEF June 2016**



# C. U. SHAH UNIVERSITY

## FACULTY OF SCIENCES

### DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Waves and Optics

SUBJECT CODE: 4SC04WAO1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
Marks	Hrs	Marks	Hrs	Pr	TW								
3	0	0	3	3	30	1.5	70	3	--	--	--	100	

**Objectives:-**The general purpose of this course is

- To expose the student knowledge of superposition of waves, Nature of Light, Huygens Principle, Diffraction, polarization and interference, sound and acoustics of building, Resolving power of Lloyd's Mirror, Fresnel's Bi-prism, Telescope, Prism, Microscope, Grating and interferometer.

**Prerequisites:-**Fundamental knowledge of waves and optics.

**Course outline:-**

Sr. No.	Course Contents	Hours
1	<b>Superposition of Two Collinear Harmonic oscillations:</b> Linearity and Superposition Principle, (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). <b>Superposition of Two Perpendicular Harmonic Oscillations:</b> Graphical and Analytical Methods, Lissajous Figures with equal and unequal frequency and their uses.	06
2	<b>Sound:</b> Simple harmonic motion, forced vibrations and resonance, Fourier's Theorem, Application to saw tooth wave and square wave, Intensity and loudness of sound, Decibels, Intensity levels, musical notes, musical scale. Acoustics of buildings: Reverberation and time of reverberation, Absorption coefficient, Sabine's formula, measurement of reverberation time, Acoustic aspects of halls and auditoria.	07
3	<b>Diffraction:</b> Fraunhofer diffraction: Single slit, Double Slit, Multiple slits & Diffraction grating, Fresnel Diffraction: Half-period zones. Zone plate, Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. <b>Polarization:</b> Transverse nature of light waves. Plane polarized light, production and analysis. Circular and elliptical polarization.	16



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<b>4</b>	<p><b>Wave Optics:</b> Electromagnetic nature of light, Definition and Properties of wave front, Huygens Principle.</p> <p><b>Interference:</b> Interference: Division of amplitude and division of wavefront, Young's Double Slit experiment, Lloyd's Mirror and Fresnel's Biprism, Phase change on reflection: Stokes' treatment, Interference in Thin Films: parallel and wedge-shaped films, Fringes of equal inclination (Haidinger Fringes), Fringes of equal thickness (Fizeau Fringes), Newton's Rings: measurement of wavelength and refractive index.</p> <p><b>Michelson's Interferometer:</b> Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes.</p>	16
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**Learning Outcomes:-**After successful completion of this course, students have:

- Knowledge of superposition of waves, nature of light, Huygens principle, diffraction, polarization and interference, sound and acoustics of building, optical instruments.

### **Books Recommended:-**

1. 'Fundamentals of Optics', **Francis Arthur Jenkins and Harvey Elliott White**, McGraw Hill.
2. 'Optics', **Ajoy Ghatak**, Tata McGraw Hill.
3. 'Optics', **Eugene Hecht and A. R. Ganesan**, Pearson Education.
4. 'Light and Optics: Principles and Practices', **Abdul Al-Azzawi**, CRC Press.
5. 'Contemporary Optics', **A. K. Ghatak and K. Thyagarajan**, Plenum Press.
6. 'Fundamentals of Optics', **H. R. Gulati and G. R. Khanna**, R. Chand Pub.
7. 'Principles of Optics', **B.K. Mathur**, Gopal Printing, (1995).
8. 'University Physics', **F. W. Sears, M. W. Zemansky and H. D. Young**, Addison Wesley.
9. 'A textbook of Optics', **N. Subrahmanyam, Brij Lal and M. N. Avadhanulu**, S. Chand and Company Ltd.
10. 'Optics and Spectroscopy', **R. Murugesan and K. Sivaprashatha**, S. Chand and Company Ltd.
11. 'Handbook of Optics-Vol. I to IV', **Michael Bass**, McGraw Hill.

### **E-Resources:-**

1. <http://pms.iitk.ernet.in/wiki/index.php/Physics>
2. [www.wikipedia encyclopaedia](http://www.wikipedia.org)
3. [www.physic.about.com](http://www.physic.about.com)
4. [www.physic.org](http://www.physic.org)
5. [www.Physicsclassroom.com](http://www.Physicsclassroom.com)
6. [www.howstuffwork.com](http://www.howstuffwork.com)
7. [www.colorado.edu/physics/2000](http://www.colorado.edu/physics/2000)
8. [www.ndrs.org.physic.com](http://www.ndrs.org.physic.com)
9. [www.physlinc.com](http://www.physlinc.com)
10. [www.fearophysic.com](http://www.fearophysic.com)
11. [www.hyperphysics.com](http://www.hyperphysics.com)

### **Useful CD Rom for e-learning:-**

1. Hyper Physics.
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3. Physics Encyclopaedia.
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# C. U. SHAH UNIVERSITY

## **FACULTY OF SCIENCES**

### **DEPARTMENT OF PHYSICS**

**COURSE: B.Sc.**

**SEMESTER: IV**

**SUBJECT NAME: Analog and Digital Electronics**

**SUBJECT CODE: 4SC04ADE1**

**Teaching & Evaluation Scheme:-**

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
3	0	0	3	3	30	1.5	70	3	--	--	--	100	

**Objectives:-**The general purpose of this course is

- To expose the student knowledge of Transistor Biasing ,Parameters, Stability Factor, Method of Transistor Biasing, Practical Circuit of Transistor Amplifier, Classification of Amplifiers, Frequency response and Bandwidth.
- To expose the student knowledge of Analog and Digital Systems and Different types of Gates, advantages of JFET, MOSFET, UJT and Thermistor.

**Prerequisites:-**Fundamental knowledge of Electronics.

**Course outline:-**

Sr. No.	Course Contents	Hours
<b>1</b>	Basic common emitter amplifier circuit, load line analysis, operating point, cut off and saturation points, common base configuration, Transistor biasing, inherent variations of transistor parameters, stabilization, stability factor, method of transistor biasing, base resistor method, biasing with feedback resistor, voltage divider bias method, design of transistor biasing circuits, single stage transistor amplifier, phase reversal, voltage gain, classification of amplifiers, frequency response and bandwidth.	15
<b>2</b>	Types of Field Effect Transistors, Junction Field Effect Transistor, Working Principle, Symbol and Importance of JFET, Difference Between JFET and Bipolar Transistor, Output Characteristics of JFET, Advantage of JFET, Parameters of JFET (only definition), MOSFET, Unijunction Transistor, Equivalent Circuit of a UJT, Characteristics of UJT, Advantage and Application of UJT, Thermistor.	15
<b>3</b>	Characteristics of an Ideal and Practical Op-Amp (IC741), Open-loop and Closed-loop Gain. CMRR, concept of Virtual ground, Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator and (6) Zero Crossing Detector. <b>Sinusoidal Oscillators:</b> Barkhausen's criterion for self-sustained Oscillations, Determination of frequency of RC oscillator	15



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4	Analog and Digital Signal, Binary Number System, Logic Gates, OR Gate, AND Gate, NOT Gate, Combination of basic logic gate, NAND gate as Universal gate XOR and XNOR gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Fundamental Products, Minterms and Maxterms, Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map, Binary Addition, Binary Subtraction using 2's Complement Method, Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor.	15
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**Learning Outcomes:-**After successful completion of this course, students have:

- Knowledge of Different types of Biasing, and amplifier circuits and its application.
- Knowledge of JFET, MOSFET, UJT, Thermistor and its characteristic and application.
- Knowledge of Analog and Digital System and Different types of Gates.

**Books Recommended:-**

1. 'Principles of Electronics', **V. K. Mehta and Rohit Mehta**, *S. Chand and Company Ltd.*
2. 'Industrial Electronics and Control', **S. K. Bhattacharya and S. Chatterjee**, *Tata McGraw Hill.*
3. 'Basic Electronics (Solid State)', **B. L. Theraja**, *S. Chand and Company Ltd.*
4. 'Digital Electronics', **A. P. Malvino**, *McGraw Hill International Ed.*
5. 'Principal of Electronics', **A. P. Malvino**, *McGraw Hill International Ed.*
6. 'Electronic Devices and Circuits', **Allen Mottershad**, *Prentice Hall of India.*
7. 'Communication Electronics', **Louis E Frenzel**, *Tata McGraw Hill Pub.*
8. 'Integrated Electronics', **J. Millman and C. C. Halkias**, *Tata McGraw Hill.*
9. 'Electronic Devices and Circuits', **S. Salivahanan and N. Suresh Kumar**, *Tata McGraw Hill.*
10. 'Microelectronic Circuits', **M. H. Rashid**, 2<sup>nd</sup> Ed., *Cengage Learning.*
11. 'Modern Electronic Instrumentation and Measurement Techniques', **Helfrick and Cooper**, *PHI Learning.*
12. 'Digital Principles & Applications', **A. P. Malvino, D. P. Leach and Saha**, *Tata McGraw Hill.*
13. 'Microelectronic Circuits', **A. S. Sedra, K. C. Smith and A. N. Chandorkar**, 6<sup>th</sup> Ed., *Oxford University Press.*
14. 'Fundamentals of Digital Circuits', **A. Anand Kumar**, 2<sup>nd</sup> Ed., *PHI Learning Pvt. Ltd.*

**E-Resources:-**

1. <http://pms.iitk.ernet.in/wiki/index.php/Physics>
2. [www.wikipedia.org](http://www.wikipedia.org)
3. [www.physic.about.com](http://www.physic.about.com)
4. [www.physic.org](http://www.physic.org)
5. [www.Physicsclassroom.com](http://www.Physicsclassroom.com)
6. [www.howstuffwork.com](http://www.howstuffwork.com)
7. [www.colorado.edu/physics/2000](http://www.colorado.edu/physics/2000)
8. [www.ndrs.org.physic.com](http://www.ndrs.org.physic.com)
9. [www.physlinc.com](http://www.physlinc.com)
10. [www.fearophysic.com](http://www.fearophysic.com)
11. [www.hyperphysics.com](http://www.hyperphysics.com)

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1. Hyper Physics.
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# C. U. SHAH UNIVERSITY

## FACULTY OF SCIENCES

### DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Applied Optics

SUBJECT CODE: 4SC04APO1

#### Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
3	0	0	3	3	30	1.5	70	3	--	--	--	100	

**Objectives:-**The general purpose of this course is

- To expose the student knowledge of Laser and its application.
- To expose the student knowledge of Fourier optics.
- To expose the student knowledge of Laws of Fibre optics its different modes of propagation and its types related to Refractive index and its application.
- To expose the student knowledge of Principle of Holography, Theory of Holography.

**Prerequisites:-**Fundamental knowledge of Laser physics and fibre optics.

#### Course outline:-

Sr. No.	Course Contents	Hours
1	<b>Laser</b> Interaction of Radiation with Mater, Einstein Relations, Light Amplification & Conditions, Population Inversion, Pumping, Metastable States, The Principal Pumping Schemes, Optical Resonant, Types of Lasers, Ruby Laser, Nd-YAG Laser, Helium-Neon Laser, Semiconductor Laser, PN-Junction Laser Applications.	15
2	<b>Fourier Optics</b> Concept of Spatial frequency filtering, Fourier transforming property of a thin lens	08
3	<b>Optical Fibre</b> Optical fibres and their properties, Principal of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating, Applications, Fibre Optic in Communication, Advantages	12
4	<b>Holography</b> Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry and character recognition	10

**Learning Outcomes:-**After successful completion of this course, students have:

- Knowledge of Laser its Application and its Types.
- Knowledge of Fourier Optics.
- Knowledge of optical fibre and its application in Communication.
- Knowledge of Holography.



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### Books Recommended:-

1. 'A textbook of Optics', **N. Subrahmanyam, Brij Lal and M. N. Avadhanulu**, *S. Chand and Company Ltd.*
2. 'Fundamentals of Optics', **Francis Arthur Jenkins and Harvey Elliott White**, *McGraw Hill.*
3. 'Optics', **Ajoy Ghatak**, *Tata McGraw Hill.*
4. 'Fundamental of Optics', **D. R. Khanna and H. R. Gulati**, *S. Chand and Company Ltd.*
5. 'Elements of Spectroscopy', **Gupta, Kumar and Sharma**, *Pragati Prakashan.*
6. 'Atomic Physics', **J. B. Rajam**, *S. Chand and Company Ltd.*
7. 'Optics and Spectroscopy', **R. Murugesan and K. Sivaprashatha**, *S. Chand and Company Ltd.*
8. 'Handbook of Optics-Vol. I to IV', **Michael Bass**, *McGraw Hill.*
9. 'LASERS: Fundamentals and Applications', **K. Thyagrajan and A. K. Ghatak**, *Tata McGraw Hill.*
10. 'Fibre Optics through Experiments', **M. R. Shenoy, S. K. Khijwania et. al.**, *Viva Books.*
11. 'Nonlinear Optics', **Robert W. Boyd**, (Chapter-I), *Elsevier* (2008).
12. 'Optics Learning by Computing with Model Examples', **Karl Dieter Moller**, *Springer* (2007).
13. 'Optical Systems and Processes', **Joseph Shamir**, *PHI Learning Pvt. Ltd.*
14. 'Optoelectronic Devices and Systems', **S. C. Gupta**, *PHI Learning Pvt. Ltd.*
15. 'Optical Physics', **A. Lipson, S. G. Lipson and H. Lipson**, 4<sup>th</sup> Ed., *Cambridge Univ. Press.*

### E-Resources:-

1. <http://pms.iitk.ernet.in/wiki/index.php/Physics>
2. [www.wikipedia encyclopaedia](http://www.wikipedia.org)
3. [www.physic.about.com](http://www.physic.about.com)
4. [www.physic.org](http://www.physic.org)
5. [www.Physicsclassroom.com](http://www.Physicsclassroom.com)
6. [www.howstuffwork.com](http://www.howstuffwork.com)
7. [www.colorado.edu/physics/2000](http://www.colorado.edu/physics/2000)
8. [www.ndrs.org.physic.com](http://www.ndrs.org.physic.com)
9. [www.physlinc.com](http://www.physlinc.com)
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11. [www.hyperphysics.com](http://www.hyperphysics.com)

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# C. U. SHAH UNIVERSITY

## FACULTY OF SCIENCES DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Weather Forecasting

SUBJECT CODE: 4SC04WEF1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
3	0	0	3	3	30	1.5	70	3	--	--	--	100

**Objectives:-**The general purpose of this course is

- To expose the student knowledge of weather forecasting.

**Prerequisites:-**Fundamental knowledge of weather forecasting.

**Course outline:-**

Sr. No.	Course Contents	Hours
1	<b>Introduction to atmosphere</b> Elementary idea of atmosphere: physical structure and composition, compositional layering of the atmosphere, variation of pressure and temperature with height, air temperature, requirements to measure air temperature, temperature sensors: types, atmospheric pressure: its measurement, cyclones and anticyclones: its characteristics.	13
2	<b>Measuring the weather</b> Wind, forces acting to produce wind, wind speed direction: units, its direction; measuring wind speed and direction; humidity, clouds and rainfall, radiation: absorption, emission and scattering in atmosphere; radiation laws. <b>Weather systems</b> Global wind systems, air masses and fronts: classifications, jet streams, local thunderstorms, tropical cyclones: classification, tornadoes, hurricanes.	10
3	<b>Climate and Climate Change</b> Climate: its classification, causes of climate change, global warming and its outcomes, air pollution; aerosols, ozone depletion, acid rain, environmental issues related to climate.	10
4	<b>Basics of weather forecasting</b> Weather forecasting: analysis and its historical background, need of measuring weather, types of weather forecasting, weather forecasting methods, criteria of choosing weather station, basics of choosing site and exposure, satellites observations in weather forecasting, weather maps; uncertainty and predictability, probability forecasts.	12

**Learning Outcomes:-**After successful completion of this course, students have:

- Knowledge of weather forecasting.

**Books Recommended:-**

- 'Aviation Meteorology', I. C. Joshi, 3<sup>rd</sup> Ed., Himalayan Books.
- 'The weather Observers Handbook', Stephen Burt, Cambridge University Press.





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1. 'Meteorology', **S. R. Ghadekar**, *Agromet Publishers, Nagpur.*
2. 'Text Book of Agrometeorology', **S. R. Ghadekar**, *Agromet Publishers, Nagpur.*
3. 'Why the weather', **Charls Franklin Brooks**, *Chpraman and Hall, London.*
4. 'Atmosphere and Ocean', **John G. Harvey**, *The Artemis Press.*

### **E-Resources:-**

1. <http://pms.iitk.ernet.in/wiki/index.php/Physics>
2. [www.wikipedia encyclopaedia](http://www.wikipedia.org)
3. [www.physic.about.com](http://www.physic.about.com)
4. [www.physic.org](http://www.physic.org)
5. [www.Physicsclassroom.com](http://www.Physicsclassroom.com)
6. [www.howstuffwork.com](http://www.howstuffwork.com)
7. [www.colorado.edu/physics/2000](http://www.colorado.edu/physics/2000)
8. [www.ndrs.org.physic.com](http://www.ndrs.org.physic.com)
9. [www.physlinc.com](http://www.physlinc.com)
10. [www.fearophysic.com](http://www.fearophysic.com)
11. [www.hyperphysics.com](http://www.hyperphysics.com)

### **Useful CD Rom for e-learning:-**

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3. Physics Encyclopaedia.
4. Virtual Physics Junior (Original PC CD Rom).
5. Encyclopaedia Britannica-2008.



# C. U. SHAH UNIVERSITY

## FACULTY OF SCIENCES DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Physics Practical-IV

SUBJECT CODE: 4SC04PPR1

### Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
0	0	6	6	3	--	--	--	--	20	10	70	100	

**Objectives:-**The general purpose of this course is

- To expose the student knowledge of practical's related to theory of physics.

**Prerequisites:-**Fundamental knowledge of physics practical.

### Course outline:-

Sr. No.	Course Contents
1	Determination of the grating radial spacing of the CD by reflection using He-Ne or solid state laser.
2	To find the width of wire or width of slit using diffraction pattern obtained by He-Ne or solid state laser.
3	To study the frequency response of a common source FET amplifier.
4	To study the characteristics of field effect transistor and determination of $\mu$ , $r_d$ and $g_m$ .
5	Familiarization with Schuster's focusing and determination of angle of prism.
6	To determine the resolving power of a prism.
7	To determine the wavelength of sodium light using Fresnel's Bi-prism.
8	To verify and design AND, OR, NOT and XOR gates using NAND gates.
9	To minimize a given logic circuit.
10	To study Half adder, Full adder and 4-bit binary adder.
11	To design an Astable multivibrator of given specifications using 555 timer.
12	To design a monostable multivibrator of given specifications using 555 timer.
13	To design an inverting amplifier of a given gain using OPAMP-741 and study its frequency response.
14	To design a non-inverting amplifier of a given gain using OPAMP-741 and study its frequency response.
15	To study the dispersion spectrum by a prism.

\* 15% of new experiments can be introduced AND/OR replaced as per the need, with the permission of the Head.

**Learning Outcomes:-**After successful completion of this course, students have:

- Knowledge of Practical related to theory of Physics and its application in various fields.

### Books Recommended:-

- 'B. Sc. Practical Physics', C. L. Arora, S. Chand and Company Ltd.
- 'Advanced Practical Physics', M. S. Chauhan and S. P. Sing, Pragati Prakashan.



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3. 'Experimental Physics', **University Granth Nirman Board**, (Gujarati Medium).
4. 'Physics through experiments Vol. I & II', **B. Saraf et al.**, *Vikas Publishing House*.
5. 'Advanced Practical Physics', **S. L. Gupta and V. Kumar**, *Pragati Prakashan*.
6. 'An advanced course in practical Physics', **D. Chattopadhyay and P. C. Rakshit**, *New Central Book Agency Pvt. Ltd.*
7. 'Electronic Laboratory Primer', **Poorna Chandra and Sasikala**, *S. Chand and Company Ltd.*
8. 'Advanced Practical Physics for Students', **B. L. Wosnop and H. T. Flint**, *Asia Publishing House*.
9. 'Advanced Level Physics Practicals', **Michael Nelson and Jon M. Ogborn**, 4<sup>th</sup> Ed., *Heinemann Educational Publishers*.
10. 'Engineering Practical Physics', **S. Panigrahi and B. Mallick**, *Cengage Learning India Pvt. Ltd.*
11. 'A Text Book of Practical Physics', **Indu Prakash and Ramakrishna**, 11<sup>th</sup> Ed., *Kitab Mahal*.
12. 'A Laboratory Manual of Physics for Undergraduate Classes', **D. P. Khandelwal**, *Vani Publication*.
13. 'Basic Electronics: A Text Lab Manual', **P. B. Zbar, A. P. Malvino and M. A. Miller**, *McGraw Hill*.

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1. <http://pms.iitk.ernet.in/wiki/index.php/Physics>
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4. [www.physic.org](http://www.physic.org)
5. [www.Physicsclassroom.com](http://www.Physicsclassroom.com)
6. [www.howstuffwork.com](http://www.howstuffwork.com)
7. [www.colorado.edu/physics/2000](http://www.colorado.edu/physics/2000)
8. [www.ndrs.org.physic.com](http://www.ndrs.org.physic.com)
9. [www.physlinc.com](http://www.physlinc.com)
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