# Millia Institute of Technology Rambagh, Purnea

Affiliated to BIhar Engineering University, Patna

# NAAC Accredited & ISO 9001:2015



# **SYLLABUS**

# **Department of Civil Engineering**

# **2nd SEMESTER**

### B.Tech (Civil Engineering)

SI No.	. Course Code	Course Title	Hours Per Week			Total
			Lecture	Tutorial	Practical	Credits
1.	100201	Engineering Physics	3	0	0	3
2.	100202	Engineering Mathematics-II	3	1	0	4
3.	100203	Programming for Problem Solving	3	0	0	3
4.	100214P	Swachha Bharat Mission	0	0	2	1
5.	100210	Building Material and Construction Techniques	2	0	0	2
6.	100211	Environmental Science and Sanitation	2	0	0	2
7.	100212	Elements of Civil Engineering	2	0	0	2
8.	100201P	Engineering Physics Lab	0	0	2	1
9.	100203P	Programming for Problem Solving Lab	0	0	2	1
10.	100210P	Building Material and Construction Techniques Lab	0	0	2	1
					TOTAL	20

#### **Course Code-100201 Engineering Physics**

#### **Unit- 1.0**

#### **1. Frame of Reference:**

Non-Inertial frame of reference, rotating coordinate system, centripetal and Coriolis acceleration and its application in weather system.

#### 2. Oscillations:

Harmonic Oscillator, Damped Harmonic motion - overdamped, critically Damped and lightly damped oscillators, Force Oscillators and Resonance.

#### **Unit- 2.0**

#### **1. Optics:**

Huygens's Principle, Superposition of Waves and interference of Light by wave frontsplitting and amplitude-splitting; Young's double slit experiment, Michelson interferometer, Fraunhofer diffraction from single slit and circular aperture, Diffraction Grating and their resolving power

#### 2. LASER:

Einstein's theory of matter-radiations interaction, Einstein's Coefficients (A and B), Amplification by population inversion, Different types of lasers – Gas Laser, Helium-Neon Laser, Solid State Laser (Ruby, Neodymium), Semiconductor Laser.

#### **Unit- 3.0**

#### **1. Quantum Mechanics:**

Compton Effect, Photoelectric Effect, Wave Particle duality, de Broglie's hypothesis, Heisenberg's Uncertainty Principle, Wave function and wave packets, phase and group velocities, Schrodinger's Wave Equation, Normalization, Expectation values, Eigenvalues and Eigenfunction.

#### 2. Applications in One dimensions:

Application of Schrodinger Wave Equation for particle in one dimensional box - its wavefunction and eigenvalue of energy and momentum.

#### **Unit- 4.0**

#### **1. Vector Calculus:**

Gradient, Divergence and Curl, Line, Surface and Volume integrals, Gauss's Divergence theorem and Stokes' theorem in Cartesian Coordinate.

#### 2. Electrostatics:

Gauss's Law and its applications, Divergence and Curl of Electrostatic fields, Electrostatic Potential, Boundary Conditions, Poisson's and Laplace's equations, Dielectrics, Polarization, Bound Charges, Electric displacement, Boundary Conditions in dielectrics. **Unit- 5.0** 

#### **1. Magnetostatics:**

Lorentz force, Biot-Savart and Ampere's circuital laws and their applications, Divergence and Curl of Magneto static fields, Magnetic vector potential, Force and torque on a magnetic dipole, Magnetic Materials, Magnetization, Bound currents, Boundary conditions.

#### 2. Electrodynamics and Electromagnetic Waves:

Ohm's law, Motional EMF, Faraday's Law, Lenz's law, Self and mutual inductance, Energy stored in magnetic field, Maxwell's equations in vacuum and nonconducting medium, Continuity Equation, Poynting Theorem, Wave Equations: plain electromagnetic wave in vacuum and their transverse nature and Polarization.

#### **Unit- 6.0**

#### 1. Introduction to Solids and Semi-Conductors:

Free electron theory of metal, fermi level, Bloch's theorem for particle in a periodic Potential, Kroning-Penney model and origin of energy band.

#### **2. Electronic Materials:**

Metals, semiconductors and insulators, intrinsic and extrinsic semiconductors, Carrier transport, diffusion and drift, P-N junction.

#### 2 hrs

#### 4 hrs

4 hrs

4 hrs

#### 3 hrs

3 hrs

# 3 hrs

#### 2 hrs

# 4 hrs

4 hrs

5 hrs

#### Test/ Reference:-

- 1. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, R. Eisberg R. Resnick, Wiley India Pvt. Ltd ISBN 978-81-265-0818-1
- 2. Theory of Vibration with Application, W.T. Thomson M. D. Dahleh, Pearson India ISBN 978-81-317-0482-0
- 3. Introduction to Electrodynamics, D.J. Griffiths, Pearson India, ISBN 978-93-325-5044-5
- 4. Electromagnetism, I.S. Grant, W. R. Phillips, Wiley India Pvt. Ltd ISBN 978-04-719-2712-9
- 5. The Feynman Lectures on Physics, R.P. Feynman R. B. Leighton, Pearson India ISBN 978-00-710-7458-2
- 6. Optics, Ajay Ghatak ,McGraw Hill ISBN 978-93-901-1359-0
- Physics of Vibration and Waves, H. J. Pain, Wiley India Pvt. Ltd, ISBN 978-04-700-1296-3
- 8. Concept of Modern Physics, Arthur Beiser, McGraw Hill ISBN 978-93-513-4185-7
- Introduction to Solid State Physics, C. Kittle, Wiley India Pvt. Ltd, ISBN 978-81-265-7843-6

# Course Code-100201PEngineering Physics Lab<br/>Perform any 10 Experiments0 0

1. Determination of the capacitance and permittivity of the given material.

2. Determination of e/m of electron.

3. Determination of Planck's constant and Photoelectric Work Function using Photoelectric cell.

4. Verification of inverse square law using photocell.

5. Determination of Wavelength of (He-Ne) LASER using Diffraction Grating Method.

6. Calculation of Energy Band Gap of a semiconductor.

7. Determination of Dielectric constant using resonance method.

8. Determination of Wavelength of Sodium light by measuring the diameter of the Newton's Ring.

9. Determination of curvature of convex surface of a lens by Newton's ring.

10. Verification of existence of Bohr's Energy level with Frank-Hertz apparatus.

11. Determination of the Earth's horizontal magnetic field intensity and magnetic Moment of a magnet by employing magnetometer.

12. Verification of Faraday's Law and Lenz's Law of Electromagnetic Induction.



#### **Engineering Mathematics– II** 3104 Course Code-100202 Unit- 1.0 Complex Analysis – I

Functions of complex variable, limit, Continuity, Differentiability, Analytic function, Cauchy-Riemann Equations in Cartesian and polar form, harmonic function and harmonic

#### conjugate. Unit- 2.0 Complex Analysis – II

Line Integral, contour integrals, Cauchy theorem, Cauchy's Integral formula(without proof), Taylors series, zero of analytic functions, singularities, Laurent's series, residue, Cauchy residue theorem(without Proof) and its applications.

#### **Unit- 3.0 Ordinary Differential Equations**

Linear differential equations of nth Order with constant coefficients, solution of Homogeneous and Non-Homogeneous Equations, Equations with variable coefficients, Cauchy-Euler Equations, Method of Variation of Parameters.

#### **Unit-4.0 Sequence and Series**

Introduction of Sequence and Series, Nature of series Tests of convergence of Series: Comparison test, D'Alembert ratio test, Cauchy's Root test, Raabe's test, Logarithmic test, Cauchy's condensation test.

#### **Unit- 5.0 Laplace Transform**

Laplace Transform, Existence theorem, properties of Laplace Transform, Laplace Transform of Periodic functions, Inverse Laplace Transform, convolution theorem. Application of Laplace Transform to solve Ordinary differential equations.

#### **Unit- 6.0 Fourier Series**

Fourier Series, Fourier Series for odd and even functions, Half range sine and cosine series, Parseval's theorem.

#### **Test/ Reference:-**

- 1. Advanced Engineering Mathematics, Kreyszig Erwin, John Wiley and Sons, 10th Edition.2020 ISBN:978-0470-45836-5
- 2. Advanced Engineering Mathematics, Dass H.K., S Chand and Company pvt.Ltd.,22nd Edition,2018 ISBN:978-93-5283-718-2
- Grewal B.S., 3. Higher Engineering Mathematics, Khanna Publishers,44th Edition,2023 ISBN:9788174091154
- 4. Complex Variables (Theory and Applications), Kasana H.S., PHI,2nd Edition.2015 ISBN:978-81-203-2641-5
- 5. A Text Book of Engineering Mathematics, Bali N.P., Goyal Manish Laxmi Publications,9th Edition,2014
- 6. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill New Delhi, 11th Reprint, 2010, ISBN-10 007063419X ISBN-13978- 0070634190
- 7. Differential Equations, Ross S.L., Wiley Publications, 3rd edition, 2016 ISBN: 978-81-265-1537-0
- 8. Advanced Differential Equations, Raisinghania M.D., S.Chand and Company PVT.LTD.,18th Edition,2015 ISBN:978-81-219-0893-1
- 9. Schaum's Outlines Complex Variables, Spiegel Murray R, Lipschutz Seymour, Schiller J John and Spellman Dennis, MC Graw Hill Education Private Ltd.2nd Edition.2010 ISBN:978-0-07-008538-1

#### 8 hrs

8 hrs

6 hrs

#### 8 hrs

#### 6 hrs

#### Course Code-100203 Programming for Problem Solving 3003 **Unit-1.0**

#### **Introduction to Programming**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

#### **Unit-2.0**

#### **Operators, Conditional Branching and Loops**

Arithmetic expressions/arithmetic operators, relational operators, logical operators, bitwise operators and precedence. Writing and evaluation of conditionals and consequent branching, Iteration and loops.

#### **Unit- 3.0**

#### **Arrays and String**

Array declaration & initialization, bound checking arrays (1-d, 2-d), character arrays and strings.

#### **Unit- 4.0**

#### **Function, Recursion and Pointers**

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Idea of pointers, Defining pointers, Use of Pointers in self- referential structures, idea of call by reference.

#### **Unit- 5.0**

#### **User defined Data Types and File handling**

Structure- defining, declaring, initializing; accessing structure members, processing of structure, array of structures, structures within structure, structure and function, type definition; Union— definition, declaration, accessing union members, initializing union. Introduction, file declaration, opening and closing a file, working with text and binary files, I/O operations on file, error handling, random access to files

#### **Unit- 6.0**

#### **Basic Algorithms**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

#### **Test/ Reference:-**

- 1. Programming in ANSI C 4th Ed, E Balagurusamy, McGraw Hill Education India Private Limited, ISBN-978-9339219666, 7th Edition
- 2. The C Programming Language 2e, W. Kernighan / Dennis Ritchie, Pearson Education India, 978-9332549449, 2nd Edition
- 3. Computer Fundamentals and Programming in C,ReemaThareja,Oxford University Press, ISBN- 978-9354977893, 3rd Edition

#### 8 hrs

5 hrs

#### 6 hrs

#### 8 hrs

6 hrs

#### Course Code-100203P Programming for Problem Solving Lab 0 0 2 1 Perform any 10 Experiments

- 1. Tutorial 1: Problem solving using computers:
  - Lab1: Familiarization with programming environment
- Tutorial 2: Variable types and type conversions:
  Lab 2: Simple computational problems using arithmetic expressions
- Tutorial 3: Branching and logical expressions: Lab 3: Problems involving if-then-else structures
- Tutorial 4: Loops, while and for loops: Lab 4: Iterative problems e.g., sum of series
- 5. Tutorial 5: 1D Arrays: searching, sorting:
  - Lab 5: 1D Array manipulation
- 6. Tutorial 6: 2D arrays and Strings
- Lab 6: Matrix problems, String operations 7. Tutorial 7: Functions, call by value:
  - Lab 7: Simple functions
- 8. Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
  - Lab 8 and 9: Programming for solving Numerical methods problems
- 9. Tutorial 10: Recursion, structure of recursive calls
  - Lab 10: Recursive functions
- 10. Tutorial 11: Pointers, structures and dynamic memory allocation
  - Lab 11: Pointers and structures
- 11. Tutorial 12: File handling:
  - Lab 12: File operations

#### Course Code-100214PSwatch Bharat Mission0 02 1

Objectives:

1. Understanding the importance of cleanliness and sanitation: The course could aim to create

awareness about the significance of cleanliness and sanitation in maintaining personal health,

environmental sustainability, and community well-being. It could cover topics such as waste management, sanitation practices, and the impact of poor sanitation on public health.

2. Developing skills for effective waste management: The course could provide training on various waste management techniques, such as waste segregation, composting, recycling,

and proper disposal of hazardous waste. It could also emphasize the importance of reducing waste generation and promoting sustainable waste management practices.

3. Promoting behavioural change towards cleanliness: The course could focus on influencing

positive behavioural change among individuals and communities towards cleanliness. It could include modules on promoting good hygiene practices, creating awareness about the harmful effects of littering and open defecation, and encouraging responsible waste disposal habits.

4. Creating awareness about Swachh Bharat Mission initiatives: The course could provide information about the Swachh Bharat Mission initiatives and campaigns launched by the Government of India to promote cleanliness and sanitation, such as Swachh Survekshan, Swachh Bharat Abhiyan, and Clean India Campaign. It could also discuss the progress made,

challenges faced, and future prospects of the Swachh Bharat Mission.

5. Engaging in community participation and advocacy: The course could emphasize the importance of community participation in the Swachh Bharat Mission and provide tools and strategies for engaging with local communities to promote cleanliness and sanitation. It could

also encourage advocacy for policy changes and innovations to address sanitation-related issues at the community, regional, and national levels.

6. Pre-requisite: Nil

7. Course Outcome:

8. Increased awareness and knowledge about cleanliness and sanitation: Participants of the course may gain a deeper understanding of the importance of cleanliness and sanitation, including the impact on personal health, environmental sustainability, and community well-being. They may learn about various waste management techniques, hygiene practices, and the initiatives of the Swachh Bharat Mission.

9. Enhanced skills for effective waste management: Participants may acquire practical skills related to waste management, such as waste segregation, composting, recycling, and proper disposal of hazardous waste. They may also develop skills in reducing waste generation and promoting sustainable waste management practices in their communities or workplaces.

10. Positive behavioral change towards cleanliness: The course may influence participants to

adopt positive behavioral changes towards cleanliness, such as avoiding littering, practicing good hygiene habits, and promoting responsible waste disposal. Participants may develop a sense of responsibility towards maintaining cleanliness in their surroundings and actively contribute towards creating a cleaner environment.

11. Increased community participation and advocacy: Participants may become actively engaged in community participation and advocacy efforts related to cleanliness and

sanitation. They may collaborate with local communities, government bodies, and nongovernmental organizations (NGOs) to raise awareness, implement cleanliness initiatives, and advocate for policy changes or innovations to address sanitation-related issues. 12. Contribution towards Swachh Bharat Mission objectives: Participants may contribute towards the objectives of the Swachh Bharat Mission, such as promoting cleanliness, ensuring proper waste management, and eliminating open defecation. They may actively participate in Swachh Bharat Mission campaigns, initiatives, and activities, and make a positive impact on their communities and society at large. 13. List of Reports:

14. Any topics related to Swatch Bharat Mission

#### Course Code-100210 Building Material and Construction Techniques 2002 Unit- 1.0 7hrs

Stones and Bricks: Classification of Rocks. Requirement of good building stones. Quarrying and Dressing of Stones. 1 Components, properties and types of Bricks. Field and Laboratory tests of Bricks.

#### Unit- 2.0

Cement: Introduction and manufacturing of cement. Composition of cement. Bouge's compound and their significance. Hydration of cement. Physical properties of cement. Testing of Cement. Types of Cement and their field applications. Storage of cement and its effects on properties of cement.

#### Unit- 3.0

Aggregate: Aggregate: Sources of aggregate, Classification according to source, size and shape. Properties of fine and coarse aggregates. Bulking of fine aggregate, Parameters for good aggregate. Grading and Zoning of fine and coarse aggregates as per IS code. Fineness Modulus of fine and coarse aggregate. Testing of Aggregate.

#### Unit- 4.0:

Miscellaneous Building Material: Metals: Steel: Important properties and uses of Iron (Cast iron, wroght iron and steel), Test on steel rebar. Admixtures: Purpose, Types of chemical and mineral admixtures. Gypsum: source, properties and use. Paints: Types, distemper, varnish.

#### Unit- 5.0:

Concrete: Introduction and Types of Concrete, Concreting Operations (Batching, mixing, transportation, placing, compaction, curing and finishing of concrete). Grades of concrete as per IS 456, Water cement ratio and its significance. Properties and testing of fresh concrete. Properties and testing of hardened concrete. Non-Destructive Testing (NDT) of hardened concrete. Concrete Mix Design: objective, methods of mix design, the study of procedural steps of mix Design as per IS 10262:2019.

#### Unit- 6.0:

Basic Building Constructions: Brick Masonry: types of bonds, relative merits and demerits of English, Single Flemish and Double Flemish bond. Cavity Wall: Components and construction. Damp Proofing: causes, effects, prevention and treatments. Fire resistant construction: Fire resistant properties of common building materials.

#### Test/ Reference:-

- 1. Concrete Technology, Gambhir, M.L., Tata McGraw Hill Publishing Co. Ltd., New Delhi, 5th Edition, 2017, ISBN-13: 978-1- 259-06255-1
- 2. Concrete Technology, Shetty, M.S., S Chand and Co. Pvt. Ltd., Ram Nagar, New Delhi-110055, 8th Edition, 2019, ISBN, : 978-8-121- 90003-4
- 3. Concrete Technology, Santhakumar ,A. R., Oxford University Press, New Delhi, 2nd Edition, 2018, ISBN-13: 978-0-195-67153-7
- 4. Concrete Technology, Neville, A. M. and Brooks, J.J., Pearson Education Pvt. Ltd., New Delhi, 2nd Edition, 2010, ISBN 978-0-273-73219-8
- Properties of Concrete, Neville A. M., Pearson Education Pvt. Ltd., New Delhi, 5th Edition, 2012, ISBN 978-8131791073
- 6. A Text-Book of Building Construction ,S.P.Bindra and S.P.Arora, Dhanpat Rai Publications
- 7. Building Construction, B. C. Punmia, Laxmi Publicaton

#### 7hrs

#### 7hrs

### 7hrs

7hrs

# Course Code-100210PBuilding Material and Construction Techniques Lab<br/>Perform any 10 Experiments0 0 2 1

- 1. Determine the fineness of the given cement by Sieving as per IS: 4031 (Part 1)-1996 or Blaine's air permeability apparatus as per IS: 4031 (Part 2)- 1999
- 2. Determine the standard consistency of the given cement using Vicats apparatus as per IS: 4031 (Part 4)- 1988.
- 3. Determine the setting time of the given cement using Vicats apparatus as per IS: 4031 (Part 5)- 1988.
- 4. Determine the compressive strength of the given cement as per IS: 4031 (Part 6) 1988.
- 5. Determine the soundness of the given cement by Lechatelier method as per IS: 4031 (Part 3)- 1988
- 6. Determine the size, grading and fineness modulus of the given fine and coarse aggregates as per IS: 2386 (Part I) 1963.
- 7. Determine the flakiness index and elongation index of the given coarse aggregate as per IS: 2386 (Part I) 1963.
- 8. Determine the silt content in given sand as per IS: 2386 (Part II) 1963.
- 9. Determine the bulking of given sand as per IS: 2386 (Part III)- 1963.
- 10. Determine the bulk density of the given fine and coarse aggregates as per IS: 2386 (Part III) -1963.
- 11. Determine the water absorption of the given fine and coarse aggregates as per IS: 2386 (Part III) -1963.
- 12. Determine the impact value of the given coarse aggregate as per IS: 2386 (Part IV)-1963.
- 13. Determine the crushing value of the given coarse aggregate as per IS: 2386 (Part IV)- 1963.
- 14. Determine the abrasion value of the given coarse aggregate as per IS: 2386 (Part IV)- 1963.
- 15. Determine workability of the given concrete mix by slump test/compaction factor test/flow table/VeeBee consistometer method as per IS: 1199-1959.
- 16. Determine the compressive strength of the given concrete mix at 7 days and 28 days of curing as per IS: 516-1959.
- 17. Asses the durability of the given concrete using Rapid Chloride Penetration test (RCPT) as per ASTM C 1202 /Permeability test as per IS: 3085-1965.

#### Course Code-100211

#### Environmental Science and Building Sanitation 2002

#### Unit- 1.0:

#### **Introduction to Environmental Science**

Definition, scope, and importance of Environmental Science, Environmental systems and their components, Interaction between Environmental systems, Natural Resources, Case study on key Environmental Issues..

#### Unit- 2.0:

#### **Ecosystems and Biodiversity**

Structure and function of ecosystems, Energy flow and nutrient cycles (carbon, nitrogen, phosphorus), Biodiversity and its conservation, Case study on successful ecosystem conservation efforts.

#### Unit- 3.0:

#### **Environmental Pollution**

Air, water, soil, and noise pollution, Sources, effects, and control measures, Case studies on pollution management.

#### Unit- 4.0:

#### **Sustainable Development**

Principles of sustainable development, Environmental impact assessment (EIA), Sustainable practices in civil engineering, Case study on sustainable practices in civil engineering. **Unit- 5.0**:

#### Unit- 5.0:

## Building Sanitation

Importance of sanitation in buildings, Design and layout of sanitation systems, Waste management and disposal.

#### Unit- 6.0:

#### Water Supply and Modern Sanitation Techniques

Water Supply and Treatment: Sources of water and quality standards, Water supply systems for buildings, Water treatment processes. Modern Techniques in Sanitation: Modern tools and technologies in building sanitation, Smart sanitation systems and IoT, Case study on innovative sanitation solutions.

#### **Test/ Reference:-**

- 1. Environmental Science: Earth as a Living Planet Daniel B. Botkin, Edward A. Keller Wiley, 9th Edition ISBN: 978-1118427323
- 2. Environmental Engineering and Sanitation Joseph A. Salvato Wiley-Interscience, 4th Edition ISBN: 978-0471333055
- 3. Water Supply and Sanitation E. W. Steel, Terence J. McGhee McGraw-Hill, 5th Edition ISBN: 978-0070609384

#### **7hrs** ns. V

#### 7hrs

### 7hrs

### 7hrs

7hrs

#### **Course Code-100212 Elements of Civil Engineering** 2002 **Unit- 1.0** 7hrs

#### **Overview of Civil Engineering**.

Basic understanding and History of Civil Engineering. Fundamental of Civil Architecture and Town Planning Basic Surveying Modern Surveying Equipment [ like TS, Theodolite ] Case study of National Infrastructure Projects, Professional Ethics in Engineering. **Unit- 2.0** 

#### **Structural Engineering.**

Introduction to Mechanics of Structure. Type of Structure. Fundamentals of Building Materials. Repair and Rehabilitation of Structures.

#### **Unit-3.0**

#### Geotechnical Engineering.

Basic Terminology and properties of Soil Mechanics. Types of Foundations [ Shallow and Deep | Solid Waste Management and Landfill. Basic of Engineering Geology.

#### **Unit- 4.0**

#### Water Resources Engineering

Fluid Properties and Type of Fluid Flow Wave and Current System Sediment Transport System Water Resources Structure Water Treatment and Supply.

#### **Unit- 5.0**

#### **Traffic and Transport Engineering**

Introduction to different modes of Transportation. Major Transport Infrastructure in India. Introduction to Geometric Design. Pavement Materials, Design and Construction Basic of Traffic Engineering Road Safety Role of PPP model in transportation.

#### **Unit- 6.0**

#### Miscellaneous

Sustainability in Construction. Construction Management. Contract Management Software used in Civil Engineering. Automation and Robotics in Civil Engineering.

#### **Test/ Reference:-**

- 1. Basic Civil Engineering, B. C. Punmia, Ashok Kumar, Jain, Arun Kumar Laxmi Publications
- 2. Basic Civil Engineering, Satheesh Gopi, Pearson Publishers ISBN 978-81-317-2988-
- 3. Basic Civil Engineering, Palanichamy, McGraw Hill

## 7hrs

7hrs

#### 7hrs

7hrs