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| **Institute / College Name :** | Darbhanga College of Engineering | | |
| **Program Name** | **B. Tech** | | |
| **Course Code** | 221101 | | |
| **Course Name** | Engineering Physics | | |
| **Lecture / Tutorial (per week):** | 3/1 | **Course Credits** | 3 |
| **Course Coordinator Names** | Dr. A. K. Choudhary, Dr. Puja Kumari, Dr. A. K. Singh | | |

1. **Scope and Objectives of the Course**

This course is designed to review the fundamentals and practices of physical phenomena happening in the surroundings. Physics is about the study of laws of nature. It is important for advancing the theoretical models of physical phenomena or experimental materials and equipment which could significantly impact the value of current technologies.

The course outcomes are:

1. Utilization of basic concept in branch papers.
2. Experimental visualization of theoretical studied things.
3. Learn to do numerical and derivation of formulae which lead to concept in depth.

**DR. A. K. CHOUDHURY(UNIT 2 AND UNIT 3)**

1. **Textbooks**

**TB1:** Optics by Ajoy Ghatak Publisher: TMH

**TB2**: Engineering Physics -Hitendra K. Malik & Ajay Kumar Singh Publisher: TMH

1. **Reference Books**

**RB1:**Lasers and Non- Liner Optics by B. B. Laud; Publisher: New Age International Ltd.

**Other readings and relevant websites**

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| --- | --- |
| S.No. | **Link of Journals, Magazines, websites and Research Papers** |
|  | <http://optics.byu.edu/BYUOpticsBook_2008.pdf> |
|  | <http://qa.answers.com/Q/Difference_between_he-ne_laser_and_ruby_laser> |
|  | <https://www.slideshare.net/Tuhin_Das/laser-its-application> |
|  | <https://www.elprocus.com/laser-diode-construction-working-applications/> |
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1. **Course Plan**

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| --- | --- | --- | --- | --- | --- | --- |
| **Lecture Number** | Date of Lecture | Topics | **Web Links for video lectures** | | **Text Book / Reference Book / Other reading material** | **Page numbers of Text Book(s)** |
|  |  |  |  | |  |  |
| 1-2 |  | Optics |  | | TB1 |  |
|  |  | Temporal coherence, Michelson's interferometer for measurement of coherence length of source and line width, | [https://video.search.yahoo.com/search/video?fr=tightropetb&p=optics+video+lecture#id=8&vid=7cd2dcfcf4779b8f1d3d31c1015bf12f&action=click](https://video.search.yahoo.com/search/video?fr=tightropetb&p=optics+video+lecture%23id=8&vid=7cd2dcfcf4779b8f1d3d31c1015bf12f&action=click) | |  |  |
| **Tutorial - 1** | | | | | | |
| 3-4 |  | **Coherence and Diffraction** |  | | TB1 |  |
|  |  | Spatial coherence, Measurement of spatial coherence using Young's interferometer, Fraunhofer diffraction by single slit, Double slit and Grating. | [https://video.search.yahoo.com/search/video?fr=tightropetb&p=COHERENCE+VIDEO+LECTURE#id=4&vid=79d5a761d1737c5ac2cba55ef65fce28&action=view](https://video.search.yahoo.com/search/video?fr=tightropetb&p=COHERENCE+VIDEO+LECTURE%23id=4&vid=79d5a761d1737c5ac2cba55ef65fce28&action=view) | |  |  |
| **Tutorial – 2, Assignment 1** | | | | | | |
| **Mid-Semester Exam (Syllabus covered from 1-13 lectures)** | | | | | | |
| 5-7 |  | **Lasers** |  | | TB2, RB1 |  |
|  |  | Lasers and Laser light, Einstein A and B coefficient, Population inversion, Light amplification by optical resonator, Characteristics of Laser, Working principle of He-Ne Laser. | [https://video.search.yahoo.com/search/video?fr=tightropetb&p=laser+video+lecture#id=6&vid=98722f994a8f29b79c4373caf89ebb30&action=click](https://video.search.yahoo.com/search/video?fr=tightropetb&p=laser+video+lecture%23id=6&vid=98722f994a8f29b79c4373caf89ebb30&action=click) | |  |  |
| **Tutorial – 3** | | | | | | |
|  |  | **Polarisation** | |  | TB1 |  |
| 8-10 |  | Unpolarised light, Production of plane polarized light by Polaroid technique, Brewster’s Law, Malu’s Law | | <https://www.youtube.com/watch?v=HH58VmUbOKM> |  |  |
| 11-14 |  | Double Refraction, Production of Plane, Circular and elliptical, Polarized Light, Analysis of unpolarised light and polarized light, Magneto-optic effect, electro optic effect and photo elastic effect | | <https://www.youtube.com/watch?v=8YkfEft4p-w> | TB1, RB1 |  |
| **Tutorial – 4, Assignment 2** | | | | | | |

**DR. PUJA KUMARI (Unit 4 and Unit 5)**

1. **Textbooks**

**TB1:'** Modern Engineering Physics' by A. S. Vasudeva, Publisher: S. Chand

**TB2**: 'Fundamentals of Physics' by Alan Giambattista, Betty McCarthy Richardson, Robert C Richardson, Publisher: McGraw Hill.

1. **Reference Books**

**RB1:**Concept of Modern Physics by Arthur Beiser, Publication: TMH

**RB2:** Modern Physics by G. Aruldhas & P. Rajagopal; Publication : Surya Publication

**Other readings and relevant websites**

|  |  |
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| S.No. | **Link of Journals, Magazines, websites and Research Papers** |
|  | <https://www.khanacademy.org/science/physics/quantum-physics/modal/v/de-broglie-wavelength> |
|  | <https://www.sciencedirect.com/science/article/pii/S0920563297006877> |
|  | <https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/lecture-videos/lecture-5/> |
|  | <https://www.youtube.com/user/MIT> |
|  | <https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture-notes/MIT8_04S16_LecNotes1.pdf> |
|  | <https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/lecture-notes/MIT8_04S16_LecNotes5.pdf> |

1. **Course Plan**

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| --- | --- | --- | --- | --- | --- |
| **Lecture Number** | Date of Lecture | Topics | **Web Links for video lectures** | **Text Book / Reference Book / Other reading material** | **Page numbers of Text Book(s)** |
| 1-4 |  | Introduction |  | TB1, RB1 |  |
|  |  | Introduction to Quantum Physics, Planck's Theory of Black body radiation, Compton Effect, Photoelectric Effect, Einstein photo electric equation and its experimental verification | <http://nptel.ac.in/courses/115104096/1> |  |  |
| **Tutorial - 1** | | | | | |
| 5-7 |  | **Wave Particle Duality** |  | TB1, RB2 |  |
|  |  | Wave particle duality, De-Broglie waves, De-Broglie wave velocity, Wave and Group Velocity, Davison and Germer experiment | <https://www.youtube.com/watch?v=uvHc9etFt-A> |  |  |
| **Tutorial – 2, Assignment I** | | | | | |
| 8-9 |  | **Uncertainty principle** |  | TB1, RB1 |  |
|  |  | Heisenberg's uncertainty priciple, Application of uncertainty principle. | <http://www.nptel.ac.in/courses/122106034/1> |  |  |
| **Tutorial - 3** | | | | | |
| 10-13 |  | **Wave Equations** |  | TB1, RB1 |  |
|  |  | Wave functions and wave equation, physical interpretation of wave function and normalization condition, Expectation values, Schrodinger's wave equation (Time dependent and time independent i.e. steady, state form) in one dimension | <https://www.youtube.com/watch?v=bESVLOTvijk> |  |  |
| **Tutorial – 4, Assignment 2** | | | | | |
| **Mid-Semester Exam (Syllabus covered from 1-13 lectures)** | | | | | |
| 14-17 |  | **Quantum operators and particle in a box** |  | TB1, RB1 |  |
|  |  | Quantum mechanical operators, Particle in a box (Infinite Potential Well), Finite Potential barrier and tunneling | [https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/video-lectures/part-2/#?w=535](https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2016/video-lectures/part-2/%23?w=535) |  |  |
| **Tutorial – 5** | | | | | |
| 18-20 |  | **Special Theory of Relativity** |  | TB2, RB2 |  |
|  |  | Michelson-Morely experiment, Postulates of special theory of relativity, | <https://www.youtube.com/watch?v=0nHovWsWZTw&list=PLRuWd0sgheSZLMfA9yl_-cYEW_QyRlssD> |  |  |
| **Tutorial - 7** | | | | | |
| 21-23 |  | **Consequences of Theory of Relativity** |  | TB2, RB2 |  |
|  |  | Lorentz transformation and its application (Length contraction and Time dilation) | <https://www.youtube.com/watch?v=0nHovWsWZTw&list=PLRuWd0sgheSZLMfA9yl_-cYEW_QyRlssD> |  |  |
| **Tutorial – 8, Assignment 3** | | | | | |

**DR. A. K. SINGH (UNIT 1 AND UNIT 5)**

1. **Textbooks**

**TB1:** Elements of electromagnetics by Mathew N.O. Sadiku: Publication: Oxford University Press.

**TB2**:Introduction to electrodynamics by David J. Griffiths; Publisher: Pearson Education.

**TB3**: Concept of Modern Physics by Arthur Beiser: Publication: TMH

**TB4**:Introduction to Nanotechnology by Charles P Poole and Frank J Owens, Publisher: Wiley

1. **Reference Books**

**RB1:**Modern Physics by G. Aruldas & P. Rajagopal; Pub: Prentice Hall of India

**RB2:**Principles of electricity by Leigh Page and Normal IIsley Adams, Pub.: Eurasia Publishing House, New Delhi

**Other readings and relevant websites**

|  |  |
| --- | --- |
| S.No. | **Link of Journals, Magazines, websites and Research Papers** |
|  | <http://www.academicpub.org/jbap/> |
|  | <https://ocw.mit.edu/courses/physics/> |
|  | <https://ocw.mit.edu/high-school/physics/> |
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1. **Course Plan**

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| --- | --- | --- | --- | --- | --- |
| **Lecture Number** | Date of Lecture | Topics | **Web Links for video lectures** | **Text Book / Reference Book / Other reading material** | **Page numbers of Text Book(s)** |
|  |  | Electrostatics |  | TB1, TB2, RB2 |  |
| 1-2 |  | Dielectric-The three electric vectors, Gauss’s Law in Dielectrics,Energy stored in Electrostatic field | <https://www.youtube.com/watch?v=gvLSENp_Vss> |  |  |
| **Tutorial – 1** | | | | | |
| 3-5 |  | Boundary condition. Continuity Equation for charge, Displacement current |  | TB2 |  |
| **Tutorial – 2** | | | | | |
|  |  | **Electromagnetics** |  | TB2 |  |
| 6-9 |  | Maxwell’s Equation in Differential and Integral form and their physical significance, Maxwell’s Equation in free space and speed of plane electromagnetic waves travelling in vacuum. |  |  |  |
| **Tutorial –3, Assignment – 1** | | | | | |
| 10-12 |  | **Nano-Physics** |  | TB4 |  |
|  |  | Introduction and Basic definition of Nano Technology,Properties of Nano particles,Elementary ideas of Synthesis of Nano particles,Application of Nano Technology | <www.springer.com/cda/content/document/cda.../9783642025242-c2.pdf?SGWID> |  |  |
| **Tutorial – 4** | | | | | |

1. **Evaluation Scheme:**

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| --- | --- | --- |
| Component 1 | Mid Semester Exam | 20 |
| Component 2 | Assignment Evaluation | 10 |
| Component 3\*\* | End Term Examination\*\* | 70 |
|  | **Total** | **100** |

**\*\*** The End Term Comprehensive examination will be held at the end of semester. The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

**SYLLABUS**

|  |  |  |
| --- | --- | --- |
| Topics | **No of lectures** | **Weightage** |
| **1.Electrostatics and Electromagnetic Theory:** Dielectrics- The three electric vectors, Gauss's law in Dielectrics, Maxwell's Equations in Differential and Integral form and their Physical significance, Maxwell's Equations in free space and speed of plane electromagnetic waves travelling in vacuum, Poynthing vectors, Electromagnetic waves propagation in dielectrics and conductors. | 9 | 19% |
| **2. Optics and Laser:** Temporal coherence, Michelson's interferometer for measurement of coherence length of source and line width, Spatial coherence, Measurement of spatial coherence using Young's interferometer, Fraunhofer diffraction by single slit, Double slit and Grating.  Lasers and Laser light, Einstein A and B coefficient, Population inversion, Light amplification by optical resonator, Characteristics of Laser, Working principle of He-Ne Laser. | 7 | 14% |
| **3. Polarisation:** Unpolarised light, Production of plane polarised light by Polaroid technique (Principle of action should be emphasized) Brewster's Law, Malu's Law, Double Refraction, Production of Plane, Circular and elliptical, Polarized Light, Analysis of unpolarised light and polarised light, Magneto-optic effect, Electro optic effect and photo elastic effect. | 7 | 14% |
| **4. Quantum Physics:** Planck's theory of black body radiation, Compton effect, Photo electric effect, Einstein photo electric equation and its experimental verification.  Wave particle duality, De-Broglie waves, De-Broglie wave velocity, Wave and group velocity, Davison and Germer experiment, Heisenberg's uncertainty principle, Application of uncertainty principle.  Wave functions and wave equation, physical interpretation of wave function and normalization condition, Expectation values, Schrodinger's wave equation (Time dependent and time independent i.e. steady, state form) in one dimension, quantum-mechanical operators, Particle in a box (Infinite Potential Well), Finite Potential barrier and tunneling | 18 | 37% |
| **5. Special Theory of Relativity :** Michelson-Morely experiment, Postulates of special theory of relativity, Consequences of Special theory of relativity, Lorentz transformation and its application. (Length contraction and Time dilation) | 5 | 10% |
| **6. Nano-Physics:** Introduction and Basic definition of Nanotechnology, Properties of Nano particles, Elementary ideas of Synthesis of Nano particles, Application of Nano Technology. | 3 | 6% |

**This Document is approved by:**

|  |  |  |
| --- | --- | --- |
| **Designation** | **Name** | **Signature** |
| Course Coordinator | Dr. A. K. Choudhary, Dr. Puja Kumari, Dr. A. K. Singh |  |
| H.O.D | Dr. Anil Kumar Choudhary |  |
| Principal | Dr. Aseem Kumar Thakur |  |
| Date | 18/02/2018 |  |

**Evaluation and Examination Blue Print:**

Internal assessment is done through quiz tests, presentations, assignments and project work. Two sets of question papers are asked from each faculty and out of these two, without the knowledge of faculty, one question paper is chosen for the concerned examination. Examination rules and regulations are uploaded on the student’s portal. Evaluation is a very transparent process and the answer sheets of sessional tests, internal assessment assignments are returned back to the students.

The components of evaluations alongwith their weightage followed by the University is given below

Class test 5%

Assignments/Quiz Tests/Seminars 5%

Mid Semester 20%

End term examination 70%