



GOVERNMENT OF TAMIL NADU

HIGHER SECONDARY SECOND YEAR

# PHYSICS

VOLUME - II

A publication under Free Textbook Programme of Government of Tamil Nadu

Department of School Education

**Untouchability is Inhuman and a Crime**

## Government of Tamil Nadu

First Edition - 2019  
(Published Under New Syllabus)

**NOT FOR SALE**

## Content Creation



State Council of Educational  
Research and Training

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## Printing & Publishing



Tamil Nadu Textbook and Educational  
Services Corporation

[www.textbooksonline.tn.nic.in](http://www.textbooksonline.tn.nic.in)

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## PHYSICS

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**E-book**



**Assessment**



**DIGI links**



Let's use the QR code in the text books!

- Download DIKSHA app from the Google Play Store.
- Tap the QR code icon to scan QR codes in the textbook.
- Point the device and focus on the QR code.
- On successful scan, content linked to the QR code gets listed.

**Note:** For ICT corner, Digi Links QR codes use any other QR scanner.

# HOW TO USE THE BOOK

## Scope of Physics

- Awareness on higher learning - courses, institutions and required competitive exams
- Financial assistance possible to help students to climb academic ladder
- Gender initiatives by the Government of India.

## Learning Objectives:

- Overview of the unit
- Gives clarity on the goals and objective of the topics



## Example problems

- Additional facts related to the topics covered to facilitate curiosity driven learning



## ICT

- To ensure understanding, problems/illustrations are given at every stage before advancing to next level

- Visual representation of concepts with illustrations
- Videos, animations, and tutorials

- To harness the digital skills to class room learning and experimenting

## Summary

- Recap of salient points of the lesson

## Concept Map

- Schematic outline of salient learning of the unit

## Evaluation

- Evaluate students' understanding and get them acquainted with the application of physical concepts to numerical and conceptual questions

## Books for Reference

- List of relevant books for further reading

## Solved examples

- Solutions to exercise problems are accessible here. In addition, a few solved examples are given to facilitate students to apply the concepts learnt.

## Competitive Exam corner

- Model Questions - To motivate students aspiring to take up competitive examinations such as NEET, JEE, Physics Olympiad, JIPMER etc

## Glossary

- Scientific terms frequently used with their Tamil equivalents

## Content Focus

- Covers ray and wave optics extensively, salient concepts in dual nature of radiation and matter, atomic and nuclear physics. Topics in semiconductors and communication are optimised. An exclusive unit on 'Recent developments in physics' highlights that physics is the basic building block for sciences, engineering, technology and medicine. With this, students are motivated to pursue higher education confidently.

## Back Wrapper

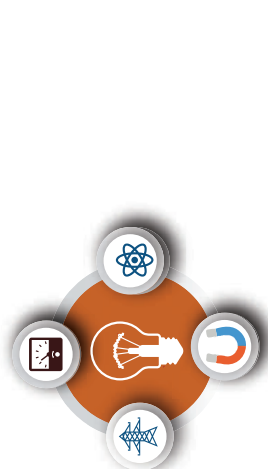
*Richard Philip Feynman, (1918–1988) a theoretical physicist who received noble prize in physics in 1965 for his contributions to the development of quantum electrodynamics. He is the first person to discuss the possibility of manipulation of atoms that seeded nanotechnology. His lectures on various topics in physics are very popular among physicists.*

*Illustration of Gravitational waves from two merging black holes.*

## Front Wrapper

*Actual photograph of a super massive black hole M87\**

# Scope of Physics - Higher Education



## Entrance Examinations After +2

- Physics Olympiad Exam
- NEET-National Eligibility cum Entrance Test
- IIT JEE-Joint Entrance Examination (Mains & Advanced)
- NEST- National Entrance Screening Test
- KVPY-Kishore Vaigyanik Protsahan Yojana
- JEE Mains Paper II for B.Arch
- AIIMS - All Indian Institute of Medical Science's Examination
- Chennai Mathematical Institute Entrance Examination
- BITSAT- Birla Institute of Science And Technology Admission Test
- AIEEE – All India Engineering Entrance Exam
- CUCET – Central Universities Common Entrance Test
- JIPMER - Jawaharlal Institute of Postgraduate Medical Education & Research
- CLAT – Common Law Admission Test
- HSEE- Humanities and Social Sciences Entrance Examination
- AIPVT -All India Pre-Veterinary Test
- NDA – National Defence Academy Examination

## After Graduation

- JAM- Joint Admission Test
- JEST – Joint Entrance Screening Test
- GATE- Graduate Aptitude Test in Engineering
- CAT – Common Admission Test (for MBA)
- Exams conducted by Respective Universities

## After Post Graduation

- CSIR NET - National Eligibility Test for JRF and Lectureship

## After Completing +2

- Integrated M.Sc. Physics
- Central Universities through CUCET
- Central Research Institutes like IISER using KVPY, JEE Advanced
  - ◆ IISER aptitude test
  - ◆ Top 1% students in State board are eligible for IISER Aptitude Test
- Admission in NISER through NEST
- B.Sc Photonics
- B.Sc Hons. in Mathematics and Physics in CMI
- B.Sc Hons. in Mathematics and Computer Science in CMI
- Five-Year Dual degree In IIST ( B.Tech + Master of Science)
- Master of Science (Astronomy and Astrophysics, Solid State Physics)

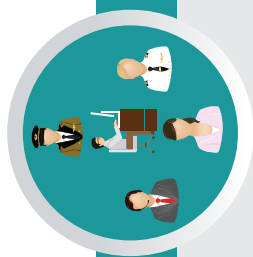
### Note

- Students admitted to IISc, IIT's, NIT's
- IISER's, IIST, will get a Scholarship equivalent to INSPIRE
- Assured placement in ISRO and other divisions for the students of IIST
- Institutes and their ranking can be found in [www.nirfindia.org](http://www.nirfindia.org)

## After B.Sc Physics

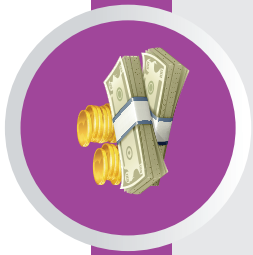
- M.Sc Physics in IIT's and NIT's through JAM
- Integrated Ph.D in IISER's and IISc through JAM and JEST
- M.Sc Physics in Central Universities through CUCET
- M.Sc in Energy Physics, Applied Physics in IIT's through JAM
- Integrated Ph.D in IMSc, TIFR, JNCASR through JEST score
- Integrated Ph.D in TIFR through JEST and TIFR exam
- M.Sc Photonics, Reactor physics, Nuclear Engineering ,
- M.Sc Medical Physics
- M.Sc Biophysics
- Research Institutes abroad like CERN, NASA, LIGO offer Summer internship programmes for motivated Indian students pursuing Undergraduate course in physics
- Indian Academy of Science & various other research institutes offer paid Summer Internship for science students to get an hands on experience in research.

# Opportunities after B.Sc. Physics



## Jobs in Government Sector

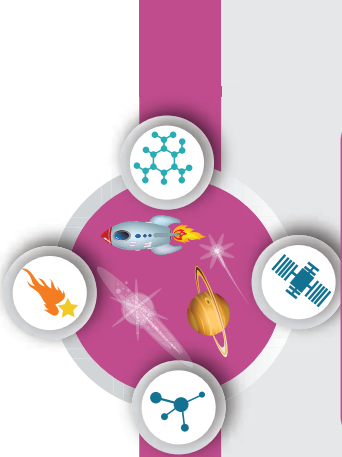
- Scientific Officer and Scientific Assistant Jobs
- CSIR Labs
- DRDO – Defence Research and Development Organisation
- DAE -Department of Atomic Energy
- DoS - Department of Science
- IMD- Indian Meteorological Department
- ONGC -Oil and Natural Gas Corporation
- ATC – Air Traffic Controller
- Teaching faculty in schools and colleges through SET, NET,TET
- Scientist post in various research institutes in India



## Scholarships

- INSPIRE Scholarship - Scholarship for Higher Education (SHE) - 80000 per annum, for B.Sc/B.S/Int M.Sc/Int M.S
- Eligibility Criteria:- Top 1% students in their +2 board exam
- Top 10000 rank holders in JEE or NEET
- Students studying at NIISER, IISER, Department of Atomic Energy Centre for Basic Science
- NTSE, KVPY, JBNSTS Scholars
- International Olympiad Medalists
- Indra Gandhi Scholarship for single girl child for full time regular Master's Degree
- Post Graduate Merit Scholarship for University rank holders in UG level
- Mathematics Training and Talent Search (MTTS) Programme
- Eligibility Criteria:- Students who studied Maths at UG or PG level
- Dr. K S Krishnan Research Associateship (KSKRA)
- Eligibility Criteria:- Students who possess Master's Degree or Ph.D in science or engineering
- IGCAR JRF
- Eligibility Criteria:- Passing JEST, GATE, NET Exams
- Promotion of Science Education (POSE) Scholarship Scheme
- Dhruvhai Ambani Scholarship Programme
- Foundation for Academic Excellence and Access Scholarship (FAEA)
- Central Sector Scheme of National Fellowship and Scholarship for Higher Education of ST students
- Pre - Matric and Post - Matric Scholarship for students belonging to minority communities to pursue their School and Collegiate education by the Ministry of Minority affairs, Government of India.
- Pre Matric and Post Matric Scholarship for students with Disabilities to pursue their School and Collegiate Education by the Department of Empowerment of Persons with Disabilities, Government of India.
- Maulana Azad scholarship for minorities.

# Institutes in india to pursue research in physics



## Research Areas

- General Relativity and Cosmology
- Astronomy and Astrophysics
- Quantum Optics and Information theory
- Plasma physics
- Meteorology and Atmospheric science
- String Theory, Quantum Gravity
- Optics and Photonics
- Condensed Matter Theory, Material Science and Spintronics
- Cryptography
- Mathematical Physics, Statistical Physics
- Crystal Growth and Crystallography
- Atomic and Molecular Physics
- Biophysics, Medical Physics
- Nuclear and High energy Particle Physics
- Energy and Environmental Studies
- Geophysics
- Quantum Biology and Quantum Thermodynamics and Cymatics

| Famous Research Institutes for Physics in India                            |                                                        |  |
|----------------------------------------------------------------------------|--------------------------------------------------------|--|
| Name of the Institution                                                    | Website                                                |  |
| Institute of Mathematical Sciences, Chennai (IMSc)                         | <a href="http://www.imsc.res.in">www.imsc.res.in</a>   |  |
| Saha Institute of Nuclear Physics, Kolkata                                 | <a href="http://www.saha.ac.in">www.saha.ac.in</a>     |  |
| International Centre for Theoretical Sciences, Bangalore                   | <a href="http://www.icts.res.in">www.icts.res.in</a>   |  |
| Harish chandra Research Institute, Allahabad                               | <a href="http://www.hri.res.in">www.hri.res.in</a>     |  |
| Aryabhata Research Institute of Observational Sciences, Nainital           | <a href="http://www.aries.res.in">www.aries.res.in</a> |  |
| Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)          | <a href="http://www.jncasr.ac.in">www.jncasr.ac.in</a> |  |
| Institute of Physics (IOP), Bhubaneshwar                                   | <a href="http://www.iopb.res.in">www.iopb.res.in</a>   |  |
| Indian Association for the Cultivation of Sciences (IACS), Kolkata         | <a href="http://www.iacs.res.in">www.iacs.res.in</a>   |  |
| Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram                    | <a href="http://www.vssc.gov.in">www.vssc.gov.in</a>   |  |
| National Physical Laboratory (NPL), Delhi                                  | <a href="http://www.nplindia.in">www.nplindia.in</a>   |  |
| National Institute of Science Education and Research (NISER), Bhubaneshwar | <a href="http://www.niser.ac.in">www.niser.ac.in</a>   |  |
| Indian Institute of Science (IISc), Bangalore                              | <a href="http://www.iisc.ac.in">www.iisc.ac.in</a>     |  |
| Raman Research Institute (RRI), Bangalore                                  | <a href="http://www.rri.res.in">www.rri.res.in</a>     |  |
| Tata Institute of Fundamental Research (TIFR), Mumbai                      | <a href="http://www.tifr.res.in">www.tifr.res.in</a>   |  |
| Bhaba Atomic Research Centre (BARC), Mumbai                                | <a href="http://www.barc.gov.in">www.barc.gov.in</a>   |  |
| Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam                | <a href="http://www.igcar.gov.in">www.igcar.gov.in</a> |  |
| Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune       | <a href="http://www.iucaa.in">www.iucaa.in</a>         |  |
| Indian Institute of Space Science and Technology (IIST), Trivandrum        | <a href="http://www.iist.ac.in">www.iist.ac.in</a>     |  |
| Institute of Plasma Research (IPR), Gujarat                                | <a href="http://www.ipr.res.in">www.ipr.res.in</a>     |  |
| Physical Research Laboratory (PRL), Ahmedabad                              | <a href="http://www.prl.res.in">www.prl.res.in</a>     |  |
| Inter-University Accelerator Center (IUAC), Delhi                          | <a href="http://www.iuac.res.in">www.iuac.res.in</a>   |  |
| Indian Institute of Astrophysics (IIA), Bangalore                          | <a href="http://www.iia.res.in">www.iia.res.in</a>     |  |
| Chennai Mathematical Institute (CMI), Chennai                              | <a href="http://www.cmi.ac.in">www.cmi.ac.in</a>       |  |
| Liquid Propulsion Systems Centre                                           | <a href="http://www.lpsc.gov.in">www.lpsc.gov.in</a>   |  |
| S.N.Bose Centre for Basic Sciences                                         | <a href="http://www.bose.res.in">www.bose.res.in</a>   |  |
| CSIR National laboratories                                                 |                                                        |  |
| Indian Institute of Technology (IIT) in various places                     |                                                        |  |
| IISER's in various places                                                  |                                                        |  |
| National Institute of Technology (NIT) in various places                   |                                                        |  |
| Indian Institute of Information Technology (IIITs) at various places       |                                                        |  |
| Central and State Universities                                             |                                                        |  |

# Gender Initiatives by the Government of India

## Women Scientist Scheme by the Department of Science and Technology (DST)

- Under this scheme, women scientists are being encouraged to pursue research in frontier areas of science and engineering, on problems of societal relevance and to take up S&T-based internship followed by self-employment. Following three categories of fellowships, with research grants, are available for Indian citizen:

- Women Scientist Scheme-A(WOS-A): Research in Basic/Applied Science
- Women Scientist Scheme-B (WOS-B): S&T interventions for Societal Benefit
- Women Scientist Scheme-C (WOS-C): Internship in Intellectual Property Rights (IPRs) for the Self-Employment

### Eligibility:

The scheme is meant to encourage women in S&T domain, preferably those having a break in career and not having regular employment, to explore possibility of re-entry into the profession.

### Qualifications:

- Minimum Post Graduate degree, equivalent to M.Sc. in Basic or Applied Sciences or B.Tech. or MBBS or other equivalent professional qualifications
- M.Phil/M.Tech/M.Pharm/M.VSc or equivalent qualifications
- Ph.D. in Basic or Applied Sciences

- <http://www.dst.gov.in/> scientific-programmes/ scientific-engineering- research/women-scientists- programs

## Global STEM (Science, Technology, Engineering and Mathematics) Scholarships for Indian Women in Science

- A list of some STEM scholarships offered to Indian Women if they would like to pursue their higher education abroad.

- Society of Women Engineers (SWE) Scholarship
- The Google Anita Borg Memorial Scholarship Program
- Women In Aviation International Scholarships
- Amelia Earhart Fellowship by Zonta International
- The Graduate Women In Science (GWIS) National Fellowships Program

- <https://feminisminindia.com/2017/06/14/global-stem-scholarships/>



## KIRAN (Knowledge Involvement in Research Advancement through Nurturing) Scheme of DST

- <https://www.ugc.ac.in/pdfw/>