

**BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA  
ROURKELA**



**Curriculum and Syllabus**

**of**

**B.Tech (*Civil Engineering*) from the Batch 2018-19**

**Semester (3<sup>rd</sup>)**

**Director, Curriculum Development**  
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Rourkela

<b>Third Semester</b>							
<b>Theory</b>							
<b>Sl No</b>	<b>Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L-T-P</b>	<b>Credit</b>	<b>University Marks</b>	<b>Internal Evaluation</b>
1	BS	RMA3A001	Mathematics - III	3-0-0	3	100	50
2	ES	ROP3B001	Object Oriented Programming Using JAVA	3-0-0	3	100	50
3	HS	REN3E001 / ROB3E002	Engineering Economics / Organisational Behaviour	3-0-0	3	100	50
4	PC	RME3C001	Mechanics of Solid	3-0-0	3	100	50
5	PC	RME3C002	Fluid Mechanics and Hydraulic Machines	3-0-0	3	100	50
6	MC*	RES3F001	Environment Science	3-0-0	0	—	100 (Pass mark is 37)
<b>Total Credit (Theory)</b>					<b>15</b>		
<b>Total Marks</b>						<b>500</b>	<b>250</b>
<b>Practical</b>							
1	PC	RCI3C201	Building Drawing using Auto CAD	0-0-3	2		100
2	PC	RME3C202	Fluid Mechanics and Hydraulic Machines Lab.	0-0-3	2		100
3	ES	ROP3B201	OOP Using JAVA Lab.	0-0-3	2		100
4	PSI	RIP3H201	Evaluation of Internship - I	0-0-3	1		100
<b>Total Credit (Practical)</b>					<b>7</b>		
<b>Total Semester Credit</b>					<b>22</b>		
<b>Total Marks</b>							<b>400</b>

\*Mandatory Non-Credit Courses (MC) result will be reflected with Pass (P) / Fail (F) grade. Thus the grade obtained will not be affecting the grade point average. However it shall appear on the grade sheet as per AICTE rule.

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<b>3<sup>rd</sup> Semester</b>	<b>RMA3A001</b>	<b>MATHEMATICS – III</b>	<b>L-T-P</b> <b>3-0-0</b>	<b>3 CREDITS</b>
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### **Module-I (10 Hours)**

Solution of Non-linear equation in one variable (Bisection, Secant, Newton Rapson Method, Fixed Point Iteration method). Numerical Solutions of system of Linear equations (Gauss-Seidel, Successive Over Relaxation, Doolittle method, Crouts method, Choleskys Method).

Interpolation: Newton's forward and backward interpolation, Newton divided difference interpolation, Lagrange Interpolation.

### **Module-II (8 Hours)**

Numerical Differentiation, integration and Solution of Differential Equations: Numerical Differentiation, The trapezoidal rule, The Simpson's rule, Gauss Integration formulas. Solution of ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods, multi step methods, Methods for system and higher order ordinary differential equations.

### **Module-III (8 Hours)**

Sample Space, Probability, Conditional Probability, Independent Events, Bayes' Theorem, Random variables, Probability distributions, Expectations, Mean and variance, Moments.

### **Module-IV (9 Hours)**

Bernoulli Trials, Binomial, Poisson, Hyper Geometric Distribution, Uniform., Exponential and Normal distribution, Bivariate Distributions.

### **Module-V (10 Hours)**

Correlation and Regression Analysis, Rank Correlation, Maximum Likely hood estimate, Method of Moments, Confidence intervals mean and variance of a Normal Distribution, p-value. Testing of hypothesis: test for goodness of fit, Test for single mean and variance of a Normal Distribution.

#### **Books:**

1. E. Kreyszig," Advanced Engineering Mathematics:,Tenth Edition, Wiley India
2. S.Pal and S.C. Bhunia, "Engineering Mathematics" Oxford University Press
3. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd
4. R. E. Walpole, R. h. Myers, S. L. Myers, K. E. Ye; "Probability and Statistics, Pearson".
5. R. L. Burden, J. D. Faires, " Numerical Analysis, Cenage Learning India Pvt. Ltd"
6. B.V.RAMANA,"Higher Engineering Mathematics" Tata Magraw Hill

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<b>3<sup>rd</sup> Semester</b>	<b>ROP3B001</b>	<b>OBJECT ORIENTED PROGRAMMING USING JAVA</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module-I (10 Hrs)**

#### **Chapter 1:-** An introduction to programming.

Different types of programming languages, Description of Compiler and Interpreter, Advantage of Object Oriented Programming, Object Oriented Programming, Features of Object Oriented Programming.

#### **Chapter 2:-** Introduction to Java.

What is Java?, Why Java?, History behind Java, Different versions of Java, Difference between C/C++ and Java, Features of Java, First Java Program, Prerequisites Before start writing a java program, Writing the program, Compiling the program, How Java program compiles?, Executing the program, How Java program executes?, What is JVM and its significance in executing a program?, Architecture of JVM.

**Chapter 3:-** Understanding First Program and a step forward, Understanding every term of the program, Java Tokens, Datatypes, Operators, What are Operators?, Different types of Operators, Typecasting, Control Structures and Arrays, Different types of control structures, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

### **Module-II: (08 Hrs.)**

#### **Chapter 1:-** Introduction to Classes and Objects.

Classes, Methods, Objects, Description of data hiding and data encapsulation, Constructors, Use of static Keyword in Java, Use of this Keyword in Java, Array of Objects, Concept of Access Modifiers (Public, Private, Protected, Default).

#### **Chapter 2:-** Inheritance

Understanding Inheritance, Types of Inheritance and Java supported Inheritance, Significance of Inheritance, Constructor call in Inheritance, Use of super keyword in Java, Polymorphism, Understanding Polymorphism, Types of polymorphism, Significance of Polymorphism in Java, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching.

#### **Chapter 3:-** String Manipulations.

Introduction to different classes, String class, String Buffer, String Builder, String Tokenizer, Concept of Wrapper Classes, Introduction to wrapper classes, Different predefined wrapper classes, Predefined Constructors for the wrapper classes. Conversion of types from one type (Object) to another type (Primitive) and Vice versa, Concept of Auto boxing and unboxing.

### **Module-III: ( 09 Hrs.)**

#### **Chapter 1:-**Data Abstraction

Basics of Data Abstraction, Understanding Abstract classes, Understanding Interfaces, Multiple Inheritance Using Interfaces, Packages, Introduction to Packages, Java API Packages, User-Defined Packages, Accessing Packages, Error and Exception Handling, Introduction to error and exception, Types of exceptions and difference between the types, Runtime Stack Mechanism, Hierarchy of Exception classes, Default exception handling in Java, User defined/Customized Exception Handling, Understanding different keywords (try, catch, finally, throw, throws), User defined exception classes, Commonly used Exceptions and their details.

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#### **Chapter 2:-**Multithreading

Introduction of Multithreading/Multitasking, Ways to define a Thread in Java, Thread naming and Priorities, Thread execution prevention methods. (yield(), join(), sleep()), Concept of

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Synchronisation, Inter Thread Communication, Basics of Deadlock, Demon Thread, Improvement in Multithreading, Inner Classes, Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class.

#### **Module-IV:** ( 10 Hrs.)

##### **Chapter 1:-**IO Streams (java.io package)

Introduction, Byte Stream and Character Stream, Files and Random Access Files, Serialization, Collection Frame Work (java.util), Introduction, Util Package interfaces, List, Set, Map etc, List interfaces and its classes, Setter interfaces and its classes.

##### **Chapter 2:-**Applet

Introduction, Life Cycle of an Applet, GUI with an Applet, Abstract Window Toolkit (AWT), Introduction to GUI, Description of Components and Containers, Component/Container hierarchy, Understanding different Components/Container classes and their constructors, Event Handling, Different mechanisms of Event Handling, Listener Interfaces, Adapter classes.

#### **Module-V:** ( 08 Hrs.)

##### **Chapter 1:-**Swing (JFC)

Introduction Diff b/w awt and swing, Components Hierarchy, Panes, Individual Swings Components JLabel, JButton, JTextField, JTextArea.

##### **Chapter 2:-**JavaFX

Getting started with JavaFX, Graphics, User Interface Components, Effects, Animation, and Media, Application Logic, Interoperability, JavaFX Scene Builder 2, Getting Started with scene Builder.

Working with scene Builder.

#### **Books :-**

1. Programming in Java. Second Edition. OXFORD HIGHER EDUCATION. (SACHIN MALHOTRA/SAURAV CHOUDHARY)
2. CORE JAVA For Beginners. (Rashmi Kanta Das), Vikas Publication
3. JAVA Complete Reference (9<sup>th</sup> Edition) Herbalt Schelidt.

<b>3<sup>rd</sup> Semester</b>	<b>ROP3B201</b>	<b>OOP USING JAVA LAB.</b>	<b>L-T-P</b> <b>0-0-3</b>	<b>2 CREDITS</b>
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JAVA programs on:

1. Introduction, Compiling & executing a java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do, while, for etc.
4. Classes and objects.
5. Data abstraction & data hiding, inheritance, polymorphism.
6. Threads, exception handlings and applet programs
7. Interfaces and inner classes, wrapper classes, generics



<b>3<sup>rd</sup> Semester</b>	<b>REN3E001</b>	<b>ENGINEERING ECONOMICS</b>	<b>L-T-P</b>	<b>3 CREDITS</b>
			<b>3-0-0</b>	

### Module - I (08 hours)

**Engineering Economics-** Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

**Demand** - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Demand Forecasting – Meaning

**Supply**-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

### Module - II (08 hours)

**Production** - Production function, Laws of returns: Law of variable proportion, Law of returns to scale

**Cost and Revenue Concepts** - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization.

### Module III (08 hours)

**Market** - Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

### Module - IV (12 hours)

**Time Value of Money**- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

**Evaluation of Engineering Projects**-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects.

**Depreciation**- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project.

### Module -V (06 Hours)

**Inflation**-Meaning of inflation, types, causes, measures to control inflation.

**National Income**-Definition, Concepts of national income, Method of measuring national income.

**Banking** -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

#### **Books:**

1. Principles of Economics by Deviga Vengedasalam and Karaunagarajan Madhavan, Oxford
2. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
3. C. S. Park, Contemporary Engineering Economics, 6th Edition, Pearson Education, 2015.
4. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
5. R.Paneer Selvan, " Engineering Economics", PHI
6. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
7. Jhingan,M.L., "Macro Economic Theory"
8. Macro Economics by S.P.Gupta, TMH

**Course Outcomes of Engineering Economics**

At the end of the course the engineering graduates will be able to

1. **Remembering** : Define the basic concept of micro and macro economics, engineering economics and their application in engineering economy.
2. **Understanding** : Evaluate numerically the effects of changes in demand and supply on price determination of products and services.
3. **Analyze** : the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise.
4. **Develop** : the ability to account for time value of money using engineering economy factors and formulas.
5. **Apply**: knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, taxes and inflation.



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<b>3<sup>rd</sup> Semester</b>	<b>ROB3E002</b>	<b>ORGANISATIONAL BEHAVIOUR</b>	<b>L-T-P</b>	<b>3 CREDITS</b>
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**Objectives:**

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

**Module-I:**                   **(06 Hrs.)**

**Fundamentals of OB:** Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.

**Module-II:**                   **(12 Hrs.)**

**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.

**Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.

**Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

**Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

**Module-III:**                   **(10 Hrs.)**

**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development.

**Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

**Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

**Module-IV:**                   **(08 Hrs.)**

**Organizational Culture :** Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.



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**Module-V:**           **(09 Hrs.)**

**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change.

Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

**Books:**

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley



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<b>3<sup>rd</sup> Semester</b>	<b>RME3C001</b>	<b>Mechanics of Solid</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **MODULE – I                   (10 Hrs.)**

**Concept of Stress:** Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads,

**Analysis of Axially Loaded Members:** Composite bars in tension and compression - temperature stresses in composite rods, Concept of Statically indeterminate problems. Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

### **MODULE – II                   (09 Hrs.)**

**Biaxial State of Stress and Strain :** Analysis of Biaxial Stress. Plane stress, Principal plane, Principal stress, Mohr's Circle for Biaxial Stress. Two dimensional state of strain, Principal strains, Mohr's circle for strain, Calculation of principal stresses from principal strains, Strain Rossette.

**Thin Cylinder:** Stresses in thin cylinders and thin spherical shells under internal pressure, wire winding of thin cylinders.

### **MODULE - III                   (09 Hrs.)**

**Shear Force and Bending Moment Diagrams:** Shear force and bending moment. Types of load and Types of support. Support reactions, Relationship between bending moment and shear force, Point of inflection, Point of contraflexure. Shear Force and Bending Moment diagrams.

**Bending of Beams:** Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, Composite beams.

### **MODULE - IV                   (9 Hrs.)**

**Deflection of Beams :** Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

**Theory of Columns:** Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio, Eccentric loading of short column

### **MODULE – V                   (08 Hrs.)**

**Torsion:** Torsion in solid and hollow circular shafts, Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Strength of shafts in combined bending and twisting, Close - Coiled helical springs.

**Testing of materials** with UTM; testing of hardness and impact strength.

### **Books:**

- Strength of Materials by G. H. Ryder, Macmillan Press
- Elements of Strength of Materials by S.P.Timoshenko and D.H.Young, Affiliated EastWest Press
- Strength of Materials by R.Subramaniam, Oxford University Press
- Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
- Mechanics of Materials by R.C.Hibbeler, Pearson Education
- Mechanics of Materials by William F.Riley, Leroy D.Sturges and Don H.Morris, Wiley

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- Mechanics of Materials by James M. Gere, Thomson Learning
- Strength of Materials by James M. Gere and Barry J. Goodno, Cengage Learning
- Strength of Materials by S.S.Rattan, Tata Mc Graw Hill
- Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall of India

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<b>3<sup>rd</sup> Semester</b>	<b>RCI3C201</b>	<b>Building Drawing using Auto CAD</b>	<b>L-T-P 0-0-3</b>	<b>2 CREDITS</b>
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### **Laboratory Experiments**

1. The drawing is to be drawn using **Auto CAD**.
2. Plan, elevation, side view of residential/office building
3. Drawing of 2 bed room/3 bed room houses (single and two storeyed), ground and first floor plans, elevation and section for load bearing and framed structures
4. Detailing of doors/windows
5. Drawing of several types of footing, bricks work, floor, staircases, masonry, arches and lintels
6. Types of steel roof trusses
7. Project on establishments like Residential Building/ Bank building/ Post office/ Hostel/ Library/ Hospital/ Auditorium etc

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<b>3<sup>rd</sup> Semester</b>	<b>RME3C002</b>	<b>Fluid Mechanics and Hydraulic Machines</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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**Module - I**                   **(12 Hrs.)**

**Introduction:** Scope of fluid mechanics and its development as a science Physical property of Fluid: Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

**Fluid statics:** Pressure, Pascal's Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer. Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface. Buoyancy and floatation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

**Module - II**                   **(08 Hrs.)**

**Fluid kinematics:** Introduction, description of fluid flow, classification of fluid flow. Reynold's number, Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity, Mathematical definitions of irrotational and rotational motion. Circulation, potential function and stream function. Flow net.

**Module - III**                   **(08 Hrs.)**

**Fluid dynamics :** Introduction to N-S equation and non-dimensional number, Euler's equation along a streamline, energy equation, Bernoulli's equation and its application to siphon, venturimeter, orificemeter, pitot tube. Flow in pipes and ducts: Loss due to friction, Minor energy losses in pipes Hydraulic Gradient Line (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes, fluid flow in pipes in series and parallel. Flow through nozzles.

**Module - IV**                   **(10 Hrs.)**

**Impact of Jets :** Flat, inclined and curved plates with stationary and moving case.

**Hydraulic turbines:** Classification, Impulse and Reaction turbine; Tangential, Radial and axial turbine. Impulse turbine, Pelton wheel, bucket dimensions, number of buckets in pelton wheel, efficiency and performance curves.

**Reaction Turbines:** Francis turbine and Kaplan turbine, velocity triangle and efficiencies, performance curve. Function of draft tube and casing cavitation.

**Module - V**                   **(07 Hrs.)**

**Centrifugal Pump:** constructional features, vane shape, velocity triangles, Efficiencies, Multi stage centrifugal pumps, Pump Characteristic, NPSH and Cavitation.

**Positive displacement pumps:** Reciprocating Pump, Working principle, Discharge, work done and power requirement, Slip, Indicator diagram

**Books:**

- Fluid Mechanics, Y A Cengel, TMH
- Fluid Mechanics and Hydraulic Machines, Modi & Seth
- Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, TMH
- Fluid Mechanics and Machinery, Mohd. Kareem Khan, OXFORD
- Introduction to Fluid Mechanics, Fox, McDonald, Willey Publications
- Fluid Mechanics and Fluid Machines by A.K.Jain, Khanna Publishers
- Fluid Mechanics and Machinery, CSP Ojha and P.N. Chandramouli, Oxford University Press
- Fluid Mechanics by Kundu, Elsevier
- An Introduction to Fluid Dynamics, G.K.Batchelor, Cambridge University Press
- Engineering Fluid Mechanics by Garde et. al., Scitech
- Fluid Mechanics by J.F.Douglas, J.M.Gasiorek, J.A.Swaffield and L.B.Jack, Pearson Education
- Fluid Mechanics and Machines, Sukumar Pati, TMH

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<b>3<sup>rd</sup> Semester</b>	<b>RME3C202</b>	<b>Fluid Mechanics and Hydraulic Machines Lab.</b>	<b>L-T-P 0-0-3</b>	<b>2 CREDITS</b>
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***Laboratory Experiments (Minimum 8 experiments)***

1. Determination of Metacentric Height and application to stability of floating bodies.
2. Determination of Cv and Cd of Orifices.
3. Experiments on impact of Jets
4. Experiments on performance of Pelton Turbine
5. Experiments on performance of Francis Turbine
6. Experiments on performance of Kaplan Turbine
7. Experiments on performance of centrifugal pump
8. Experiments on performance of reciprocating pump
9. Experiments on Reynold's Apparatus
10. Experiments on Flow through pipes
11. Experiments on performance of Gear pump
12. Verifications of momentum equation

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<b>3<sup>rd</sup> Semester</b>	<b>RES3F001</b>	<b>ENVIORMENT SCIENCE</b>	<b>L-T-P</b> <b>3-0-0</b>	<b>0 CREDIT</b>
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We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two type of activities.

**(a) Awareness Activities:**

- i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
- ii) Slogan making event
- iii) Poster making event
- iv) Cycle rally
- v) Lectures from experts

**(b) Actual Activities:**

- i) Plantation
- ii) Gifting a tree to see its full growth
- iii) Cleanliness drive
- iv) Drive for segregation of waste
- v) To live some big environmentalist for a week or so to understand his work
- vi) To work in kitchen garden for mess
- vii) To know about the different varieties of plants
- viii) Shutting down the fans and ACs of the campus for an hour or so



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**Tentative Curriculum and Syllabus**

**of**

**B.Tech(*Civil Engineering*) from the Batch 2018-19**

**Semester (4<sup>th</sup>)**

<b>Fourth Semester</b>							
<b>Theory</b>							
<b>Sl No</b>	<b>Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L-T-P</b>	<b>Credit</b>	<b>University Marks</b>	<b>Internal Evaluation</b>
1	PC	RCI4C001	Surveying	3-0-0	3	100	50
2	PC	RCI4C002	Transportation Engineering	3-0-0	3	100	50
3	HS	REN4E001 / ROB4E002	Engineering Economics / Organisational Behaviour	3-0-0	3	100	50
4	PC	RCI4C003	Structural Analysis-I	3-0-0	3	100	50
5	PE	RCI4D001	Construction Technology	3-0-0	3	100	50
		RCI4D002	Concrete Technology				
		RCI4D003	Remote Sensing and Geographic Information System				
6	OE	RCI4G001	Introduction to Physical Metallurgy and Engineering Materials	3-0-0	3	100	50
			RCI4G002				
			Analog Electronic Circuits				
6	MC*	RCN4F001	Constitution of India	3-0-0	0	—	100 (Pass mark is 37)
<b>Total Credit (Theory)</b>					<b>18</b>		
<b>Total Marks</b>						<b>600</b>	<b>300</b>
<b>Practical</b>							
1	PC	RCI4C201	Field Surveying Sessional	0-0-3	2		100
2	PC	RCI4C202	Transportation Engineering Laboratory	0-0-3	2		100
3	PC	RCI4C203	Material Testing Laboratory	0-0-3	2		100
<b>Total Credit (Practical)</b>					<b>6</b>		
<b>Total Semester Credit</b>					<b>24</b>		
<b>Total Marks</b>							<b>300</b>

\*Mandatory Non-Credit Courses (MC) result will be reflected with Pass (P) / Fail (F) grade. Thus the grade obtained will not be affecting the grade point average. However it shall appear on the grade sheet as per AICTE rule.

<b>4<sup>th</sup> Semester</b>	<b>RCI4C001</b>	<b>Surveying</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module- I (12 hrs)**

Linear measurement and chain survey: Use of chains and tapes for measurement of correct length of lines, direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination.

Compass surveying: Use of prismatic compass, temporary adjustment, bearing of a line, local attractions, correction of bearing.

### **Module- II (10 hrs)**

Levelling: Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Reduction of levels by height of instrument and rise and fall method. Curvature and refraction error, sensitiveness of level tube, reciprocal levelling, levelling difficulties and common errors, Automatic and Electronic or Digital levels.

### **Module- III (7 hrs)**

Contouring: Contour interval and horizontal equivalent, characteristics of contours, methods of contouring- different and indirect method, contour gradient.

### **Module- IV (8 hrs)**

Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles, theodolite traversing.

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### **Module- V (8 hrs)**

Modern Surveying Instruments – Electromagnetic Spectrum, Radar, Electronic Distance Measurement, EDM Equipment, Corrections to measurement, Digital Theodolite, Total Stations, Introduction to Remote Sensing and GIS.

#### **Books:**

- Surveying- Vol.I, by B.C. Punmia, Laxmi Publications
- Surveying & Levelling, Vol-I by T.P.Kanethar&S.V.Kulkarni, Pune VidyarthiGrihaPrakashan
- Surveying and Leveling by R. Subramanian, Oxford University Press
- Surveying Vol-1 by R Agor, Khanna Publishers
- A Textbook of Surveying, C. Venkatramaiah, Universities Press
- Surveying AndLevelling, N.N. Basak, McGraw-Hill Education

<b>4<sup>th</sup> Semester</b>	<b>RCI4C201</b>	<b>Field Surveying Sessional</b>	<b>L-T-P 0-0-3</b>	<b>2 CREDITS</b>
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1. Testing of chain and measurement of correct length of the line and chain traversing.
2. Traversing by Compass
3. Horizontal and vertical angle measurement by theodolite
4. Traversing by theodolite
5. Use of dumpy level and automatic level for fly levelling.
6. Contouring
7. Measurement of distance, horizontal and vertical angle by Total Station
8. Contouring by Total Station

<b>4<sup>th</sup> Semester</b>	<b>RCI4C002</b>	<b>Transportation Engineering</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module-I (10 hrs)**

Modes of transportation, importance of highway transportation, history of road construction. Principle of highway planning, road development plans, highway alignments requirements, engineering surveys for highway location.

Geometric design- Design controls, highway cross section elements, cross slope or camber, road width, road margins, typical cross sections of roads, design speed, sight distance, design of horizontal and vertical alignments, horizontal and vertical curves.

### **Module-II (10 hrs)**

Highway Materials:- Properties of subgrade , sub-base , base course and surface course materials , test on subgrade soil, aggregates and bituminous materials.

Traffic Engineering:- definition , fundamentals of traffic flow , traffic management, prevention of road accidents , elements of transport planning , highway drainage

### **Module-III (9 hrs)**

Design of Highway Pavements: Flexible pavements and their design, review of old methods, CBR method, IRC:37-2012, equivalent single wheel load factor, rigid pavements, stress in rigid pavement, IRC design method (IRC:58-2011).

### **Module-IV (9 hrs)**

Highway Construction: Construction of various layers, earthwork, WBM, GSB, WMM, various types of bituminous layers, joints in rigid pavements, Hot Mix Plants, Construction of Rigid Pavements

### **Module-V (7 hrs)**

Highway Maintenance: Various type of failures of flexible and rigid pavements.

#### **Books:**

- Highway Engineering, by S.K.Khanna and CEG Justo, Nem Chand & Bros.
- Transportation Engineering-Highway Engineering by C Venkatramiah, Universities Press.
- A course in Highway Engineering by Dr. S.P. Bindra, Dhanpat Rai Publications.
- Principles of Highway Engineering and Traffic Analysis by Mannering Fred L., Washburn Scott S. and Kilaresk Walter P., Wiley India Pvt. Ltd
- Traffic Engineering and Transportation Planning by Kadiyali, L.R.,Khanna Publishers
- Transportation Engineering and Planning by Papacostas, C.S. and Prevedouros, P.D.,Prentice Hall.

<b>4<sup>th</sup> Semester</b>	<b>RCI4C202</b>	<b>Transportation Engineering Laboratory</b>	<b>L-T-P 0-0-3</b>	<b>2 CREDITS</b>
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***Laboratory Experiments (Minimum 8 to 15 experiments)***

1. Determination of aggregate crushing value.
2. Determination of Los Angeles abrasion value of aggregates.
3. Determination of aggregate impact value.
4. Determination of penetration value of bitumen.
5. Determination of softening point value of bitumen.
6. Determination of ductility value of bitumen.
7. Determination of flash and fire point of bitumen.
8. Determination of specific gravity of bitumen.
9. Determination of stripping value of aggregate.
10. Determination of flakiness index and elongation index of coarse aggregate.
11. Determination of specific gravity and water absorption of coarse aggregate.
12. Determination of CBR of soil subgrade
13. Design of GSB and WMM
14. Marshall method of mix design
15. Demonstration of advanced equipment for characterization of pavement materials.

<b>4<sup>th</sup> Semester</b>	<b>REN4E001</b>	<b>ENGINEERING ECONOMICS</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module - I (10 hours)**

**Engineering Economics-** Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

**Demand** - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Demand Forecasting – Meaning

**Supply**-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

### **Module - II (08 hours)**

**Production** - Production function, Laws of returns: Law of variable proportion, Law of returns to scale

**Cost and Revenue Concepts** - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization.

### **Module III (08 hours)**

**Market** - Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

### **Module - IV (12 hours)**

**Time Value of Money**- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

**Evaluation of Engineering Projects**-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects.

**Depreciation**- Depreciation of capital asset, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project.

### **Module -V (07 Hours)**

**Inflation**-Meaning of inflation, types, causes, measures to control inflation.

**National Income**-Definition, Concepts of national income, Method of measuring national income.

**Banking** -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

### **Books:**

1. Principles of Economics by Deviga Vengedasalam and Karaunagarajan Madhavan, Oxford
2. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India
3. C. S. Park, Contemporary Engineering Economics, 6th Edition, Pearson Education, 2015.
4. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
5. R.Paneer Selvan, “ Engineering Economics”, PHI
6. Ahuja,H.L., “Principles of Micro Economics” , S.Chand & Company Ltd
7. Jhingan,M.L., “Macro Economic Theory”
8. Macro Economics by S.P.Gupta, TMH

**Course Outcomes of Engineering Economics**

At the end of the course the engineering graduates will be able to

1. **Remembering** : Define the basic concept of micro and macro economics, engineering economics and their application in engineering economy.
2. **Understanding** : Evaluate numerically the effects of changes in demand and supply on price determination of products and services.
3. **Analyze** : the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise.
4. **Develop** : the ability to account for time value of money using engineering economy factors and formulas.
5. **Apply:** knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, taxes and inflation.

<b>4<sup>th</sup> Semester</b>	<b>ROB4E002</b>	<b>ORGANISATIONAL BEHAVIOUR</b>	<b>L-T-P</b> <b>3-0-0</b>	<b>3 CREDITS</b>
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**Objectives:**

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

**Module-I:**                   **(06 Hrs.)**

**Fundamentals of OB:** Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.

**Module-II:**                   **(12 Hrs.)**

**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.

**Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications.

**Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

**Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

**Module-III:**                   **(10 Hrs.)**

**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development.

**Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

**Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

**Module-IV:**                   **(08 Hrs.)**

**Organizational Culture :** Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.

**Module-V:**           **(09 Hrs.)**

**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change.

Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

**Books:**

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa, HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

<b>4<sup>th</sup> Semester</b>	<b>RCI4C003</b>	<b>Structural Analysis-I</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module- I (8 hrs)**

Concept of determinate and indeterminate structures, determination of degree of static and kinematic indeterminacy in plane frame and continuous structures.

Methods of Analysis: Equilibrium equations, compatibility requirements, Introduction to force and displacement methods.

Analysis of propped cantilever by consistent deformation method, Analysis of fixed and continuous beams by Moment-Area method, Conjugate beam method and theorem of three moments.

### **Module- II (7 hrs)**

Energy theorems and its application, Strain energy method, Virtual work method, unit load method, Betti's and Maxwell's laws, Castiglano's theorem, concept of minimum potential energy.

### **Module- III (7 hrs)**

Analysis of redundant plane trusses.

Deflection of pin jointed plane trusses. Analytical method and Williot –Mohr diagram. Introduction to space truss.

### **Module- IV (7 hrs)**

Rolling loads and influence lines for determinate structures, simply supported beams, cantilever, ILD for reaction, shear force and bending moment at a section, ILD for wheel loads, point loads and udl, maximum bending moment envelope.

### **Module- V (7 hrs)**

Analysis of three hinged arches, Suspension cable with three hinged stiffening girders subjected to dead and live loads, ILD for Bending Moment, Shear Force, normal thrust and radial shear for three hinged arches.

#### **Books:**

- Theory and Problems in Structural Analysis by L Negi, Mc Graw Hill
- Structural Analysis by T.S. Thandamoorthy, Oxford University Press
- Basic Structural Analysis by C S Reddy, McGraw Hill
- Elementary Structural Analysis by Norris and Wilber, McGraw Hill
- Structural Analysis by Aslam Kassimali, Cengage Learning
- Structural Analysis by R.C. Hibbeler, Pearson Education

<b>4<sup>th</sup> Semester</b>	<b>RCI4C203</b>	<b>Material Testing Laboratory</b>	<b>L-T-P 0-0-3</b>	<b>2 CREDITS</b>
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### **Laboratory Experiments**

**Brick:** (a) Shape and size test for brick  
(b) Water absorption test for brick  
(c) Compressive strength of brick

**Cement:** (a) Fineness of cement  
(b) Soundness of cement by Lechattelier test  
(c) Specific gravity of cement  
(d) Fineness of cement by air permeability  
(e) Standard consistency of a given sample by Vicat test  
(f) Initial and final setting time of cement  
(g) Fineness modulus of fine and coarse aggregate  
(h) Aggregate crushing value of coarse aggregate  
(i) Compressive strength of cement mortar  
(j) Tensile strength of cement mortar

**Steel:** (a) Tensile strength of steel  
(b) Compression test of cast iron  
(b) Rigidity modulus of cast iron  
(c) Fatigue test of steel (cyclic loading)  
(d) Strain measurement using strain gauge and strain rosette

<b>4<sup>th</sup> Semester</b>	<b>RCI4D001</b>	<b>Construction Technology</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module- I (10 hrs)**

Introduction of various Civil Engineering structures, Functions of various components of building and other structures.

Fundamentals of Construction Technology: Introduction, Construction activities, construction process, construction workers, construction estimating, construction estimate, construction schedule, productivity and mechanized construction, Quality and safety.

Preparatory Work and Implementation: Site layout, Infrastructure development, construction methods, construction materials, deployment of construction equipment, prefabrication in construction, falsework and temporary work.

### **Module- II (9 hrs)**

Earthwork: Introduction, Classification of soil, project site development, setting out, mechanized excavation, ground water control. Piling: classification of piles, pile driving methods, load test and quality control.

Concrete and Concreting: Introduction, Important properties of concrete, Use of admixtures, formwork, shotcrete, lightweight and heavyweight concrete, ready-mix concrete, high performance concrete, self-compacting concrete, extreme weather concreting, prestressed concrete, under water concreting, curing of concrete, non-destructive testing of hardened concrete.

### **Module -III (8 hrs)**

Roof and roofing: Introduction, cast-in-situ reinforced concrete roofs, precast reinforced concrete roofs, roofs covered with sheets, water proofing over roofs.

Finishing Work: Introduction, plastering, pointing, facing, glazing, flooring, painting, Construction joints-need and materials used, Plumbing and electrification- various typesof fittings and laying procedure.

### **Module- IV (10 hrs)**

Mechanized Construction: Introduction, general consideration, plants for earthwork- tractor, bulldozer, ripper, scraper, face shovel, backhoe, dragline, clamshell etc., roller, plants for transportation, movement and handling- derrick, crane, hoist, concrete mixers and pumps, scaffolding , Building items: Plastering & pointing- its purpose, various types, construction procedures, advantages and disadvantages, suitability of each, Damp proof course (DPC), Anti-termite measures and treatment, Construction joints-need and materials used, Plumbing and electrification- various types of fittings and laying procedure.

### **Module -V (8 hrs)**

Building Maintenance and Safety Measures: Purpose, need, importance, methods, Causes and types of defects in buildings, Preparation of report on maintenance work, Remedial measures and execution procedure of any one type of building maintenance work, Importance of various Laws / Norms / Regulations / Acts for safety, Precautions and precautionary Measures, Post-accident procedures.

**Books:**

- Construction Technology, Subir Sarkar and Subhajit Saraswati, Oxford University Press
- Construction Planning and Management, U.K. Srivastava, Galgotia Publications Pvt Ltd
- Construction Engineering and Man agent, S. Seetharaman, Umesh Publications
- Concrete Technology, Santha Kumar, Oxford University Press
- Construction Technology Analysis and Choice, Tony Bryan, Wiley
- Building Construction, B.C.Punmia, Laxmi Publication
- Building Construction, Sushil Kumar, Standard Publisher
- Building Construction, Rangwala

<b>4<sup>th</sup> Semester</b>	<b>RCI4D002</b>	<b>Concrete Technology</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module- I (10 hrs)**

**Cement:** Portland cement- chemical composition, Hydration, Setting of cement, Structure of hydrate cement, Test on physical properties, Different grades of cement.

**Admixtures:** Types of admixtures - mineral and chemical admixtures -properties - dosages - effects - usage.

**Aggregates:** Classification of aggregate, Particle shape & texture, Bond, strength & other mechanical properties of aggregate, Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate, Bulking of sand, deleterious substance in aggregate, Soundness of aggregate, Alkali aggregate reaction, Thermal properties, Sieve analysis, Fineness modulus , Grading curves, Grading of fine & coarse Aggregates, Gap graded aggregate, Maximum aggregate size.

### **Module-II (10 hrs)**

**Fresh concrete:** Workability - Factors affecting workability, Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability , Segregation & bleeding, Mixing and vibration of concrete, Steps in manufacture of concrete , Quality of mixing water.

**Hardened concrete:** Water Cement ratio , Abram's Law, Nature of strength of concrete, Maturity concept , Strength in tension & compression, Factors affecting strength, Relation between compression & tensile strength, Curing.

### **Module-III (10hrs)**

**Testing of hardened concrete:** Compression tests, tension tests, factors affecting strength , flexure tests , splitting tests , pull-out test, non-destructive testing methods - codal provisions for NDT.

**Elasticity, creep & shrinkage :** modulus of elasticity, dynamic modulus of elasticity, posisson's ratio, creep of concrete, factors influencing creep, relation between creep & time , nature of creep, effects of creep , shrinkage , types of shrinkage.

### **Module- IV (7 hrs)**

**Mix design :**Factors in the choice of mix proportions , Durability of concrete, Quality Control of concrete , Statistical methods , Acceptance criteria, Proportioning of concrete mixes by various methods , BIS method of mix design.

### **Module- V (8 hrs)**

**Special concretes:** Light weight aggregates - Light weight aggregate concrete - Cellular concrete - **No-fines concrete** - High density concrete -Fibre reinforced concrete - Polymer concrete - Types of Polymer concrete - High performance concrete - Self compacting concrete.

#### **Books:**

- Concrete Technology - Gambhir, M.L., , McGraw Hill
- Properties of Concrete by A.M.Neville
- Concrete Technology by M.S.Shetty. - S.Chand& Co.
- Concrete Technology by Santakumar A.R, Oxford University Press

<b>4<sup>th</sup> Semester</b>	<b>RCI4D003</b>	<b>Remote Sensing and Geographic Information System</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Module - I (07 Hrs)**

Introduction , Types , Application and importance of Remote Sensing; Physics of Remote Sensing; The Electromagnetic spectrum; Spectral Reflectance Curves; Spectral signatures; Resolution.

### **Module - II (10 Hrs)**

Remote Sensing Platforms: Ground, airborne and satellite based platforms; Some important Remote Sensing Satellites. Sensors: Passive and Active Sensors; Major Remote Sensing Sensors; Satellite band designations and principal applications; Colour / False Colour; Aerial Photography/ Aerial Photo Interpretation.

### **Module -III (10 Hrs)**

Digital Image Processing: Pixels and Digital Number; Digital Image Structure; Format of Remote Sensing Data; Image Processing functions: Image Restoration, Image Enhancement, Image Transformation, Image Classification and Analysis; Image interpretation strategies.

### **Module - IV (09 Hrs)**

Geographic Information System: Introduction; Preparation of thematic map from remote sensing data; Co-ordinates systems; GIS components: Hardware, software and infrastructures; GIS data types: Data Input and Data Processing; DEM/ DTM generation.

### **Module -V (09 Hrs)**

Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems. Spatial planning approach. Global Positioning System – an introduction.

#### **Books:**

- Remote Sensing and GIS - Anji Reddy M., The Book Syndicate, Hyderabad, 2000.
- Principles of Geographical Information Systems - P A Burrough and R. A. McDonnell, OUP, Oxford, 1998.
- Remote Sensing for Earth Resource- Rao, D.P., AEG Publication, Hyderabad, 1987.
- Geographic Information System- Kang Tsung Chang, Tata Mc Graw Hill, Publication Edition, 2002.

<b>4<sup>th</sup> Semester</b>	<b>RCI4G001</b>	<b>Introduction to Physical Metallurgy and Engineering Materials</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **MODULE-I (08 hrs)**

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

### **MODULE-II (10 hrs)**

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing ; recovery; recrystallization and grain growth; hot working.

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation.

### **MODULE-III (08 hrs)**

Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d)Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

### **MODULE-IV (10 hrs)**

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel.

T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

### **MODULE-V (10 hrs)**

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic-: Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Fibre reinforced plastics, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

### **Books:**

- Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
- Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.
- Physical Metallurgy: Principles and Practice by Ragahvan, PHI

- Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
- Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
- Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
- Elements of Materials Science & Engineering by Van Vlack, Pearson
- Mechanical Metallurgy by Dieter, Tata MacGraw Hill
- Composite Material science and Engineering by K. K. Chawla, Springer
- Material Science and Metallurgy, by U. C. Jindal, Pearson

<b>4<sup>th</sup> Semester</b>	<b>RCI4G002</b>	<b>Data Communication</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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### **Course Objectives**

- To have a detailed study of various analog and digital modulation and demodulation techniques
- To have a thorough knowledge of various multiplexing schemes and Data communication protocols
- To know about the standards and mechanisms of television systems.

### **Course Outcomes**

- Knowledge of working of basic communication systems
- Ability to evaluate alternative models of communication system design

#### **Module-I (10 Hours)**

- INTRODUCTION TO DATA COMMUNICATIONS AND NETWORKING: Standards Organizations for Data Communications, Layered Network Architecture, Open Systems Interconnection, Data Communications Circuits, Serial and parallel Data Transmission, Data communications Networks, Alternate Protocol Suites.
- SIGNALS, NOISE, MODULATION, AND DEMODULATION: Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and M-ary Encoding, Digital Modulation.

#### **Module -II (08 Hours)**

- METALLIC CABLE TRANSMISSION MEDIA: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves
- OPTICAL FIBER TRANSMISSION MEDIA: Advantages of Optical Fiber cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

#### **Module-III (08 Hours)**

- DIGITAL TRANSMISSION: Pulse Modulation, Pulse code Modulation, Dynamic Range, Signal Voltage to- Quantization Noise Voltage Ratio, Linear Versus Nonlinear PCM Codes, Companding, PCM Line Speed, Delta Modulation PCM and Differential PCM.
- MULTIPLEXING AND T CARRIERS: Time- Division Multiplexing, T1 Digital Carrier System, Digital Line Encoding, T Carrier systems, Frequency- Division Multiplexing, Wavelength- Division Multiplexing, Synchronous Optical Network.

#### **Module-IV (09 Hours)**

- WIRELESS COMMUNICATIONS SYSTEMS: Electromagnetic Polarization, Electromagnetic Radiation, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.

#### **Module-V (10 Hours)**

- DATA COMMUNICATIONS CODES, ERROR CONTROL, AND DATA FORMATS: Data Communications Character Codes, Bar Codes, Error Control, Error Detection and Correction, Character Synchronization.
- DATA COMMUNICATIONS EQUIPMENT: Digital Service Unit and Channel Service Unit, Voice- Band Data Communication Modems, Bell Systems-Compatible Voice- Band Modems, Voice- Band Modem Block Diagram, Voice- Band Modem Classifications, Asynchronous Voice-Band Modems, Synchronous Voice-Band Modems, Modem Synchronization, 56K Modems, Modem Control: The AT Command Set, Cable Modems.

#### **Books:**

- Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.
- Data Communications and Networking, Behrouz A Forouzan, Fourth Edition. TMH.
- Data and Computer communications, 8/e, William Stallings, PHI.
- Computer Communications and Networking Technologies, Gallow, Second Edition Thomson
- Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education.

<b>4<sup>th</sup> Semester</b>	<b>RCI4G003</b>	<b>Analog Electronic Circuits</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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## **MODULE – I**

**MOS Field-Effect Transistor:** Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS; V-I Characteristics of E- MOSFET and D-MOSFET; MOSFET as an Amplifier and as a Switch.

**Biassing of BJTs:** Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples.

**Biassing of FETs and MOSFETs:** Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design

**Small Signal Analysis of BJTs:** Small-Signal Equivalent-Circuit Models; Small Signal Analysis of CE, CC, CB amplifiers. Effects of  $R_S$  and  $R_L$  on CE amplifier operation, Emitter Follower; Cascade amplifier, Darlington Connection and Current Mirror Circuits.

**Small Signal Analysis of FETs:** Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers. Effects of  $R_{SIG}$  and  $R_L$  on CS Amplifier; Source Follower and Cascaded System.

## **MODULE – III**

**High Frequency Response of FETs and BJTs:** High Frequency equivalent models and frequency Response of BJTs and FETs; Frequency Response of CS Amplifier, Frequency Response of CE Amplifier.

## **MODULE – IV**

**Feedback amplifier and Oscillators:** Concepts of negative and positive feedback; Four Basic Feedback Topologies, Practical Feedback Circuits, Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits, Power Amplifier (Class A, B, AB, C).

**Operational Amplifier:** Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Non-inverting Configurations, Open-loop and Closed-loop Gains, Differentiator and Integrator, Instrumentation amplifier.

## Books:

- Microelectronics Circuits, Adel Sedra and Kenneth C Smith, Oxford University Press, New Delhi, 5<sup>th</sup> Edition, International Student Edition,2009. (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14)
  - Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi , 9<sup>th</sup>/10<sup>th</sup> Edition,2013. (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14)
  - Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2<sup>nd</sup> Edition,2008.

- Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup> Edition, (For Problem Solving)
- Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3<sup>rd</sup> Edition,2002.
- Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2<sup>nd</sup> Edition.2004.
- Microelectronic Circuits: Analysis and Design, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc. India Edition.
- Electronic device and circuits, David A. Bell, Oxford University Press, 5<sup>th</sup> edition,2008.
- Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009

<b>4<sup>th</sup> Semester</b>	<b>RCN4F001</b>	<b>Constitution of India</b>	<b>L-T-P 3-0-0</b>	<b>0 CREDIT</b>
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### **Basic features and fundamental principles**

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

### **Course content**

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India

11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21.