



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SUBJECT NAME: Optics

SEMESTER: IV

SUBJECT CODE: 4SC04PHC1

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 Nature of Light, Huygens Principle, Fermat's Principle, Optical Path, Fermat's Principle, Reflection and Refraction.
- To expose the student knowledge of Diffraction, Fresnel's Explanation of the rectilinear propagation of Light, Zone plate & convex lens and Theory of Grating.
- To expose the student knowledge of Resolving power of Telescope, Prism, Microscope, Grating.

Prerequisites:-Fundamental knowledge of optics.

Course outline:-

| Sr. No. | Course Contents |
|---------|--|
| 1 | Nature of Light, Theories of Light, Electromagnetic Nature of Light, Definition of a Wave Front, Propagation of a Wave Front, Huygens Principle of Secondary Wavelets, Fermat's Principle, Optical Path, Fermat's Principle of Least Time or Extremum Path, Examples of Fermat's Principle, Reflection and Refraction. |
| 2 | Introduction, Two Types of Diffraction, Fresnel's Explanation of the Rectilinear propagation of Light, Zone plate, Action of Zone plate, Comparison between Zone plate & Convex lens. |



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| 3 | Fraunhofer Diffraction at Double Slit(Geometry Method), Plane diffraction Grating, Theory of Grating, Determination of wavelength, Prism & Grating spectra(Brief). |
| 4 | Resolving power, Rayleigh's Criteria for resolution, Resolving power of Telescope, Resolving power of Microscope, Ways of Increasing resolution, Resolving power of Prism, Resolving power of Grating. |

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

- Knowledge of Nature of Light, Diffraction and different principle of it, Resolving power of different Measuring 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 & K. Thyagarajan**, *Plenum Press*.
6. 'Introduction to Optics', **Khanna and Gulati**, *R.Chand*.

E-Resources:-

1. www.physic.about.com
2. www.physic.org
3. www.Physicsclassroom.com
4. www.howstuffwork.com
5. www.colorado.edu/physics/2000
6. www.ndrs.org.physic.com
7. www.physlinc.com
8. www.fearophysic.com
9. www.hyper.physics.com



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SUBJECT NAME: Laser and Fiber Optics

SEMESTER: IV

SUBJECT CODE: 4SC04PHC2

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 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 and Fibre Optics.

Course outline:-

| Sr. No. | Course Contents |
|---------|--|
| 1 | 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. |
| 2 | Optical Fibers, Critical Angle of Propagation, Modes of Propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Types of Optical Fibers, Application. |
| 3 | Illumination & Image Transmission, Optical Communications, Optical fibre sensors, Medical Applications, Military Application, Fibre Optic in Communication, Advantages. |



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| 4 | Holography |
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| | Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. |
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Learning Outcomes:-After successful completion of this course, students have:

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

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 & K. Thyagarajan**, *Plenum Press*.
6. 'Introduction to Optics', **Khanna and Gulati, R. Chand**.

E-Resources:-

1. www.physic.about.com
2. www.physic.org
3. www.Physicsclassroom.com
4. www.howstuffwork.com
5. www.colorado.edu/physics/2000
6. www.ndrs.org.physic.com
7. www.physlinc.com
8. www.fearophysic.com
9. www.hyperphysics.com



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FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Electronics

SUBJECT CODE: 4SC04PHE1

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 & Bandwidth.
- To expose the student knowledge of Analog and Digital Systems and Different types of Gates.
- To expose the student knowledge of Advantages of JFET, MOSFET, UJT and Thermistor.

Prerequisites:-Fundamental knowledge of Electronics.

Course outline:-

| Sr. No. | Course Contents |
|---------|--|
| 1 | 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, How Transistor Amplifier, Practical Circuit of Transistor Amplifier, Phase Reversal, Load Line Analysis, Voltage Gain, Classification of Amplifiers, Frequency response & Bandwidth. |



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| 2 | Types of Field Effect Transistors, Junction Field Effect Transistor, Working Principle of JFET, Symbol, Importance of JFET, Difference Between JFET and Bipolar Transistor, Output Characteristics of JFET. |
| 3 | Advantage of JFET, Parameters of JFET (only definition), MOSFET, Uni junction Transistor, Equivalent Circuit of a UJT, Characteristics of UJT, Advantage & Application of UJT, Thermistor. |
| 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. |

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 & Rohit Mehta**, S. Chand Company.
2. 'University Physics', **Sears, Zeemansky and Young**, Narosa Publishing.
3. 'Physics', **Halliday and Resnick**, John Wiley.
4. 'Properties of Matter', **Mathur**, S. Chand.
5. 'Electronic Devices & Circuits', **Allen Mottershad**, Good year publishing company.
6. 'Electronic Devices & Circuits Theory', **Boylesad & Nashelsky**, Pearson Education Canada.
7. 'Classical Electrodynamics', **J. D. Jackson**, Prentice hall, Englewood Cliffs. N.J.
8. 'Heat and Thermodynamics', **Mark W. Zeemansky**, Special Indian Edition.
1. 'A Text Book of Quantum Mechanics', **Methue & Venktesn**, Tata McGraw Hill, New Delhi.
9. 'Principles of Optics', **Mathur & Pandya**, Tata McGraw hill.
10. 'Atomic Physics', **J. B. Rajam**, S. Chand & Company Ltd.
11. 'Electricity and Magnetism', **Berkeley**, Physics course.
12. 'Modern Engineering Physics', **A. S. Vasudeva**, S. Chand Company.
13. 'Engineering Physics', **M. N. Avadhanulu & P. G. Kshirsagar**, S. Chand.
14. 'Optical Electronics', **A. K. Ghatak and K. Thyagarajan**, Cambridge University Press (UK) 1989; Reprinted by Foundation Books, India.

E-Resources:-

1. www.physic.about.com
2. www.physic.org
3. www.Physicsclassroom.com
4. www.howstuffwork.com
5. www.colorado.edu/physics/2000
6. www.ndrs.org.physic.com



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7. www.physlinc.com
8. www.fearophysic.com
9. [www.hyper physics.com](http://www.hyperphysics.com)



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FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Mechanics of Particles

SUBJECT CODE: 4SC04PHE2

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 Work and Energy Theorem.
- To expose the student knowledge of Gravitational Potential Energy, Elastic Potential Energy, Law of Conservation of Energy, Centre of Mass, Kepler's Laws.
- To expose the student knowledge of Inertial Frames and Galilean Transformations.
- To expose the student knowledge of Theory of Relativity.

Prerequisites:-Fundamental knowledge of Mechanics of Particles.

Course outline:-

| Sr. No. | Course Contents |
|---------|--|
| 1 | Fundamentals of Dynamics Dynamics of a System of Particles. Centre of Mass. Conservation of Momentum. Idea of Conservation of Momentum from Newton's Third Law. Impulse. Momentum of Variable Mass System: Motion of Rocket. |



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| 2 | Work and Energy Theorem Gravitational Potential Energy. Elastic Potential Energy. Force as Gradient of Potential Energy. Work and Potential energy. Work done by Non-conservative Forces. Law of Conservation of Energy, Elastic and Inelastic Collisions between particles. Centre of Mass and Laboratory Frames. Motion of a Particle under Central Force Field. Two Body Problem and its Reduction to One Body Problem and its Solution. The Energy Equation and Energy Diagram, Kepler's Laws (Ideas Only). Orbits of Artificial Satellites. |
| 3 | Reference Frames Inertial Frames and Galilean Transformations. Galilean Invariance and Conservation Laws. Non-inertial Frames and Fictitious Forces. Uniformly Rotating Frame. Physics Laws in Rotating Coordinate Systems. Centrifugal forces: Coriolis Force and its Applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems. |
| 4 | Theory of Relativity Michelson-Morley Experiment and its Outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and Order of Events. Lorentz Contraction. Time Dilation. Relativistic Transformation of Velocity, Frequency and Wave Number. Relativistic Addition of Velocities. Variation of Mass with Velocity. Rest Mass. Massless Particles. Mass-energy Equivalence. |

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

- Knowledge of Work and Energy Theorem.
- Knowledge of Gravitational Potential Energy, Elastic Potential Energy, Law of Conservation of Energy, Centre of Mass, Kepler's Laws.
- Knowledge of Inertial Frames and Galilean Transformations.
- Knowledge of Theory of Relativity.

Books Recommended:-

1. 'An introduction to mechanics', **Daniel Kleppner, Robert J. Kolenkow**, McGraw-Hill.
2. 'Mechanics Berkeley physics course', **Charles Kittel, Walter Knight, Malvin Ruderman, Carl Helmholtz, Burton Moyer**, Tata McGraw-Hill.
3. 'Mechanics', **D. S. Mathur**, S. Chand & Company Limited.
4. 'Mechanics', **Keith R. Symon**, Addison Wesley.
5. 'University Physics', **F. W. Sears, M. W. Zemansky and H. D. Young**, Narosa Publishing House.



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E-Resources:-

1. www.physic.about.com
2. www.physic.org
3. www.Physicsclassroom.com
4. www.howstuffwork.com
5. www.colorado.edu/physics/2000
6. www.ndrs.org.physic.com
7. www.physlinc.com
8. www.fearophysic.com
9. www.hyperphysics.com



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FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Physics Practical-IV SUBJECT CODE: 4SC04PHP1

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 | 4 | 4 | 2 | -- | -- | -- | -- | 10 | 10 | 30 | 50 |

Objectives:-The general purpose of this course is

- To expose the student knowledge of Practical's related to theory of Physics.

Prerequisites:-Fundamentalknowledge of Physics Practical.

Course outline:-

| Sr. No. | Course Contents |
|---------|---|
| 1 | Determine the modulus of rigidity by Maxwell's needle. |
| 2 | Determine the modulus of rigidity by Statistical method. |
| 3 | Find the focal length & Refractive index of Convex lens by Optical lever. |
| 4 | Determination of λ using mercury light by Diffraction gratings. |
| 5 | Resolving power of prism. |
| 6 | Resolving power of telescope. |
| 7 | Energy band gap of thermistor. |
| 8 | Study of Characteristics of Solar Cell. |
| 9 | Characteristics of Field Effect Transistor. Determination μ , r_d , g_m . |
| 10 | Characteristics of Uni Junction Transistor. |
| 11 | Verification of truth table of AND, OR, NOT, NAND & NOR gate. |
| 12 | NAND gate as Universal gate. |
| 13 | Study of Zener Diode as voltage regulating characteristics. |



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| 14 | Study of Characteristics Photo Transister. |
| 15 | FET as Valtmeter. |
| 16 | e/m by Thomson's method. |

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:-

1. 'Practical Physics', **C. L. Arora**, *S. Chand Comp.*
2. 'Advanced Practical Physics', **Chauhan & Singh**, *PragatiPracation.*
3. 'Physics through experiments', B. Sarafetlal, Vol. I & II.
4. 'Practical Physics', **Chattopadhyaya, Rakshit&Saha.**

E-Resources:-

1. www.physic.about.com
2. www.physic.org
3. www.Physicsclassroom.com
4. www.howstuffwork.com
5. www.colorado.edu/physics/2000
6. www.ndrs.org.physic.com
7. www.physlinc.com
8. www.fearophysic.com
9. www.hyperphysics.com



FACULTY OF SCIENCE

COURSE: B.Sc.

SEMESTER: IV

SUBJECT NAME: Professional Communication Skills (PCS)

SUBJECT CODE: 4SC04PCS1

Teaching & Evaluation Scheme:-

| Teaching Scheme | | | | Credit | Evaluation Scheme | | | | | | |
|-----------------|----|----|-------|--------|-------------------|-----|----------------|-----|-----------|--------------------------------|-------|
| Th | Tu | Pr | Total | | Th | Hrs | Sessional Exam | Hrs | Term Work | Practical / Comprehensive Viva | Total |
| 02 | 02 | -- | 04 | 03 | 70 | 3 | 30 | 1.5 | 20 | 30 | 150 |

Objectives:

- To give a global competitive edge to the students by way of honing their Professional Communication Skills.
- To make them aware of the societal setting of the professional life.
- To train them in basic fundamentals skills of Communication – LSRW

Prerequisites:

- Students should have basic knowledge of English Language and grammar.
- Students should have ability to speak and write correct sentences in their day to day language.
- Students should be familiar with correct usage of language.

Course outline:

| Sr. No. | Course Content (Title of the Unit) | Minimum Number of Hours |
|---------|---|-------------------------|
| 0 | Prerequisites | 02 |
| 1 | Behavioural Communication | 08 |
| 2 | Mastering LSRW Skills | 05 |
| 3 | Presentation Skills | 05 |
| 4 | Reading Skill | 03 |
| 5 | Writing Skill | 10 |
| 6 | Learning Phonetics for Effective Speaking | 06 |
| 7 | Revision of Grammar | 06 |
| 8 | Vocabulary Building | 03 |
| | PART-B Prose and Poetry | 12 |
| 9 | One Act Play | |
| 10 | Poems | |
| | Total Hours | 60 |



Detail Course Content:

| Unit No. | Content In Details Including Its Sub Topics |
|-----------------|---|
| | PART – A Professional Communication |
| 1 | Behavioural Communication <ul style="list-style-type: none"> Basics of Behavioral Communication Importance of Behavioral Communication in Professional World Types of Behavioral Communication Verbal Communication v/s Non Verbal Communication Grooming and Etiquettes |
| 2 | Mastering LSRW Skills <ul style="list-style-type: none"> Story Making and Telling Movie Review (Writing and Speaking) Book Review (Writing and Speaking) |
| 3 | Presentation Skills <ul style="list-style-type: none"> What is presentation? Purpose of Presentation Preparatory Steps of Presentation Nuances of Delivery Importance of Audio-Visual Aids in Presentation |
| 4 | Business & Technical Letter Writing <ul style="list-style-type: none"> Introduction to Letter Writing Personal Letter Vs Business Letter Style of writing Business Letter Principles of writing Business Letter Layout of Business Letter Types of Letter – Inquiry, Order, Quotation, Claim & Adjustment, Sales Letter Report Writing: <ul style="list-style-type: none"> What is Report? Characteristics of Report Types of Informal Reports |
| 6 | Learning Phonetics for Effective Speaking <ul style="list-style-type: none"> Speech Mechanism Sounds, Vowels & Consonants Accents, Tone, Syllable, Intonation Patent & Phonetics Transcription |
| 7 | Revision of Grammar Some of the grammatical topics should be revised to strengthen LSRW SKILLS of the students |
| 8 | Vocabulary Developing <ul style="list-style-type: none"> Homophones Homonyms One word Substitute |
| 9 | PART – B Literature |
| | Prose (One Act Play) <ul style="list-style-type: none"> “A Marriage Proposal” by Anton Chekhov |



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| | Poetry <ul style="list-style-type: none">• “The Night of Scorpion ” by NissimEzekeil• “The Lamb” by William Black• “The Pulley ” by George Herbert |
|--|---|

Resources:

- Green Andy, Effective Personal Communication Skills For Public Relations, Kogan Page, Limited, 2006
- Technical Communication, by D.K.Chakradev, Tech-max publication
- Basic Business Communication, by Flatly and Lesicar
- Basic Communication Skills for Technology, by Andrea J. Rutherford, by Pearson Education
- From sentence to paragraph, by William J. Kelly and Deborah L. Lawton, by Longman
- Technical Communication : Principles and Practice, by Meenaxi Raman andSangeeta Sharma, Oxford University Press
- An Intermediate English Grammar, Raymond Murphy, Cambridge University Press
- A High School English Grammar, Wren & Martin, S. Chand Publication
- A Course in Phonetics for Spoken English, Sethi&Dhamija
- Masks: One Act Plays(Ed) D. S. Maini. Macmillan.
- Wing word: A Collection of Poetries.