Department of Civil Engineering

Details of Lesson Plan

S.No.	Particulars	Details
1.	Course Name	Engineering Physics
2.	Course Code	BSC-202
3.	Academic Year	2024-2025
4.	Semester	2nd
5.	Number of Lesson plans	56
6.	Faculty Assigned	Dr. Surinder Singh

Surinder

Faculty Signature

Lesson Plan No. 1	Course Name: Engineering Physics Topic: Introduction to vectors	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of vectors and scalar quantities b. illustrate different vector and scalar operations with examples c. applications of various mathematical operations
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn vector operations - Difference between scalar and vector quantities - Highlight the importance of vector differentiation 2. **Development** (30 minutes) a. Scalar and vector quantities with examples b. Representation of vectors c. Types of vectors -Equal vectors -Negative vector -Null vector -Unit vector d. Position vector e. Product of vectors - Scalar product and cross product - Scalar triple product f. Applications of vector products 3. Exercise (5 minutes) – Use Google forms for quiz based on the topic
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://nptel.ac.in/courses/103102024 https://www.youtube.com/watch?v=h9Ih8atdxcw 3. Homework Basic problems on mathematical operations taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.

	2. Google assignment Quiz on scalar product, vector product, etc review. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 2	Course Name: Engineering Physics Topic: Concepts of Del operator, partial derivative, and fields (scalar and vector).	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Understand the fundamental concept of the Del operator (∇) and its application in vector calculus. b. Grasp the concept of partial derivatives and their significance in multivariable calculus. c. Differentiate between scalar fields and vector fields and comprehend their respective characteristics. d. Relate the concepts of Del operator, partial derivative, and fields to real-world phenomena and scientific applications.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Define the Del operator (∇) and its role in vector calculus. Explain the concept of partial derivatives and their notation. 2. **Development** (30 minutes) a. Del Operator and Partial Derivatives: - Illustrate the Del operator (∇) in Cartesian and other coordinate systems. - Demonstrate the calculation of partial derivatives using examples. - Emphasize the geometric interpretation of partial derivatives. b. Scalar and Vector Fields: - Define scalar and vector fields and provide examples (e.g., temperature distribution for scalar field, velocity field for vector field). - Discuss the properties and behavior of scalar and vector fields. - Highlight the divergence and curl operations in vector fields. c. Real-world Applications: - Showcase practical applications of Del operator, partial derivatives, scalar, and vector fields in physics, engineering, and other disciplines. - Engage students in discussions about how these concepts are utilized in various scientific contexts.

	3. Exercise (5 minutes) – Use Google forms for quiz based on the topic
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://nptel.ac.in/courses/103102024 https://www.youtube.com/watch?v=h9Ih8atdxcw 3. Homework Basic problems on mathematical operations taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google assignment Quiz on Del operator, partial derivative, and fields. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 3	Course Name: Engineering Physics Topic: Gradient of scalar field and physical significance	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Physical meaning of gradient of a scalar field b. illustrate difference between the scalar and vector quantity obtained on applying del operator applications of gradient of a scalar field
Teaching Aids (if any)	a. Power point presentation b. Chalk and talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn operations - Difference between scalar and vector operators - Highlight the importance of gradient of scalar field 2. **Development** (30 minutes) a. Gradient of a scalar field b. Physical meaning of gradient c. Numerical problems based on gradient d. Applications of gradient 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://nptel.ac.in/courses/122101002 https://www.youtube.com/watch?v=NED2Cl8u9Q0 Homework Basic problems on gradient taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on gradient, its physical significance and numerical problems

	Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 4	Course Name: Engineering Physics Topic: Divergence of vector and its expression in term of cartesian coordinates.	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of divergence of a vector field b. illustrate the concept of solenoidal field applications of divergence to various fields
Teaching Aids (if any)	a. Power point presentation b. Talk and chalk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn operations - Difference between scalar and vector operators - Highlight the importance of divergence of a vector field 2. **Development** (30 minutes) a. Divergence of vector field b. Physical meaning of divergence c. Numerical problems based on divergence d. Applications of divergence 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://nptel.ac.in/courses/122101002 https://web.iitd.ac.in/~pmvs/courses/mcl704/BVC.pdf https://ocw.mit.edu/courses/res-tll-004-stem-concept-videos-fall-2013/94c6fc5f25af9e74e87a9a460657a76a_MITRES_TLL-004F13_Curl_IG.pdf Homework Basic problems on divergence taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.

	2. Google Assignment Quiz on divergence, its physical significance and numerical problems Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 5	Course Name: Engineering Physics Topic: Numerical problems based on divergence.	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. To understand the concept of divergence in vector calculus. b. To solve numerical problems involving divergence to analyze the behavior of vector fields. c. To apply divergence theorem in various scenarios for solving practical problems.
Teaching Aids (if any)	a. Power point presentation b. Talk and chalk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - Define divergence and explain its significance in vector calculus. 2. **Development** (30 minutes) a. Illustrative examples: Work through numerical problems step by step, demonstrating the application of divergence in different contexts. b. Guided practice: Engage students in solving problems collaboratively, providing guidance and feedback as needed. c. Independent practice: Assign numerical problems for students to solve individually or in small groups to reinforce learning. d. Application exercises: Present real-world scenarios where understanding divergence is crucial, encouraging students to apply their knowledge creatively. e. Discussion and review: Encourage students to discuss their approaches and solutions, addressing any misconceptions and reinforcing key concepts. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://nptel.ac.in/courses/122101002 https://web.iitd.ac.in/~pmvs/courses/mcl704/BVC.pdf https://ocw.mit.edu/courses/res-tll-004-stem-concept-videos-fall-

	2013/94c6fc5f25af9e74e87a9a460657a76a_MITRES_TLL-004F13_Curl_IG.pdf Homework Basic problems on divergence taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on divergence, its physical significance and numerical problems Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 6	Course Name: Engineering Physics Topic: Curl of vector and physical interpretation	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of curl of vector field b. illustrate difference between dot and cross product operators applications of curl of vector field
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn operations - Definition of curl operator - Highlight the importance of Curl of vector field 2. **Development** (30 minutes) a. Curl of vector field b. Physical meaning of curl c. Numerical problems based on curl d. Applications of curl 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://nptel.ac.in/courses/122101002 https://www.youtube.com/watch?v=NED2Cl8u9Q0 3. Homework Basic problems on gradient taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Curl of a vector Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 7	Course Name: Engineering Physics Topic: Numerical problems based on Curl of Vector	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of curl of a vector in three-dimensional space. b. Develop the ability to calculate the curl of a vector function using various methods. c. Apply the concept of curl to solve numerical problems in physics and engineering. d. Enhance problem-solving skills through the application of vector calculus.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - Define curl as a measure of rotation within a vector field and explain its significance in physics and engineering. 2. **Development** (30 minutes) a. Mathematical representation: Introduce the mathematical definition of curl in terms of partial derivatives and explain its geometric interpretation. b. Calculation methods: Present various methods for calculating the curl of a vector field, including the determinant method and the cross-product method. c. Application of curl: Illustrate how curl is applied in real-world problems, such as fluid dynamics, electromagnetism, and mechanical engineering. d. Guided practice: Work through a series of numerical problems involving the computation of curl, providing step-by-step guidance and explanations. e. Independent practice: Assign additional problems for students to solve individually or in groups, encouraging critical thinking and application of learned concepts. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading

	https://nptel.ac.in/courses/122101002 https://www.youtube.com/watch?v=NED2Cl8u9Q0 3. Homework Basic problems on gradient taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Curl of a vector Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 8	Course Name: Engineering Physics Topic: Gauss's divergence theorem (proof)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of divergence theorem b. illustrate the concept of solenoidal field c. applications of divergence to various fields
Teaching Aids (if any)	a. Power point presentation b. Talk and chalk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn operations - Difference between existence of source and sink in a field - Highlight the importance of divergence theorem 2. **Development** (30 minutes) a. Divergence of vector field b. Physical meaning of divergence c. Numerical problems based on divergence d. Applications of divergence 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://math.mit.edu/~mckernan/Teaching/12-13/Autumn/18.02/l_31.pdf https://www.youtube.com/watch?v=1qLb0B40YnA Homework Basic problems on divergence taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on divergence, its physical significance and numerical problems Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 9	Course Name: Engineering Physics Topic: Stoke's theorem (proof)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Stokes theorem b. illustrate the concept of various types of integrals c. applications of Stokes theorem to various fields
Teaching Aids (if any)	a. Power point presentation b. Talk and chalk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn operations - Difference between line, surface and volume integrals - Highlight the importance surface and volume integrals 2. **Development** (30 minutes) a. Divergence of vector field b. Physical meaning of divergence c. Numerical problems based on Stokes theorem d. Applications of Stokes theorem 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading Vector Notes- https://ocw.mit.edu/courses/18-02-multivariable-calculus-fall-2007/resources/lecture-28-divergence-theorem/ https://www.youtube.com/watch?v=qSeYksmwjZc Homework Basic problems on divergence taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on divergence, its physical significance and numerical problems Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 10	Course Name: Engineering Physics Topic: Numerical problem based on Stokes and Gauss's Divergence theorem	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Numerical problems b. illustrate the concept of solenoidal field, rotational and irrotational fields c. applications of various types of integrals.
Teaching Aids (if any)	a. Power point presentation b. Talk and chalk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn operations - Difference between scalar and vector operators - Highlight the importance of divergence of a vector field 2. **Development** (30 minutes) a. Divergence of vector field b. Physical meaning of divergence c. Numerical problems based on divergence d. Applications of divergence 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. Vector Notes https://www.youtube.com/watch?v=MZILJp2iKUs https://onlinecourses.nptel.ac.in/noc23_ma86/preview 4. Homework Basic problems on divergence taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on divergence, its physical significance and numerical problems Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 11	Course Name: Engineering Physics Topic: Concept of waves and basic of electromagnetic wave - (a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. To comprehend the fundamental principles of wave theory and understand the basics of electromagnetic waves. b. illustrate difference between displacement current and conduction current. c. applications of Maxwell's equations
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn displacement current - Highlight the importance of displacement current 2. **Development** (30 minutes) a. Maxwell's displacement current b. Magnitude of displacement current c. Modification of Ampere's circuital law d. Maxwell's Ampere's circuital law. Application of Maxwell's Ampere's circuital law 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Displacement current - MIT OpenCourseWare https://web.mit.edu/sahughes/www/8.022/lec19.pdf https://nptel.ac.in/courses/117101056 https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/ 3. Homework Basic problems on displacement current taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Displacement current Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 12	Course Name: Engineering Physics Topic: Concept of waves and basic of electromagnetic wave - (a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. To comprehend the fundamental principles of wave theory and understand the basics of electromagnetic waves. b. illustrate difference between displacement current and conduction current. c. applications of Maxwell's equations
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn displacement current - Highlight the importance of displacement current 2. **Development** (30 minutes) a. Maxwell's displacement current b. Magnitude of displacement current c. Modification of Ampere's circuital law d. Maxwell's Ampere's circuital law. Application of Maxwell's Ampere's circuital law 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Displacement current - MIT OpenCourseWare https://web.mit.edu/sahughes/www/8.022/lec19.pdf https://nptel.ac.in/courses/117101056 https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/ 3. Homework Basic problems on displacement current taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Displacement current Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 13	Course Name: Engineering Physics Topic: Concept and derivation of Displacement current	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Maxwell's displacement current b. illustrate difference between displacement current and conduction current. c. applications of Maxwell's equations
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn displacement current - Highlight the importance of displacement current 2. **Development** (30 minutes) a. Maxwell's displacement current b. Magnitude of displacement current c. Modification of Ampere's circuital law d. Maxwell's Ampere's circuital law. Application of Maxwell's Ampere's circuital law 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://nptel.ac.in/courses/117101056 https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/ 3. Homework Basic problems on displacement current taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Displacement current Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 14	Course Name: Engineering Physics Topic: Maxwell's equations in vacuum and non-conducting medium (differential and integral forms)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Maxwell's equations b. illustrate Gauss' law in electrostatics and magnetostatics in free space and in non-conducting medium c. applications of Maxwell's equations
Teaching Aids (if any)	a. Power point presentation b. Writing tablet c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn Gauss's law in electrostatics Why we learn Gauss's law in magnetostatics - Difference between the electrostatic and magnetostatics - Highlight the importance of Maxwell's equations 2. **Development** (30 minutes) a. Writing Maxwell's equations in medium b. Writing Maxwell's equations in free space c. Writing Maxwell's equations in non conducting medium 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Maxwell's equations- NPTEL https://web.mit.edu/sahughes/www/8.022/lec19.pdf Homework Basic problems on Maxwell's equations taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Maxwell's equations Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 15	Course Name: Engineering Physics Topic: Derivations of Maxwell's 1st and 2nd equation.	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Maxwell's equations b. illustrate Gauss' law in electrostatics and magnetostatics in free space and in non-conducting medium c. applications of Maxwell's equations
Teaching Aids (if any)	a. Power point presentation b. Writing tablet c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn Gauss's law in electrostatics Why we learn Gauss's law in magnetostatics - Difference between the electrostatic and magnetostatics - Highlight the importance of Maxwell's equations 2. **Development** (30 minutes) a. Writing Maxwell's equations in medium b. Writing Maxwell's equations in free space c. Writing Maxwell's equations in non conducting medium 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Maxwell's equations- NPTEL - https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/pages/part-ii-electromagnetic-waves/lecture-12/Homework Basic problems on Maxwell's equations taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Maxwell's equations Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 16	Course Name: Engineering Physics Topic: Derivations of Maxwell's 3rd and 4th equation.	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Derivation of Maxwell's equations b. Derivation of Gauss' law in electrostatics and magnetostatics c. Derivation of Maxwell's 3rd and 4th equations d.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn Gauss's law in electrostatics Why we learn Gauss's law in magnetostatics - Highlight the importance of Maxwell's equations 2. **Development** (30 minutes) a. Proof of Gauss' law in electrostatics b. Proof of Gauss's law in magnetostatics c. Proof of Faraday's law of electromagnetic induction d. Maxwell's ampere's circuital law 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/pages/part-ii-electromagnetic-waves/lecture-12/ - https://www.youtube.com/watch?v=ibF0L6X53tg Homework Basic problems on Maxwell's equations taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Maxwell's equations Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 17	Course Name: Engineering Physics Topic: Wave equations for electric and magnetic field vectors –(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Wave equation for electric and magnetic fields b. Derivation of solution of electromagnetic wave equation c. Derivation of relationship between the electric and magnetic field vectors
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wave equation for electric field Why we learn wave equation for magnetic field - Highlight the importance of wave equation equations 2. **Development** (30 minutes) a. Derivation of wave equation for electric and magnetic fields b. Derivation of solution for wave equation c. Deduce the relationship between the magnitude of electric and magnetic field vectors 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Electromagnetic wave equation _ https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/pages/part-ii-electromagnetic-waves/lecture-12/ - https://www.feynmanlectures.caltech.edu/II_20.html http://pcwww.liv.ac.uk/~awolski/Teaching/Liverpool/PHYS370/AdvancedElectromagnetism-Part2.pdf http://pcwww.liv.ac.uk/~awolski/Teaching/Liverpool/PHYS370/AdvancedElectromagnetism-Part2.pdf - Homework Basic problem on Solution of wave equation taught in class Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on solution of wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 18	Course Name: Engineering Physics Topic: Wave equations for electric and magnetic field vectors –(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Wave equation for electric and magnetic fields b. Derivation of solution of electromagnetic wave equation c. Derivation of relationship between the electric and magnetic field vectors
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wave equation for electric field Why we learn wave equation for magnetic field - Highlight the importance of wave equation equations 2. **Development** (30 minutes) a. Derivation of wave equation for electric and magnetic fields b. Derivation of solution for wave equation c. Deduce the relationship between the magnitude of electric and magnetic field vectors 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Electromagnetic wave equation _ https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/pages/part-ii-electromagnetic-waves/lecture-12/ - https://www.feynmanlectures.caltech.edu/II_20.html http://pcwww.liv.ac.uk/~awolski/Teaching/Liverpool/PHYS370/AdvancedElectromagnetism-Part2.pdf http://pcwww.liv.ac.uk/~awolski/Teaching/Liverpool/PHYS370/AdvancedElectromagnetism-Part2.pdf - Homework Basic problem on Solution of wave equation taught in class Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on solution of wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 19	Course Name: Engineering Physics Topic: Velocity of electromagnetic wave & Relation between Eo & Bo	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Velocity of electromagnetic waves b. Derivation of relationship between the electric and magnetic field vectors
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wave equation for electric field Why we learn wave equation for magnetic field - Highlight the importance of wave equations 2. **Development** (30 minutes) a. Derivation of wave equation for electric and magnetic fields b. Derivation of solution for wave equation c. Deduce the relationship between the magnitude of electric and magnetic field vectors 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Electromagnetic wave equation https://web.mit.edu/8.02t/www/802TEAL3D/visualizations/coursenotes/modules/guide13.pdf http://pcwww.liv.ac.uk/~awolski/Teaching/Liverpool/PHYS370/AdvancedElectromagnetism-Part2.pdf https://www.youtube.com/watch?v=QLiIl2NBfQk - Homework Basic problem on Solution of wave equation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on solution of wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 20	Course Name: Engineering Physics Topic: Solution of electromagnetic waves	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Derivation of solution of electromagnetic wave equation
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wave equation for electric field Why we learn wave equation for magnetic field - Highlight the importance of wave equations 2. **Development** (30 minutes) a. Derivation of wave equation for electric and magnetic fields b. Derivation of solution for wave equation c. Deduce the relationship between the magnitude of electric and magnetic field vectors 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Electromagnetic wave equation https://web.mit.edu/8.02t/www/802TEAL3D/visualizations/coursenotes/modules/guide13.pdf http://pcwww.liv.ac.uk/~awolski/Teaching/Liverpool/PHYS370/AdvancedElectromagnetism-Part2.pdf - Homework Basic problem on Solution of wave equation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on solution of wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 21	Course Name: Engineering Physics Topic: Inadequacies of classical mechanics	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the Inadequacies of Classical Mechanics
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about Quantum mechanics - Need to study Inadequacies of Classical Mechanics 2. **Development** (30 minutes) a. Inadequacies of Classical Mechanics 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. De-Broglie's concept of matter waves - https://www.khanacademy.org/science/physics/quantum-physics Homework Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on the Inadequacies of Classical Mechanics Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 22	Course Name: Engineering Physics Topic: de-Broglie's concept of matter waves and de-Broglie wavelength-(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. de-Broglie's concept of matter waves b. applications of De-Broglie's concept of matter waves
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about Quantum mechanics - Highlight the importance of De-Broglie's concept of matter waves 2. **Development** (30 minutes) a. De-Broglie's concept of matter waves b. Experimental proof - Davisson & Germer Experiment d. Numerical problems 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. De-Broglie's concept of matter waves https://www.khanacademy.org/science/physics/quantum-physics - https://www.britannica.com/science/de-Broglie-wave Homework Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on De-Broglie's concept of matter waves Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 23	Course Name: Engineering Physics Topic: de-Broglie's concept of matter waves and de-Broglie wavelength-(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. de-Broglie's concept of matter waves b. applications of De-Broglie's concept of matter waves
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about Quantum mechanics - Highlight the importance of De-Broglie's concept of matter waves 2. **Development** (30 minutes) a. De-Broglie's concept of matter waves b. Experimental proof - Davisson & Germer Experiment d. Numerical problems 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. De-Broglie's concept of matter waves https://www.khanacademy.org/science/physics/quantum-physics - https://www.britannica.com/science/de-Broglie-wave Homework Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on De-Broglie's concept of matter waves Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 24	Course Name: Engineering Physics Topic: Wave-packet	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of wave packet b. applications of wave packet
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about Quantum mechanics - Need to study wave packet - Highlight the importance of wave packet 2. **Development** (30 minutes) a. wave packet b. Mathematical proof c. Numerical problems 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/resources/de-broglie-wavelength-in-different-frames/ https://www.youtube.com/watch?v=HyMud-TSxAA Wavepacket- NPTEL-HRD https://nptel.ac.in/courses/115102023 - Homework Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on wavepacket Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 25	Course Name: Engineering Physics Topic: Phase, and group velocities	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Phase velocity & group velocity b. Express relationship between Vp and Vg
Teaching Aids (if any)	a. Power point presentation b. Chalk & Talk c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about wave velocity - Need to study velocity - Highlight the importance of phase velocity and group velocity 2. **Development** (30 minutes) a. Wavepacket b. Phase Velocity c. Group Velocity d. Relationship between phase velocity and group velocity e. Numerical problems 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Phase velocity and group velocity https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/resources/de-broglie-wavelength-in-different-frames/ - https://www.youtube.com/watch?v=HyMud-TSxAA Homework Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Vp and Vg Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 26	Course Name: Engineering Physics Topic: Heisenberg uncertainty principle –(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Heisenberg's uncertainty principle b. applications of Heisenberg's uncertainty principle
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about Quantum mechanics - Need to study Heisenberg's uncertainty principle - Highlight the importance of Heisenberg's uncertainty principle 2. **Development** (30 minutes) a. Heisenberg's uncertainty principle b. Mathematical proof c. Time energy uncertainty principle d. Experimental proof - Diffraction at single slit e. Applications of Heisenberg's uncertainty principle - Non-existence of electron in nucleus f. Numerical problems 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/6-007-electromagnetic-energy-from-motors-to-lasers-spring-2011/c51a3b6c694e74f0d3daebfb8a0a0932_MIT6_007S11_lec38.pdf - https://www.youtube.com/watch?v=TcmGYe39XG0 - Homework Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Heisenberg's uncertainty principle Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 27	Course Name: Engineering Physics Topic: Heisenberg uncertainty principle –(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Heisenberg's uncertainty principle b. applications of Heisenberg's uncertainty principle
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz d.
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about Quantum mechanics - Need to study Heisenberg's uncertainty principle - Highlight the importance of Heisenberg's uncertainty principle 2. **Development** (30 minutes) a. Heisenberg's uncertainty principle b. Mathematical proof c. Time energy uncertainty principle d. Experimental proof - Diffraction at single slit e. Applications of Heisenberg's uncertainty principle - Non-existence of electron in nucleus f. Numerical problems 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/6-007-electromagnetic-energy-from-motors-to-lasers-spring-2011/c51a3b6c694e74f0d3daebfb8a0a0932_MIT6_007S11_lec38.pdf - https://www.youtube.com/watch?v=TcmGYe39XG0 - Homework Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Heisenberg's uncertainty principle Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 28	Course Name: Engineering Physics Topic: Wavefunction- definition, interpretation, and physical significance-(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Define wavefunction and its significance in quantum mechanics. b. Understand the mathematical representation of the wavefunction and its relation to the probability amplitude. c. Discuss the physical significance of the wavefunction in describing the behavior of particles at the quantum level. d. Analyze real-world applications and experiments that rely on the concept of the wavefunction.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - What is wavefunction and its historical development in quantum mechanics. Need to study Heisenberg's uncertainty principle 2. **Development** (30 minutes) a. Explanation of the mathematical formulation of the wavefunction using Schrödinger's equation. b. Discussion on the interpretation of the wavefunction, including its probabilistic nature and implications for the uncertainty principle. c. Exploration of the physical significance of the wavefunction in describing the behavior of particles, such as wave-particle duality and quantum superposition. d. Application of the wavefunction concept to real-world scenarios, such as electron orbitals in atoms and the behavior of particles in quantum computing. e. Encourage student engagement through interactive activities, discussions, and problem-solving exercises. f. Provide opportunities for hands-on experiments or simulations to reinforce understanding. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. ummarize key points covered during the lesson, including the definition, interpretation, and physical significance of the wavefunction.

	2. Reinforce understanding by revisiting any challenging concepts and addressing student questions. 3. Connect the topic to broader themes in quantum mechanics and its impact on modern technology and scientific understanding. 4. Provide resources for further study and exploration, including recommended readings or online resources. Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Heisenberg's uncertainty principle Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 29	Course Name: Engineering Physics Topic: Wavefunction- definition, interpretation, and physical significance-(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Define wavefunction and its significance in quantum mechanics. b. Understand the mathematical representation of the wavefunction and its relation to the probability amplitude. c. Discuss the physical significance of the wavefunction in describing the behavior of particles at the quantum level. d. Analyze real-world applications and experiments that rely on the concept of the wavefunction.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - What is wavefunction and its historical development in quantum mechanics. Need to study Heisenberg's uncertainty principle 2. **Development** (30 minutes) a. Explanation of the mathematical formulation of the wavefunction using Schrödinger's equation. b. Discussion on the interpretation of the wavefunction, including its probabilistic nature and implications for the uncertainty principle. c. Exploration of the physical significance of the wavefunction in describing the behavior of particles, such as wave-particle duality and quantum superposition. d. Application of the wavefunction concept to real-world scenarios, such as electron orbitals in atoms and the behavior of particles in quantum computing. e. Encourage student engagement through interactive activities, discussions, and problem-solving exercises. f. Provide opportunities for hands-on experiments or simulations to reinforce understanding. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. ummarize key points covered during the lesson, including the definition, interpretation, and physical significance of the wavefunction.

	2. Reinforce understanding by revisiting any challenging concepts and addressing student questions. 3. Connect the topic to broader themes in quantum mechanics and its impact on modern technology and scientific understanding. 4. Provide resources for further study and exploration, including recommended readings or online resources. Basic problems on numerical taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Heisenberg's uncertainty principle Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 30	Course Name: Engineering Physics Topic: Schrodinger wave equation (Steady state and time dependent) for one-dimensional case-(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of wavefunction of free particle b. Derivation of Schrodinger's time dependent wave equation - Free particle c. For a particle subject to force
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wavefunction - Highlight the importance of Schrodinger's equation 2. **Development** (30 minutes) a. Derivation of Schrodinger's time dependent wave equation for a free particle b. Derivation of Schrodinger's time dependent wave equation for a particle subject to force 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2013/resources/lecture-3/ https://nptel.ac.in/courses/115102023 https://ocw.mit.edu/courses/8-05-quantum-physics-ii-fall-2013/61bc31b8d8bf0680c322733910a71aa0_MIT8_05F13_Chap_01.pdf https://www.youtube.com/watch?v=t3A7WBLQjB4 - Homework Basic problems on evaluation of wavefunction for a free particle moving along positive x-axis taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to

	answer and discuss. 2. Google Assignment Quiz on Schrodinger's wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 31	Course Name: Engineering Physics Topic: Schrodinger wave equation (Steady state and time dependent) for one-dimensional case-(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of wavefunction of free particle b. Derivation of Schrodinger's time dependent wave equation - Free particle c. For a particle subject to force
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wavefunction - Highlight the importance of Schrodinger's equation 2. **Development** (30 minutes) a. Derivation of Schrodinger's time dependent wave equation for a free particle b. Derivation of Schrodinger's time dependent wave equation for a particle subject to force 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2013/resources/lecture-3/ https://nptel.ac.in/courses/115102023 https://ocw.mit.edu/courses/8-05-quantum-physics-ii-fall-2013/61bc31b8d8bf0680c322733910a71aa0_MIT8_05F13_Chap_01.pdf https://www.youtube.com/watch?v=t3A7WBLQjB4 - Homework Basic problems on evaluation of wavefunction for a free particle moving along positive x-axis taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to

	answer and discuss. 2. Google Assignment Quiz on Schrodinger's wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 32	Course Name: Engineering Physics Topic: Concept of operators and expectation values-(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of operator b. Derivation of Expectation value - Momentum Energy
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn expectation values - Highlight the importance of operator 2. **Development** (30 minutes) a. Concept of operator b. Obtain expectation value of momentum and energy Applications of wavefunction 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/8-05-quantum-physics-ii-fall-2013/61bc31b8d8bf0680c322733910a71aa0_MIT8_05F13_Chap_01.pdf https://www.youtube.com/watch?v=t3A7WBLQjB4 https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/resources/expectation-values-of-operators/ https://www.youtube.com/watch?v=PXUlZcZLaz8 Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on operators and expectation values Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 33	Course Name: Engineering Physics Topic: Concept of operators and expectation values-(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of operator b. Derivation of Expectation value - Momentum Energy
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn expectation values - Highlight the importance of operator 2. **Development** (30 minutes) a. Concept of operator b. Obtain expectation value of momentum and energy Applications of wavefunction 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/8-05-quantum-physics-ii-fall-2013/61bc31b8d8bf0680c322733910a71aa0_MIT8_05F13_Chap_01.pdf https://www.youtube.com/watch?v=t3A7WBLQjB4 https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/resources/expectation-values-of-operators/ https://www.youtube.com/watch?v=PXUlZcZLaz8 Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on operators and expectation values Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 34	Course Name: Engineering Physics Topic: Applications of Schrodinger's equation (Time independent) to (i) Particle in One-Dimensional Box	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the applications of Schrodinger's equations Derivation of equation of particle in one dimensional box of infinite height
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wavefunction - Highlight the importance of Schrodinger's equation application 2. **Development** (30 minutes) a. Derivation of equation of a particle in one dimensional box of infinite height. b. Applications of wavefunction 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/resources/expectation-values-of-operators/ https://www.youtube.com/watch?v=PXUlZcZLaz8 Schrodinger's wave equation- https://archive.nptel.ac.in/courses/115/102/115102023/ https://ocw.mit.edu/courses/6-007-electromagnetic-energy-from-motors-to-lasers-spring-2011/079453e5a809275f52bc2c78da13b2e2_MIT6_007S11_lec4.pdf - Homework Basic problems on evaluation of wavefunction for a free particle moving along positive x-axis taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Schrodinger's wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 35	Course Name: Engineering Physics Topic: Single Step Potential Barrier	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of application of Schrodinger's equation Derivation of Single step potential barrier
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn wavefunction - Highlight the importance of Schrodinger's equation 2. **Development** (30 minutes) a. Derivation of single step potential 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Single step potential barrier - https://ocw.mit.edu/courses/6-007-electromagnetic-energy-from-motors-to-lasers-spring-2011/079453e5a809275f52bc2c78da13b2e2_MIT6_007S11_lec41.pdf - Homework Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Schrodinger's wave equation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 36	Course Name: Engineering Physics Topic: Numerical problems on Quantum Mechanics	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. To understand the fundamental principles of quantum mechanics through numerical problem-solving. b. To develop proficiency in applying mathematical techniques to solve quantum mechanical problems. c. To enhance critical thinking and problem-solving skills in the context of quantum mechanics. d. To appreciate the relevance and application of quantum mechanics in various scientific disciplines. e. To foster confidence in tackling complex quantum mechanical problems through practice and application.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions 2. **Development** (30 minutes) a. Begin with a brief overview of the key concepts of quantum mechanics to provide necessary background knowledge. b. Introduce numerical problems gradually, starting with simpler concepts and progressing to more complex scenarios. c. Encourage active participation by involving students in problem-solving exercises individually and in groups. d. Provide step-by-step guidance on problem-solving strategies, emphasizing the application of mathematical techniques. e. Use real-world examples to demonstrate the practical implications of quantum mechanics and motivate students' interest. f. Facilitate discussions to address misconceptions and promote deeper understanding of the underlying principles. g. Offer additional resources and references for further exploration of topics beyond the classroom. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the key concepts covered during the session, reinforcing understanding and retention. 2. Highlight the importance of numerical problem-solving in mastering quantum mechanics. 3. Provide a preview of upcoming topics or assignments to maintain

	continuity and engagement. 4. Encourage students to reflect on their learning experience and identify areas for improvement or clarification. 5. Invite questions and feedback to ensure comprehension and address any lingering doubts. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Evaluate problem-solving skills by analyzing the accuracy and efficiency of solutions provided. 3. Assess students' understanding through regular quizzes, homework assignments, and problem-solving exercises. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 37	Course Name: Engineering Physics Topic: Basic of interference	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Interference b. illustrate the phenomenon of interference of light in thin films c. applications of interference in thin films
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - Do you observe the interference of light - Why wave nature of light is established - Highlight the importance of interference 2. **Development** (30 minutes) a. Interference in thin film b. Reflected system c. Transmitted system d. Conditions for maxima & minima e. Numerical problems based on interference in thin films 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://web.mit.edu/8.02t/www/802TEAL3D/visualizations/coursenotes/modules/guide14.pdf https://www.youtube.com/watch?v=kO2yFC7_k2s https://www.khanacademy.org/science/physics/light-waves/interference-of-light-waves/v/thin-film-interference-part-1#:~:text=Thin%20film%20interference%20occurs%20when,soap%20bubbles%2C%20form%20colorful%20patterns. 3. Homework Numerical problems based on interference in thin films Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on interference in thin films Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 38	Course Name: Engineering Physics Topic: Interference in thin films (by reflection & transmission of light)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Interference b. illustrate the phenomenon of interference of light in thin films c. applications of interference in thin films
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - Do you observe the interference of light - Why wave nature of light is established - Highlight the importance of interference 2. **Development** (30 minutes) a. Interference in thin film b. Reflected system c. Transmitted system d. Conditions for maxima & minima e. Numerical problems based on interference in thin films 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Interference in thin films https://www.khanacademy.org/science/physics/light-waves/interference-of-light-waves/v/thin-film-interference-part-1#:~:text=Thin%20film%20interference%20occurs%20when,soap%20bubbles%2C%20form%20colorful%20patterns. https://www.youtube.com/watch?v=B4yDGhAQUYk https://archive.nptel.ac.in/courses/115/105/115105120/ https://vlab.amrita.edu/index.php?brch=189&cnt=1&sim=335&sub=1#:~:text=Rings%20are%20fringes%20of%20equal,contact%20to%20some%20value%20t 3. Homework Numerical problems based on interference in thin films Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer

	and discuss. 2. Google Assignment Quiz on interference in thin films Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 39	Course Name: Engineering Physics Topic: Theory of Newton's rings by reflected light; Determination of ref. Index and wavelength-(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Newton rings b. illustrate the phenomenon of interference of light applications of Newton's rings
Teaching Aids (if any)	a. Power point presentation b. Chalk & Talk c. Newton rings apparatus d. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - Do you observe the interference of light - Why wave nature of light is established - Highlight the importance of interference 2. **Development** (30 minutes) a. Newton's rings b. Experimental arrangement c. Explanation of the formation of rings d. Diameter of bright and dark rings e. Spacing between the successive rings f. Applications of Newton's rings - Determination of wavelength of monochromatic light - Determination of refractive index of liquid 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://archive.nptel.ac.in/courses/115/105/115105120/ https://vlab.amrita.edu/index.php?brch=189&cnt=1&sim=335&sub=1#:~:text=Rings%20are%20fringes%20of%20equal,contact%20to%20some%20value%20t https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-17-fraunhofer-diffraction-fourier-transforms-and-theorems 3. Homework Numerical problems based on Newton's rings experiment Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Newton's rings Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 40	Course Name: Engineering Physics Topic: Theory of Newton's rings by reflected light; Determination of ref. Index and wavelength-(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Newton rings b. illustrate the phenomenon of interference of light applications of Newton's rings
Teaching Aids (if any)	a. Power point presentation b. Chalk & Talk c. Newton rings apparatus d. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - Do you observe the interference of light - Why wave nature of light is established - Highlight the importance of interference 2. **Development** (30 minutes) a. Newton's rings b. Experimental arrangement c. Explanation of the formation of rings d. Diameter of bright and dark rings e. Spacing between the successive rings f. Applications of Newton's rings - Determination of wavelength of monochromatic light - Determination of refractive index of liquid 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://archive.nptel.ac.in/courses/115/105/115105120/ https://vlab.amrita.edu/index.php?brch=189&cnt=1&sim=335&sub=1#:~:text=Rings%20are%20fringes%20of%20equal,contact%20to%20some%20value%20t https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-17-fraunhofer-diffraction-fourier-transforms-and-theorems 3. Homework Numerical problems based on Newton's rings experiment Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Newton's rings Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 41	Course Name: Engineering Physics Topic: Theory of Newton's rings by reflected light; Determination of ref. Index and wavelength-(c)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of Newton rings b. illustrate the phenomenon of interference of light applications of Newton's rings
Teaching Aids (if any)	a. Power point presentation b. Chalk & Talk c. Newton rings apparatus d. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions - Do you observe the interference of light - Why wave nature of light is established - Highlight the importance of interference 2. **Development** (30 minutes) a. Newton's rings b. Experimental arrangement c. Explanation of the formation of rings d. Diameter of bright and dark rings e. Spacing between the successive rings f. Applications of Newton's rings - Determination of wavelength of monochromatic light - Determination of refractive index of liquid 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://archive.nptel.ac.in/courses/115/105/115105120/ https://vlab.amrita.edu/index.php?brch=189&cnt=1&sim=335&sub=1#:~:text=Rings%20are%20fringes%20of%20equal,contact%20to%20some%20value%20t https://ocw.mit.edu/courses/2-71-optics-spring-2009/resources/lecture-17-fraunhofer-diffraction-fourier-transforms-and-theorems 3. Homework Numerical problems based on Newton's rings experiment Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Newton's rings Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 42	Course Name: Engineering Physics Topic: Diffraction, Fraunhoffer & Fresnel's diffraction	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Understand the phenomenon of diffraction and its significance in wave optics. b. Differentiate between Fraunhofer and Fresnel diffraction and recognize their respective applications. c. Explore the mathematical expressions governing diffraction patterns. d. Analyze the impact of various parameters such as aperture size, wavelength, and distance on diffraction patterns.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn diffraction - Difference between interference and diffraction - Importance of diffraction 2. **Development** (30 minutes) a. Diffraction b. Fresnel's & Fraunhofer diffraction c. Diffraction at single slit -Condition for Central maxima -Minima -Secondary maxima & secondary minima 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Diffraction – NPTEL https://universe.bits-pilani.ac.in/uploads/Manjuladevi/diffraction.pdf http://www.nitttrc.edu.in/nptel/courses/video/115105120/lec40.pdf https://www.youtube.com/watch?v=HwtI8hN7F_A 3. Homework Basic problems on diffraction taught in class Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on diffraction Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 43	Course Name: Engineering Physics Topic: Fresnel's half period zones and rectilinear propagation of light	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of Fresnel's half period zones and its significance in the study of light propagation. b. Explore how Fresnel's zones contribute to the phenomenon of rectilinear propagation of light. c. Analyze the principles behind the formation and characteristics of Fresnel's half period zones. d. Apply knowledge of Fresnel's zones to real-life scenarios and optical systems.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn diffraction - Difference between interference and diffraction - Importance of diffraction 2. **Development** (30 minutes) a. Diffraction b. Fresnel's & Fraunhofer diffraction c. Diffraction at single slit -Condition for Central maxima -Minima -Secondary maxima & secondary minima d. Explanation of Fresnel's half period zones, including their formation and characteristics. e. Discussion on the mathematical derivation and equations governing Fresnel's zones. f. Illustration of how Fresnel's zones contribute to maintaining rectilinear propagation. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summary of key concepts learned, including the significance of Fresnel's half period zones in light propagation. 2. Recap of practical applications and implications of understanding Fresnel's zones. 3. Encouragement for further exploration and self-study in the field of

	optics and light propagation. 4. Homework Basic problems on diffraction taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on diffraction Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 44	Course Name: Engineering Physics Topic: Fraunhoffer diffraction due to single slit-(a)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of Fraunhofer diffraction due to a single slit. b. Identify the conditions necessary for Fraunhofer diffraction to occur. c. Analyze the characteristics of the resulting diffraction pattern. d. Apply mathematical formulas to calculate the intensity distribution in the diffraction pattern.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn diffraction - Difference between interference and diffraction - Importance of diffraction 2. **Development** (30 minutes) a. Introduction to diffraction: Define diffraction and distinguish between Fraunhofer and Fresnel diffraction. b. Explanation of Fraunhofer diffraction: Discuss the conditions under which Fraunhofer diffraction occurs, emphasizing the single-slit setup. c. Derivation of diffraction pattern: Derive the mathematical expression for the intensity distribution in the Fraunhofer diffraction pattern due to a single slit. d. Characteristics of diffraction pattern: Explore the features of the diffraction pattern, such as the central maximum and secondary maxima and minima. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the key points covered in the lesson, emphasizing the significance of Fraunhofer diffraction due to a single slit. 2. Reiterate the conditions necessary for its occurrence and its practical applications. 3. Encourage students to ask questions and clarify any doubts they may have. 4. Homework Basic problems on diffraction taught in class Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on diffraction Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 45	Course Name: Engineering Physics Topic: Fraunhoffer diffraction due to single slit-(b)	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of Fraunhofer diffraction due to a single slit. b. Identify the conditions necessary for Fraunhofer diffraction to occur. c. Analyze the characteristics of the resulting diffraction pattern. d. Apply mathematical formulas to calculate the intensity distribution in the diffraction pattern.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn diffraction - Difference between interference and diffraction - Importance of diffraction 2. **Development** (30 minutes) a. Introduction to diffraction: Define diffraction and distinguish between Fraunhofer and Fresnel diffraction. b. Explanation of Fraunhofer diffraction: Discuss the conditions under which Fraunhofer diffraction occurs, emphasizing the single-slit setup. c. Derivation of diffraction pattern: Derive the mathematical expression for the intensity distribution in the Fraunhofer diffraction pattern due to a single slit. d. Characteristics of diffraction pattern: Explore the features of the diffraction pattern, such as the central maximum and secondary maxima and minima. 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the key points covered in the lesson, emphasizing the significance of Fraunhofer diffraction due to a single slit. 2. Reiterate the conditions necessary for its occurrence and its practical applications. 3. Encourage students to ask questions and clarify any doubts they may have. 4. Homework Basic problems on diffraction taught in class Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on diffraction Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 46	Course Name: Engineering Physics Topic: Plane diffraction grating & its theory for secondary maxima and minima.	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of polarisation b. illustrate the method of restricting the light in one plane c. applications of polarisation in daily life
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn polarisation - Difference between ordinary light and polarised light - Importance of polarisation 2. **Development** (30 minutes) a. Polarisation b. Production of polarised light by tourmaline crystal c. Brewster's law d. Double refraction e. Huygens theory of double refraction f. Applications of polarisation 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading http://www.nitttrc.edu.in/nptel/courses/video/115105120/lec40.pdf https://www.youtube.com/watch?v=HwtI8hN7F_A Homework Basic problems on polarisation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on polarisation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 47	Course Name: Engineering Physics Topic: Unpolarised and polarised light and Phenomenon of double refraction	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of polarisation b. illustrate the method of restricting the light in one plane c. applications of polarisation in daily life
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn polarisation - Difference between ordinary light and polarised light - Importance of polarisation 2. **Development** (30 minutes) a. Polarisation b. Production of polarised light by tourmaline crystal c. Brewster's law d. Double refraction e. Huygens theory of double refraction f. Applications of polarisation 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. https://www.kharagpurcollege.ac.in/studyMaterial/51247Study-Material-Physics-Sem.-2-Diffraction-Class-5-27-05-2020.pdf Homework Basic problems on polarisation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on polarisation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 48	Course Name: Engineering Physics Topic: Geometry of Calcite crystal and Nicol Prism.	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of polarisation b. illustrate the method of restricting the light in one plane c. Geometry of Calcite crystal and Nicol Prism
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn polarisation - What is calcite crystal - How Nicole prism is formed 2. **Development** (30 minutes) a. Polarisation b. Production of polarised light by tourmaline crystal c. Brewster's law d. Double refraction e. Huygens theory of double refraction f. Applications of polarisation 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. https://drpradeepatuem.files.wordpress.com/2013/10/11-nicol-prism.pdf/ 4. https://archive.nptel.ac.in/courses/122/107/122107035/ 5. Homework Basic problems on polarisation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Nicole prism Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 49	Course Name: Engineering Physics Topic: Mathematical representation of elliptically and circularly polarized light	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of polarisation b. illustrate the method of restricting the light in one plane c. applications of polarisation in daily life
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn polarisation - What is circular and elliptical polarized light 2. **Development** (30 minutes) a. Polarisation b. Production of polarised light by tourmaline crystal c. Brewster's law d. Double refraction e. Huygens theory of double refraction f. Applications of polarisation 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading - Polarisation - NPTELhrd https://www.youtube.com/watch?v=Pt5wvYyguq0 - http://www.nitttrc.edu.in/nptel/courses/video/122107035/lec4.pdf 3. Homework Basic problems on polarisation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on polarisation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 50	Course Name: Engineering Physics Topic: Quarter and half wave plate.	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of polarisation b. learn about Quarter and half wave plate.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn polarisation - Difference between Quarter and half wave plate. 2. **Development** (30 minutes) a. Polarisation b. Production of polarised light by tourmaline crystal c. Brewster's law d. Double refraction e. Quarter and half wave plate f. Applications of polarisation 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/pages/part-iii-optics/lecture-17/ 4. Homework Basic problems on polarisation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Quarter and half wave plate. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 51	Course Name: Engineering Physics Topic: Numerical problems based on quarter and half wave plate	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of polarisation b. illustrate the method of restricting the light in one plane c. applications of polarisation in daily life
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn polarisation - Difference between ordinary light and polarised light - Importance of polarisation 2. **Development** (30 minutes) a. Polarisation b. Production of polarised light by tourmaline crystal c. Brewster's law d. Double refraction e. Huygens theory of double refraction f. Applications of polarisation 3. Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading 3. https://ocw.mit.edu/courses/8-03sc-physics-iii-vibrations-and-waves-fall-2016/pages/part-iii-optics/lecture-18/ 4. Homework Basic problems on polarisation taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on polarisation Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 52	Course Name: Engineering Physics Topic: Basic of Laser, induced absorption, spontaneous emission, stimulated emission, and Einstein's coefficients	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of emission, absorption and laser action b. Derivation of Einstein's coefficients
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about absorption & emission of light Have any one seen any laser source - Highlight the importance of lasers in communication 2. **Development** (30 minutes) a. Introduction to absorption & emission b. Basic of Laser c. Induced absorption d. spontaneous emission e. stimulated emission f. Einstein's coefficients Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://archive.nptel.ac.in/courses/115/102/115102124/ 1. https://www.youtube.com/watch?app=desktop&v=sv1hK_dLVzE Homework Basic problems on optical fibres taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on lasers & Einstein's coefficient Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 53	Course Name: Engineering Physics Topic: Ruby laser construction and working	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of light amplification by stimulating emission of radiation (LASER) b. Construction and working of Ruby laser c. application of laser in communication, industries and medical sciences
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about LASER Have any one seen toy LASER source - Highlight the importance of Ruby laser as monochromatic, coherent and directional source of laser 2. **Development** (30 minutes) a. Introduction to Ruby laser b. Various parts of Ruby laser -Optical resonator -Optical pumping scheme c. Working of ruby laser d. Energy level diagram Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://udrc.lkouniv.ac.in/Content/DepartmentContent/SY_78e58cb6-bfc9-43d9-8f8d-4ed7cf27fec9_37.pdf https://www.youtube.com/watch?v=IMeF85yo0_4 3. Homework Basic problems on lasers taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on Ruby laser and its applications

	Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 54	Course Name: Engineering Physics Topic: Propagation of Light in Optical fibres, Acceptance angle, acceptance cone	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of construction of optical fibres b. appreciate advantages of optical fibres and its associated challenges in its fabrication c.
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about optical fibres Have any one seen optical fibes - Difference between optical fibre communications and conventional wire system - Highlight the importance of optical fibres 2. **Development** (30 minutes) a. Introduction to optical fibes b. Parts of optical fibre -Core -Cladding -Protective jacket c. Transmission of light through optical fibre Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://archive.nptel.ac.in/courses/115/107/115107095/ https://www.scribd.com/document/422110016/Laser-and-Optical-Fiber 3. Homework Basic problems on optical fibres taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.

	2. Google Assignment Quiz on optical fibres Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 55	Course Name: Engineering Physics Topic: Numerical aperture and single mode and multimode fiber	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of propagation of light in optical fibres b. appreciate advantages of optical fibres and its associated challenges in its fabrication c. Concept of numerical aperture, acceptance angle & acceptance cone
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about optical fibres Have any one seen optical fibes - Difference between optical fibre communications and conventional wire system - Highlight the importance of optical fibres 2. **Development** (30 minutes) a. Acceptance angle b. Acceptance cone c. Advantages and d. applications of optical fibres Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://onlinecourses.nptel.ac.in/noc20_ph07/preview https://www.scribd.com/presentation/411254955/12471-Fundamental-of-Fiber-Optics 3. Homework Basic problems on optical fibres taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. 2. Google Assignment Quiz on optical fibres Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 56	Course Name: Engineering Physics Topic: Characteristics and General applications of Lasers and Optical fibres numerical problems	Course No.: BSC-202

Objectives	At the end of the lesson the student shall be able to: a. articulate the concept of propagation of light in optical fibres b. appreciate advantages of optical fibres and its associated challenges in its fabrication c. Concept of numerical aperture, acceptance angle & acceptance cone
Teaching Aids (if any)	a. Power point presentation b. Chalk & talk c. Use of Google quiz assignment tool for online quiz
Teaching Development	1. **Introduction** (5 minutes) - Ask questions Why we learn about optical fibres Have any one seen optical fibes - Difference between optical fibre communications and conventional wire system - Highlight the importance of optical fibres 2. **Development** (30 minutes) a. Acceptance angle b. Acceptance cone c. Advantages and d. applications of optical fibres Exercise (5 minutes) – Use Google forms and Nearpod tool for quiz based on the topic Use Nearpod to collect responses and discuss the answers.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Reading https://archive.nptel.ac.in/courses/104/104/104104085/ - https://ocw.mit.edu/courses/6-974-fundamentals-of-photonics-quantum-electronics-spring-2006/18f30fad63a62ef4dd894d3752b55a60_chapter7.pdf 3. Homework Basic problems on optical fibres taught in class Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer

	and discuss. 2. Google Assignment Quiz on optical fibres Spend 5 minutes to evaluate student assimilation of the lesson contents