BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA

CURRICULLUM FOR B.TECH AS PER GUIDELINES OF AICTE

2018-19

First Year B.Tech Syllabus As Per AICTE Model Curriculum.

Credit Break-up Semester-wise									
Category	**Semester**								**Total**
	1st	2nd	3rd	4th	5th	6th	7th	8th	
HS/MS Humanities and Social Sciences Including Management Courses	3		3	3				3	12
BS (Basic Science Courses)	9	9	3						21
ES(Engineering Science Courses)	6	14	5						25
PC (Professional Core Courses)			10	15	15	10	3	3	56
PE (Professional Elective Courses Relevant to Chosen Specialization/Branch)				3	6	6	3		18
OE(Open Electives From Othe Technical and/or Emerging Subjects)						3	6	3	12
Project/Seminar /Internship * *4-6 Weeks			Evaluation of Internship after 2nd Semester-1		Evaluation of Internship after 4th Semester-1	Seminar-1 Skill Project-2	5=3+1+1 Project-3 Seminar-1 Evaluation Of Internship after 4th Semester-1	6 Project-5 Grand Viva-1	16
MC (Mandatory Courses)	0	0	0	0	0	0			0
Total	18	23	22	21	22	22	17	15	160

Course Structure for First Year Engineering

First Semester						
Theory						
Category	**Course Code**	**Course Title**	**L-T-P**	**Credit**	**University Marks**	**Internal Evaluation**
BS	RMA1A001	Mathematics –I	3-0-0	3	100	50
BS	RPH1A001/ RCH1A002	Physics/Chemistry	3-0-0	3	100	50
ES	RBE1B001/ RBL1B002	Basic Electrical Engineering /Basic Electronics Engineering	2-0-0	2	100	50
ES	RBM1B001/ RBC1B002	Basic Mechanical Engineering / Basic Civil Engineering	2-0-0	2	100	50
HS	RCE1E001	Communicative English	2-0-0	2	100	50
MC	RIT1F301	Induction Training (21 Days)		0		
Total Credit (Theory)				**12**		
Total Marks					**500**	**250**
Practical						
BS	RPH1A201/ RCH1A202	Physics Lab/Chemistry Lab	0-0-3	1	-	100
ES	RBE1B201/ RBL1B202	Basic Electrical Engineering / Basic Electronics Engineering Lab	0-0-3	1	-	100
ES	RBM1B201/ RBC1B202	Basic Mechanical Engineering / Basic Civil Engineering Lab	0-0-3	1	-	100
ES	REG1B201/ RWO1B202	Engineering Graphics & Design Lab/Workshop	0-0-3	2	-	100
HS	RCE1E201	English Language Lab	0-0-3	1		100
Total Credit (Practical)				**6**		
Total Semester Credit				**18**		
Total Marks						**500**
Grand Total (Theory & Practical)= 1250						

Second Semester						
Theory						
Category	**Course Code**	**Course Title**	**L-T-P**	**Credit**	**University Marks**	**Internal Evaluation**
BS	RMA2A001	Mathematics-II	3-0-0	3	100	50
ES	REM2B001	Engineering Mechanics	3-0-0	3	100	50
BS	RPH2A001/ RCH2A002	Physics / Chemistry	3-0-0	3	100	50
ES	RBE2B001/ RBL2B002	Basic Electrical Engineering /Basic Electronics Engineering	2-0-0	2	100	50
ES	RBM2B001 / RBC2B002	Basic Mechanical Engineering / Basic Civil Engineering	2-0-0	2	100	50
ES	RPL2B001	Programming for Problem Solving using C	3-0-0	3	100	50
MC	RNC2F301	NCC/NSS/Yoga		0		
Total Credit (Theory)				**16**		
Total Marks					**600**	**300**
Practical						
BS	RPH2A201/ RCH2A202	Physics Lab/Chemistry Lab	0-0-3	1		100
ES	RBE2B201/ RBL2B202	Basic Electrical Engineering / Basic Electronics Engineering Lab	0-0-3	1		100
ES	RBM2B201/ RBC2B202	Basic Mechanical Engineering / Basic Civil Engineering Lab		1		100
ES	REG2B201/ RWO2B202	Engineering Graphics & Design Lab/Workshop	0-0-3	2		100
ES	RPL2B201	Programming for Problem Solving using C Lab	0-0-3	2		100
Total Credit (Practical)				**7**		
Total Marks (Practical)						**500**
Grand Total (Theory & Practical) = 1400						
Total Semester Credit				**23**		
Total First Year Credit				**41**		

RMA1A001 Mathematics-I 3-0-0

OBJECTIVE:

The objective of the course Mathematics-I is to familiarize the prospective engineers with techniques in calculus, Gamma & Bita function, differential equation of first and second order, series solution of differential equations, Laplace transform. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Module-1 (8 hrs.)

Asymptote, Curvature (Cartesian and polar), Gamma & Beta function , Partial differentiation, Maxima and Minima for function of two variables.

Module-2 (8 hrs.)

Differential Equation: First order differential equations, Separable Equation, Exact differential equation, Linear differential equation, Bernoulli's equation application to Electrical circuits.

Module-3 (9hrs.)

Linear differential equation of second, Homogeneous equation with constant co-efficient, Euler-Cauchy equations, Solution by undetermined co-efficient, Solutions by variation of parameters, Modelling of electric circuits

Module-4 (10 hrs.)

Series solution of differential equations, Power series method, Legendreequation and Legendre polynomial. Bessels function and its properties.

Module – 5 (10 hrs.)

Laplace transformation and its use in getting solution to differential equations, Convolution, Integral Equations.

OUTCOMES

On completion of this course, student are able to:

- Apply the knowledge of calculus, Gamma & Beta functions for analyzing engineering problems.
- Solve first order differential equation analytically using standard method.
- Demonstrate various physical models through higher order differential equation and solve such linear ordinary differential equation.
- Obtain series solution of differential equation and explain application of Bessel'sfunction.
- Apply Laplace problem to determine complete solution to ordinary differential equation.

Text Books:

1. Differential Calculus by Santi Narayan and Mittal,

2. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition ,Willey

3. Higher Engineering Mathematics by B.V. Raman, , Mc-Graw HillsEducation

4. Engineering Mathematics by Srimanta Pal and S.C. Bhunia, Oxford Publication

References:

1. Ordinary and Partial Differential equations by J. Sihna Ray and S Padhy, Kalyani Publishers

2. Advance Engineering Mathematics by P.V.O'NEIL, CENGAGE

3. Ordinary Differential Equation by P C Biswal , PHI second edition.

4. Engineering Mathematics by P. S. Das & C. Vijayakumari, Pearson.

N.B:Thecourseisof3creditwith4contacthours.

PHYSICS 3-0-0

For 1st Semester Code (RPH1A001)
For 2nd Semester Code (RPH2A001)

Module I

Oscillation & Amp; Waves (8 Hours)

Simple Harmonic Oscillation: velocity of motion, acceleration, time period, frequency, phase; damped harmonic oscillation: Wave equation of damped vibration, logarithmic decrement, quality factor, relaxation time; Forced oscillation, resonance, velocity resonance and amplitude resonance, coupled oscillation, Normal coordinates and normal frequencies, In- phase and out-of-Phase Oscillation, Concept of wave and wave equation,, reflection and transmission of longitudinal waves at boundaries.

Module II

OPTICS (10 Hours)

Concept of interference, two sources interference pattern, Bi-prism, Fringe width, uses of biprism, Newton's ring & measurement of wavelength and refractive index. Diffraction: Huygen's principle, Fresnel's Diffraction and Fraunhoffer's diffraction, Half period zone, Zone plate, construction, principle, multiple foci, comparison ofzone plate with convex lens, Fraunhoper's diffraction of Single slit, intensity distribution

Module III

LASER and Fibre Optics :(6 Hours)

Atomic excitation and energy states, Interaction of external energy with atomic energy states, Absorption, spontaneous emission and stimulated emission, Population inversion, Pumping mechanism, optical pumping, Electrical Pumping, Components of laser system, active medium, population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser (basic concepts, and Engineering application only),Structure of optical fibre, Principle of propagation and numerical aperture, Acceptance angle, classification of optical fibre (Single mode and Multimode, SINand GRIN), FOCL (Fiber Optic Communication Link)

Solid State Physics (4 Hours)

Crystalline and Amorphous solid, unit cell, lattice parameter, Miller Indices, Reciprocal Lattice(Only Concept), Bragg's law, Concept of fermions and Bosons and their distribution Functions, Band theory of Solids(Qualitative),Classification of materials: metals, semiconductor and insulator in terms of band theory.

Module IV

Electromagnetism (8 Hours)

(Student will be familiarized with some basic used in vector calculus prior to Development of Maxwell's electromagnetic wave equations. No proof of theorems and laws included in this unit expected- statement and interpretation should sufficient.)

Introduction; Scalar & vector fields, Gradient Of Scalar Field, divergence and curl of Vector Field, Gauss divergence theorem, Stokes theorem (Only Statements, noproof), Gauss's law of electrostatics in free space and in a medium (Onlystatements), Faraday's law of electromagnetic induction (Only statements)Displacement current, Ampere's circuital law, Maxwell's equation in Differential andIntegral form, Electromagnetic wave equation in E and, Electromagnetic Energy,Poynting theorem and Poynting vector(no derivation)

Module V

Quantum Physics: (10 Hours)

Elementary concepts of quantum physics formulation to deal with physical systems.
Need for Quantum physics- historical overviews (For concept), Einstein equation, de

Broglie Hypothesis of matter waves, Compton Scattering, Pair production (no derivation), Uncertainty Principle, Application of Uncertainty Principle, Non-existence of electrons in the Nucleus, Ground state energy of a harmonic oscillator.Basic Features of Quantum Mechanics: Transition from deterministic to Probabilistic,Wave function, probability density, Normalization of wave function (Simple problem),observables and operators, expectation values (Simple problem), Schrodingerequation-Time dependent and time independent equation Application: Free Particle and Particle in a box

Books:

1. Engineering Physics by D.R. Joshi, Mc Graw Hill
2. Principle of Physics Vol. I & Vol. II by Md. M. Khan & S. Panigrahi(Cambridge Univ. Press).
3. Lectures on Engineering Physics byL. Maharana, Prafulla ku. Panda, Sarat Ku. Dash, Babita Ojha (Pearson)
4. Engineering Physics by D.K. Bhattacharrya and Poom Tondon , Oxford University Press

Reference Books:

1. Optics - A. K. Ghatak
2. Introduction to Electrodynamics - David J. Griffiths, PHI Publication
3. Concepts of Modern Physics – Arthur Beiser.
4. Physics-I for engineering degree students - B.B. Swain and P.K.Jena.

CHEMISTRY 3-0-0

For 1st Semester Code (RCH1A002)
For 2nd Semester Code (RCH2A002)
Course Objectives:

(1) To understand the basics of quantum mechanical concepts and spectroscopy.
(2) To predict the bulk properties and processes using thermodynamic considerations.
(3) To learn an introductory idea about new materials.
(4) To understand the fundamental concepts on fuels and corrosion chemistry.

Module I: [10Classes]

Quantum Chemistry and Spectroscopy: Basic concepts and postulates of quantum mechanics. Introduction to Schrodinger Wave Equation (without derivation), Particle in a box: Energy levels, quantum numbers and selection rule.

Spectroscopy: Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, applications on quantitative analysis. Effect of conjugation on chromophores, Absorption by aromatic systems, introductory idea on rotational and vibrational SpectroscopyPrinciples and application to diatomic molecules.

Module II: [8 Classes]

The phase rule: Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system – water and sulfur system, Condensed phase rule, Phase diagram of two component system – Eutectic Bi-Cd, Pb-Tin system &Isomorphous System.

Module III: [10 Classes]

Fuels: Classification of fuels, calorific value. (Determination by Dulong's formula), G.C.V. and N.C.V., Solid fuels, Analysis of coal. Liquid fuels: Classification of petroleum, Refining of petroleum, Cracking, Knocking and anti knocking, cetane and octane numbers. Unleaded petrol, synthetic petrol, power alcohol. Gaseous Fuel: Producer gas, Water gas, LPG, CNG, Kerosene gas, Combustion calculation.

Module IV: [08 Classes]

Corrosion: Electrochemical theory of corrosion, galvanic series, Types of corrosion; Differential metal corrosion, Differntial aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting, metal coatings – Galvanizing and Timing, Corrosion inhibitors, cathodic protection.

Module-V: [10 Classes]

New Materials: Introduction to nanomaterials, classification (0D, 1D, 2D) with examples, size dependent properties, Top-down and Bottom-up approaches of nanomaterial synthesis. Introductory idea on synthesis of nanomaterials via green synthetic route. Application of nanomaterials in environmental fields and electronic devices.

Text Books:

1. Engineering Chemistry (NPTEL web-book) by B. L. Tembe, Kamaludddin and M. S. Krishan.
2. Text Book in Applied Chemistry by A. N. Acharya and B. Samantaray, Pearson India.
3. Fundamentals of Molecular Spectroscopy by Banwell, Tata McGraw Hill Education.
4. Textbook of nanoscience and Nanotechnology, McGraw Hill Education (India) Pvt. Ltd., 2012.
5. Advanced Engineering Chemistry by M. R. Senapati, University Science Press, India..
6. Engineering Chemistry, Jain and Jain, DhanpatRai Publication.

Reference Books:

1. Inorganic Chemistry by Donald A. Tarr, Gary Miessler, Pearson India, Third Edition.
2. Quantum Chemistry by Ira N. Levine, Pearson 7th Edition.
3. Molecular Spectroscopy, Ira N. Levine, John Wiley and Sons
4. Modern Spectroscopy – A Molecular Approach, by Donald McQuarrie and John Simon, published by University Science Books.
7. Inorganic Chemistry by W. Overton, Rounk and Armstrong, Oxford Univesity Press, 6th edition.
8. Introductory to Quantum Chemistry by A. K. Chandra. , 4th Edition, Mcgraw Hill Education.

Course Outcomes:

1. Understand the basics of quantum mechanical concepts and spectroscopy.
2. Rationalise bulk properties and processes using thermodynamic considerations.
3. Preliminary understanding on introductory idea about nano materials.
4. Analyse the quantitative aspects of fuel combustion and the mechanism of corrosion.

Basic Electrical Engineering 2-0-0

For 1st Semester Code (RBE1B001)

For 2nd Semester Code (RBE2B001)

Module 1:

DC & AC Circuits (6 hours)

Circuit laws: Fundamentals of electrical circuit, Ohm's law, Kirchoff's laws, series and parallel connections, analysis of circuits using Node voltage, mesh current, superposition, Thevenin and Norton Theorems to solve simple circuits with dc excitation. Single phase circuit: Single phase emf generation, Representation of sinusoidal waveforms, average, effective, peak and rms values, j operator, Rectangular and polar representation of phasors, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel).

Module 2:

Three Phase Circuits (5 hours)

Three phase circuit: Three phase emf generation, Delta-star and star-delta conversions, voltage and current relations in star and delta connections. solution of the three phase circuits with balanced voltage and balanced load conditions, phasor diagram, measurement of power in three phase circuits.

Module 3:

Magnetic Circuits (5 hours)

Magnetic Circuits: MMF, flux, reluctance, inductance. Review of Ampere Law, Biot Savart Law. Magnetic field, BH characteristics and Hysteresis loss, Series and parallel magnetic circuits.

Module 4:

Electrical Machines (6 hours)

Transformers (Single Phase): Construction, operation, Phasor diagram and performance testing. Induction Motors (Three Phase): Basic Principles, Rotating Magnetic Field, Equivalent circuit, Phasor diagram, Torque-Speed Characteristics Basics of DC machines: EMF Equation, Torque Equation, Methods of Excitation

Text / References:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford UniversityPress, 2011.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
4. D.C.Kulshreshtha,"BasicElectricalEngineering",McGrawHill,2009.

Basic Electronics Engineering 2-0-0

For 1st Semester Code (RBL1B002)
For 2nd Semester Code (RBL2B002)
Module 01 : (6Hours)

Introduction to Semiconductors, Junction Diode: Principle of Diodes, V-I characteristics of junction diode, AC and DC Resistance of Diode, Diode Current Equation, Equivalent circuit of Diode, Breakdown Mechanism, Zener Diode, Rectifier circuit, Clipper and Clamper, Avalanche Diode Bipolar Junction Transistor: Transistor Operation, Current Equation in n-p- n &amplifier; p-n-p transistors, CB,CE,CC Configurations and their Characteristics, Load line Analysis, DC Biasing (Fixed bias and Voltage Divider), Introduction to Amplifiers.

Module 02 : (6 Hours)

Field Effect Transistor: JFET-types, Operations and their Characteristics,
MOSFETs- types, Operations and their Characteristics
CMOS: Brief Introduction to CMOS, Principle of operation of Digital Inverters, VTC Characteristics,

Module 03: (5 Hours)

Operational Amplifiers: The Ideal Op Amp, Inverting and Non – Inverting configurations, Equivalent Circuit model, Op amp application in Integration,
Differentiation and Summing Circuits.

Module 04 : (5 Hours)

Digital Electronic Principles: Introduction, Binary digits, Logic levels and Digital waveforms, Introduction to basic Logic operation, Number system, Decimal numbers, Binary numbers, Decimal-to-Binary conversion, Simple binary arithmetic, Logic Gates, Boolean algebra and Combinational Logic Circuits: The inverter, The AND, OR, NAND NOR, Exclusive-OR and Exclusive-NOR gate, Boolean operations and expressions, Laws and Rules of Boolean algebra, De Morgan's theorem, Boolean analysis of logic circuits, Standard forms of Boolean expressions, Boolean expression and truth table. Basic combinational logic circuits, Implementation of combinational logic, the universal properties of NAND and NOR gates, Basic adders.

Text book:

1. Electronic Devices Circuit Theory - by Rober L. Boylestad 11th Edition, Pearson Publication, 2014
2. Microelectronic Circuits by A. S. Sedra and Kenneth C. Smith 7th Edition, Oxford University Press. 2017
3. Digital Design by M. Morris Mano, 5th Edition, Pearson Publication, 2016.

BASIC MECHANICAL ENGINEERING 2-0-0

For 1st Semester Code (RBM1B001)
For 2nd Semester Code (RBM2B001)

MODULE-I (8 classes)

Thermodynamics:
Systems, Properties, Process, State, Cycle, Internal energy, Enthalpy, Zeroth Law, First law and Second Law of Thermodynamics, Basic Concept of Entropy, Properties of ideal gas., Properties of pure substances, Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables. Related numericals.

MODULE-II (6 classes)

Application of Thermodynamics:
Air compressors, Steam Power Plant, Refrigerators and Heat pump, I.C. Engines (Brief Description of different components of above mentioned systems and working principles with Schematic diagram only)

MODULE-III (5Classes)

Basic Power transmission devices:
Belt, Rope, Gear drives.Coupling, clutch, brakes. (Working principle only)

Introduction to Robotics:
Robot anatomy, joints and links and common robot configurations

MODULE-IV (5 Classes)

Mechanical Measurements:
Temperature, pressure, velocity, flow, strain, force, torque measurements. (Working principle only).

Text books

i. Basic Mechanical Engineering by Pravin Kumar, Pearson
ii. Basic Mechanical Engineering by A R Israni, P K Shah, BS Publications
iii. Text book of Elements of Mechanical Engineering, S T Murthy, Universities press
iv. Basic and applied Thermodynamics by P. K. Nag, Tata McGraw Hill

Reference books

i. Basic Mechanical Engineering by .D. Mishra, P.K Parida, S.S.Sahoo, India Tech Publishing company
ii. Elements of Mechanical Engineering by J K Kittur and G D Gokak,Willey
iii. Basic Mechanical Engineering by BasantAgrawal, C M Agrawal,Willey
iv. Engineering Thermodynamics by P. Chattopadhaya, Oxford University Press

BASIC CIVIL ENGINEERING 2-0-0

For 1st Semester Code (RBC1B002)
For 2nd Semester Code (RBC2B002)

MODULE-I (6 classes)

Introduction and Scope of Civil Engineering. Broad disciplines of Civil Engineering; Importance of Civil Engineering, Early constructions and developments over time, Development of various materials of construction and methods of construction.

Building Material and Building Construction:

Bricks: Brick as a construction material and its importance, qualities of a good brick, Stone: classification, composition and characteristics, Cement: Classification, tests for cement, uses of cement, types of cement, Concrete: Quality of mixing water, Workability, Compaction of concrete, concrete mix design, Grade and strength of Concrete. Fundamentals of R.C.C. and Prestressed concrete. Types of steels used in civil engineering works.
Building Components and their basic requirements, Mortar, Stone masonry, brick masonry, roof, floors.

MODULE-II (6 classes)

Surveying: Linear measurement and chain survey: Use of chains and tapes for measurement of correct length of lines, direct and indirect ranging,Compass surveying: Use of prismatic compass, bearing of a line. Local attraction, Introduction to modern surveying instruments EDM and Total Station.

MODULE-III (6 classes)

Fundamental of soil and its classification, Foundations: Types of shallow and deep foundations with neat sketches. Fundamentals of Irrigation Engineering. Introduction of Hydraulics structure like canals, siphons, weirs, dams etc.

MODULE-IV (6 classes)

Transport, Traffic and Urban Engineering: Introduction to planning and design aspects of transportation engineering, different modes of transport, highway engineering, rail engineering, airport engineering, traffic engineering, urban engineering

TEXT BOOKS

i. Basic Civil Engineering, S. Gopi, Pearson
ii. Building Construction, Sushil Kumar, Standard Publishers Distributors
iii. Surveying and Levelling by R. Subramanian, Oxford University Press

REFERENCE BOOKS

i. Engineering Materials, S.C. Rangwala, Charotar Publishing House
ii. Building Material and Construction, G C Sahu, Joygopal Jena, McGrow Hill
iii. Surveying Vol-1 by R Agor, Khanna Publishers
iv. Basic Civil Engineering, M.S. Palanichamy, McGraw Hill

RCE1E001 Communicative English 2-0-0

Course Objectives:

- To enhance the Listening, Speaking, Reading and Writing skills of the students.
- To make the students Industry-ready.

Module 1

Introduction to communication (6 hours)

The importance of communication through English at the present time; the process of communication and factors that influence communication : sender, receiver, channel, code, topic, message, context, feedback, 'noise', filters and barriers; the importance of audience and purpose

Verbal and non-verbal communication

Listening Skills: Importance and types of Listening

Identifying and rectifying common errors: Subject-verb agreement,

Noun/ Pronoun/ Articles/ Prepositions Usage, Word choice

Vocabulary Building

Module 2

The sounds of English (6 hours)

The International Phonetic Alphabet (IPA); Vowels, diphthongs,consonants, consonant clusters; phonemic transcription;

Syllable division and word stress; sentence rhythm and weak forms, contrastive stress

Intonation: falling, rising and falling-rising tunes

Problem sounds in cultural contexts (Indian context)

Module 3

Workplace Communication (6 hours)

Communication challenges in culturally diverse workforce; Ethics in Communication

Bias-free communication

3.2 Effective Business Presentations: Importance in workplace communication; Planning, Preparing, Organizing, Rehearsing, and Delivering Oral presentations, Handling Questions; Power Point Presentation

Module 4

Writing at Work (6 hours)

Business letters

Writing notices, circulars, emails.

Writing reports and Proposals

Writing CVs (for Technical Positions and Internships)

Module 5

5. **Soft Skills/Life Skills** (8 hours)

Body Language

Connected Speech (Intonation in Everyday Speaking and Conversation)

Types of interviews, Planning and Preparing for a Job Interview; Stages of an Interview; Mastering the art of giving interviews.

Team Management and Leadership Skills; Group Discussion; Public Speaking (Reference: Martin Luther King: I have a Dream, Vivekananda: Chicago Address, Toni Morrison: Noble Prize Acceptance Speech)

Recommended Books:

1. Business Communication by Carol M Lehman, Debbie D Dufrene and Mala Sinha. Cengage Learning. 2nd Edition.
2. English Grammar in Use. Raymond Murphy. Cambridge UP. 4th Edition.
3. A Textbook of English Phonetics for Indian Students by T. Balasubramanian [MACMILLAN]
4. Soft Skills: Key to Success in Workplace and Life by Meenakshi Raman and Shalini Upadhyay. Cengage Learning. 2018 Edition.

Reference Books:

1. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
2. Business Communication Today by Courtland L Bovee and Thill, Pearson.
3. Communication skill by Sanjay Kumar & Puspa Lata, Oxford University Press. 2nd Edition.
4. Body Language. Allan Pease. Free on Googlebooks.
5. Business and Managerial Communication, Sengupta, PHI
6. Business Communication for Managers, P. Mehra, Pearson

Physics Laboratory 0-0-3

For 1st Semester Code (RPH1A201)
For 2nd Semester Code (RPH2A201)

Minimum hours: 30 Hours Credit: 02

A student is expected to perform ten experiments form the list given below.

1. Determination of Young's modulus by Searle's method.
2. Determination of Young's modulus by bending of beams.
3. Determination of Rigidity modulus by static method.
4. Determination of surface tension by capillary rise method.
5. Determination of acceleration due to gravity by Bar pendulum.
6. Verification of laws of vibration of string using sonometer.
7. Determination of wave length of light by Newton's ring apparatus.
8. Determination of wavelength of laser source by diffraction rating method.
9. Determination of grating element of a diffraction grating.
10. Plotting of characteristic curve of a PN junctiondiode.
11. Plotting of characteristic curves of BJT.
12. Study of Hall Effect.
13. Study of RC circuit.
14. Determination of unknown resistance using Meter Bridge.
15. Energy gap determination by Four-Probe method.

Books:

1. Engineering Practical Physics, by S.Panigrahi and B. Mallick, (CENGAGE learning)

CHEMISTRY LAB 0-0-3

For 1st Semester Code (RCH1A202)
For 2nd Semester Code (RCH2A202)

B. Tech. (for all branches):

1. Preparation of Polymer/drug.
2. Determination of cell constant and conductance of solutions.
3. Determination of partition coefficients of iodine between benzene and water.
4. Determination of rate constant of acid catalysed hydrolysis reaction.
5. Determination of dissolved oxygen in a sample of water.
6. Determination of Viscosity of a lubricating oil by Red Wood Viscometer.
7. Determination of Flash point of a given oil by Pensky-Marten's flash pointapproach.
8. Colligative properties using freezing point depression.
9. Proximate analysis of coal.
10. Determination of percentage of available chlorine in a sample of bleaching powder.
11. Estimation of calcium in limestone.
12. Acid-Base Titration by Potentiometry.
13. Determination of total hardness of water by EDTA method.
14. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
15. Standardization of $KMnO_4$ using sodium oxalate. Determination of ferrous iron in Mohr's salt by potassium permanganate.
16. Preparation of colloidal/nano particle solutions.

Basic Electrical Engineering Lab 0-0-3

For 1st Semester Code (RBE1B201)
For 2nd Semester Code (RBE2B201)

List of Experiment under Basic Electrical Engineering Lab:

1. Power and phase measurements in three phase system by two wattmeter method
2. Verification of super position, Thevenin and Norton's theorem
3. Plotting of B-H curve of magnetic material and calculation of hysteresis loss
4. Series RLC circuit (Power measurement, Phasor diagram)
5. OC and SC test of 1-phase transformer.
6. Study of House wiring**.**

Basic Electronics Engineering Lab 0-0-3

For 1st Semester Code (RBL1B202)
For 2nd Semester Code (RBL2B202)
List of Experiment under Basic Electronics Engineering Lab.

1. Familiarization with electronic components (Active & Passive) & electronic equipments (Multi-meters, CROs and function generators)
2. Study of the V-I characteristics of P-N junction diode & Calculate DC & AC resistance.
3. Construction of half-wave rectifier and full wave rectifier circuits (with &without Filter) & study of their output waveforms by CRO and calculation of efficiency and ripple factor
4. a) Construction of positive, negative and biased clipper circuits & study of their output waveforms by CRO
b) Construction of positive and negative clamper circuits & study of their output waveforms by CRO
5. Design of inverting and non-inverting amplifiers using Op-Amp for a given gain withthe help of breadboard and distinct components.
6. Study and realization pf logic gates. (Truth table verification)

BASIC MECHANICAL ENGINEERING 0-0-3

For 1st Semester Code (RBM1B201)
For 2nd Semester Code (RBM2B201)

(Minimum 5 experiments/studies)

1. Model study of Steam Power Plant
2. Model study of Two stroke and Four stroke I.C. Engine
3. Model study of Refrigerator & Air conditioners
4. Model study of Automobile Parts
5. Determination of velocity ratio of belt drive
6. Study of Gears and Gear trains
7. Verification of Bernoulli's Theorem and its application to Venturimeter.
8. Calibration of Bourdon Tube Pressure gauge and measurement of pressure using manometers

BASIC CIVIL ENGINEERING LAB 0-0-3

For 1st Semester Code (RBC1B202)
For 2nd Semester Code (RBC2B202)

(Minimum 5 experiments/studies)

1. Shape and size test of brick
2. Compressive strength of brick
3. Testing of chain and measurement of correct length of the line
4. Bearing of a line
5. Study of Total Station
6. Setting time of cement
7. Tensile strength of reinforcing steel
8. Compressive strength of concrete

ENGINEERING GRAPHICS & DESIGN LAB 0-0-3

For 1st Semester Code (REG1B201)
For 2nd Semester Code (REG2B201)

Introduction: Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line Conventions

AUTO CAD: layout of the software, standard tool bar/menus and description of most commonly used toolbars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP &LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. 2 – Sheets

Orthographic Projections:

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only),True and apparent lengths, True and apparent inclinations to reference planes. 2 – Sheets

Orthographic Projections of Plane Surfaces (First Angle Projection Only):

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only 1-Sheet

Projections of Solids (First Angle Projection Only):

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. 2-Sheets

Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. 2 – Sheet

Isometric Projection (Using Isometric Scale Only):

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of
tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. 2-Sheets

Text Books:

i. Engineering Drawing - N.D. Bhatt & V.M. Panchal, Charotar Publishing House, Gujarat.
ii. Computer Aided Engineering Drawing - S. Trymbaka Murthy, 4th Ed, University Press
iii. Engineering Drawing by N.S. Parthasarathy and Vela Murali Oxford University Press

Reference Books

i. Engineering Graphics - K.R. Gopalakrishna, Subash Publishers Bangalore.
ii. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, Prentice-Hall of India Pvt. Ltd., New Delhi.
iii. Computer Aided Engineering drawing, Prof. M. H. Annaiah, New Age International Publisher, New Delhi

WORKSHOP PRACTICE 0-0-3

For 1st Semester Code (RWO1B202)
For 2nd Semester Code (RWO2B202)

Fitting Practice:

Use of hand tools in fitting, preparing a male and female joint of M.S. or making a paper weight of M.S.

Welding Practice (Basic Theory to be explained prior to practice):

Gas Welding & Electric Arc welding Practice.
A joint such as a Lap joint, a T-joint or a Butt joint is to be prepared or to make furniture.

Machining (Basic Theory to be explained prior to practice):

(i) Stepped cylindrical Turning of a job and Thread-cutting in lathe.
(ii) Shaping
(iii) Milling

RCE1E201 English Language Lab 0-0-3

Objective: To assist students master the listening, speaking, reading and writing skills through practice.

Module1:

Listening and Speaking(8 Hrs)
Accent in speech (1 Hr)
Longer Discourse (dialogues, songs, contextual speech etc.) (1 Hr)
Role-play (2 Hrs)

Practicing sounds of English (1 Hr)
Extempore (1 Hr)
Presentations (2 Hr)

Module 2: Reading 4 Hrs

Reading comprehension practice: Technical text (2 Hrs),
General text (2 Hrs)

Module 3 : Writing 4 Hrs

Guided composition (2 Hrs)
Free-writing (2 Hrs)

Recommended Books:

1. English for Technical Communication by N P Sudharshana & C Savitha Cambridge University Press, 1st edition, 2018.
2. Communication Skills A Workbook by Sanjay Kumar & Pushp Lata, Oxford Publication.
3. English Language Communication Skills : Lab Manual cum Workbook by Rajesh Kumar, Cengage Learning, Ist edition, 2014.

RMA2A001 Mathematics-II 3-0-0

OBJECTIVE:

The objective of the course Mathematics-II is to familiarize the prospective engineers with techniques in Matrix algebra, Vector differential calculus, Vector integral calculus, Fourier series, Fourier transform, Fourier integral. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Module-1 (8 hrs.)

Matrix Algebra, Solution of system of linear equations (Gauss Elimination), Rank and Inverse of matrices (Gauss-Jordan), Examples of Vector Spaces.

Module-2 (8 hrs.)

Eigen values and eigen vectors, Symmetric and skew-symmetric matrices, Orthogonal matrices, Complex matrices, Hermitian and skew matrices, Unitary matrices and similarity of matrices, Diagonalisation of Matrices

Module-3 (9hrs.)

Vector differential calculus: vector and scalar functions and fields, Derivatives, Curves, tangents and arc Length, gradient, divergence, curl

Module-4 (10 hrs.)

Vector integral calculus: Line Integrals, Green Theorem, Surfaceintegrals, Gauss theorem and Stokes Theorem (Without Proof)

Module – 5 (10 hrs.)

Fourier series, Fourier expansion of functions of any period, Even and odd functions, Half range Expansion, Fourier transform and Fourier Integral.

OUTCOMES

On completion of this course, student are able to :

- Apply the knowledge of matrix algebra for solving system of linearequations and compute the inverse of matrices.
- To develop the essential tool of matrices to compute eigen values and eigen vectors required for matrix diagonalization process.
- Illustrate the concept of vector differential calculus to understand the solenoidal and irrotational vectors
- Illustrate the concept of vector integral calculus and exhibit the inter dependence of line, surface and volume integrals.
- Know the use of periodic functions and Fourier series, Fourier intergral, Fourier transform to analyze circuit and system communication.

Text Book:

1. Advanced Engineering Mathematics by E. Kreyszig, Tenth Edition,Willey

References:

2. Higher Engineering Mathematics by B.V. Raman, , McGraw Hills Education

3. Engineering Mathematics by P. S. Das & C. Vijayakumari, Pearson.

4. Advance Engineering Mathematics by P.V.O'NEIL, CENGAGE.

REM2B001 ENGINEERING MECHANICS 3-0-0

Module I (10 Hours)

Concurrent forces on a plane – Composition and resolution of forces and equilibrium of concurrent coplanar forces, Method of projections, Methods of moment, Friction, Parallel forces in a plane- Two parallel forces, General case of parallel forces.

Module II (8 Hours)

Center of parallel forces in a plane and center of gravity- centroids of composite plane figure and curves, Distributed parallel forces in a plane.

General case of forces in a plane- composition of forces in a plane and equilibrium of forces in a plane.

Moments of Inertia- Plane figure with respect to an axis in its plane and perpendicular to the plane- parallel axis theorem, Moment of Inertia of material bodies.

Plane trusses- method of joints and method of sections, Principle of virtual work –equilibrium of ideal systems.

Module III (8 Hours)

Rectilinear Translation- Kinematics- Principles of Dynamics- Concept of Inertial and Non-inertial frame of reference, D'Alemberts Principles.

Module IV (10 Hours)

Momentum and impulse, Work and Energy- impact

Curvilinear translation- Kinematics- equation of motion- projectile- D'Alemberts Principle in curvilinear motion, Moment of momentum, Work- Energy in curvilinear motion.

Kinetics of Rotation of rigid body

Text Book:

1. Engineering Mechanics by S Timoshenko, D.H Young and J.V.Rao, McGraw Hill.

Reference Books:

i. Vector Mechanics for Engineers Statics /Dynamics by Beer, Johnston, McGraw Hill
ii. Fundamental of Engineering Mechanics by S. Rajesekharan & G. Sankara Subramanium, Vikash Publishing House Pvt. Ltd.
iii. Engineering Mechanics by Shames and Rao, Pearson Education.
iv. Engineering Mechanics, Statics and Dynamics by Boresi and Schmidt, Thomson.
v. Engineering Mechanics by K.L. Kumar, Tata McGraw Hill.

RPL2B001 PROGRAMMING FOR PROBLEM SOLVING USING C

Course Outcomes

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.

- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

Contact hrs : 40

Detailed contents

Unit 1:
Introduction to Programming (4 lectures)

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture).**
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and logical errors in compilation, object and executable code- **(2 lectures)**

Unit 2:
Arithmetic expressions, operators and precedence (2 lectures)

Conditional Branching and Loops (6 lectures)
Writing and evaluation of conditionals and consequent branching **(3 lectures)**
Iteration and loops **(3 lectures)**

Arrays (6 lectures)
Arrays (1-D, 2-D), Character arrays and Strings

Unit 3:
Function (5 lectures)
Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Recursion (4 lectures)
Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 4:
Pointers (2 lectures)
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation). Dynamic memory allocation.

Structure (4 lectures)
Structures, Defining structures and Array of Structures, Structure vs Union.

File handling: ASCII and binary Files **(1 lecture)**

Unit 5:
Basic Algorithms (6 lectures)
Searching (Linear and Binary), Basic Sorting Algorithms (Bubble, Insertion, and Selection), Concepts of time and space complexity.

Assignments: All lab should be handled in UNIX/LINUX environment.

Minimum 3-5 problems should be implemented from Unit-2 to Unit-5 each..

Suggested Text Books
(i) Reema Thareja, Introduction to C Programming, 2nd Edition, Oxford University Press.
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books
(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
(ii) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(iii) Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press.

RPL2B201 Programming for Problem Solving using C (Laboratory)

1. Familiarity with basic UNIX/LINUX command, vi editor.
2. Programs on arithmetic expressions, operators and precedence.
3. Programs on Conditional Branching.
4. Programs on Loops.
5. Programs on single dimensional array.
6. Programs on two-dimensional array.
7. Programs on Functions.
8. Programs on Recursive Functions.
9. Programs on Pointers.
10. Programs on Dynamic Memory Allocation.
11. Programs on Structure.
12. Programs on Union.
13. Programs on File Handling.
14. Implementation of Linear and Binary Search.
15. Implementation of Bubble, Insertion and Selection.

Distribution of Credit Semester wise:

Semester	Credit
First	18
Second	23
Third	22
Fourth	21
Fifth	22
Sixth	22
Seventh	17
Eighth	15
Total	**160**

Internal Evaluation Scheme

Classification	Marks
Attendance and Classroom interaction	05
Assignment	05
Surprise Test	05
Quiz	05
Class Test-I & Class Test-II	30
Total	50

Pass Mark in Internal is 50% of total marks i.e. 25

External Evaluation Scheme

University Semester Examination of 3 Hours duration.

Pass mark will be 35% which means students have to score 35 out of 100.

Practical/Sessional Evaluation Scheme

Pass mark will be 50% which means students have to score 50 out of 100.

Evaluation Scheme

Attendance & Daily Performance	-20
Lab Record	- 20
Lab Quiz	- 10
Final Experiments & Viva	– 50

Total=100

- All Lab examinations are to be completed one week before the end semester examination and marks are to be displayed on the college notice board.
- Students are to be shown their copies and marks within 15 days of any Internal Examination. For each internal examination secured marks are to be displayed in the college notice board.
- Highest mark secured must be displayed with name.
- Every month the attendance must be displayed with name.
- At least three student feedbacks are to be collected. (After one month of teaching, after Class Test-II and after completion of course and before end semester examination.)
- Remedial classes if conducted must be shown as the part of the Time table and attendance record to be maintained.

Question Format

Registration no: -

[FOR ALL UG-PG & INTEGRATED PROGRAMS]
(--) Sem +++++ Regular Examination- 2018-19
SUB:
Time: 3 Hours
Max marks: 100
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1	**Short Answer Type Questions (Answer All-10)**		**(02x10)**
	a)		
	b)		
	c)		
	d)		
	e)		
	f)		
	g)		
	h)		
	i)		
	j)		
		Part- II	
Q2	**Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**		**(08x06)**
	a)		
	b)		
	c)		
	d)		
	e)		
	f)		
	g)		
	h)		
	i)		
	j)		
	k)		
	l)		
	m)		
		Part-III	
		Long Answer Type Questions (Answer Any Two out of Four)	
Q3			**(02X16)**

Q4			**(16)**
Q5			**(16)**
Q6			**(16)**

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA
ROURKELA

Curriculum and Syllabus

of

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

Semester (3rd)

Director, Curriculum Development
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Rourkela

Third Semester							
Theory							
Sl No	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**	**University Marks**	**Internal Evaluation**
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)
				Total Credit (Theory)	15		
				Total Marks		**500**	**250**
Practical							
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
				Total Credit (Practical)	**7**		
				Total Semester Credit	**22**		
				Total Marks			**400**

***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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3rd Semester	RMA3A001	MATHEMATICS – III	L-T-P 3-0-0	3 CREDITS

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 Geometirc 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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3rd Semester	ROP3B001	OBJECT ORIENTED PROGRAMMING USING JAVA	L-T-P 3-0-0	3 CREDITS

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.

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

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 (9th Edition) Herbalt Schelidt.

3rd Semester	ROP3B201	OOP USING JAVA LAB.	L-T-P 0-0-3	2 CREDITS

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

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3rd Semester	REN3E001	ENGINEERING ECONOMICS	L-T-P 3-0-0	3 CREDITS

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 assert, 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 Karaunagaran 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 Seelvan, " 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.

3rd Semester	ROB3E002	ORGANISATIONAL BEHAVIOUR	L-T-P 3-0-0	3 CREDITS

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

3rd Semester	RME3C001	Mechanics of Solid	L-T-P 3-0-0	3 CREDITS

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 contraflexture. 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

- 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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3rd Semester	RCI3C201	Building Drawing using Auto CAD	L-T-P 0-0-3	2 CREDITS

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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3rd Semester	RME3C002	Fluid Mechanics and Hydraulic Machines	L-T-P 3-0-0	3 CREDITS

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

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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

3rd Semester	RME3C202	Fluid Mechanics and Hydraulic Machines Lab.	L-T-P 0-0-3	2 CREDITS

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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3rd Semester	RES3F001	ENVIORMENT SCIENCE	L-T-P 3-0-0	0 CREDIT

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 (4th)

Fourth Semester							
Theory							
Sl No	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**	**University Marks**	**Internal Evaluation**
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	Data Communication				
		RCI4G003	Analog Electronic Circuits				
6	MC*	RCN4F001	Constitution of India	3-0-0	0	__	100 (Pass mark is 37)
Total Credit (Theory)					**18**		
Total Marks						**600**	**300**
Practical							
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
Total Credit (Practical)					**6**		
Total Semester Credit					**24**		
Total Marks							**300**

***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.**

4th Semester	**RCI4C001**	**Surveying**	**L-T-P 3-0-0**	**3 CREDITS**

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.
]
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

4th Semester	**RCI4C201**	**Field Surveying Sessional**	**L-T-P 0-0-3**	**2 CREDITS**

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

4th Semester	**RCI4C002**	**Transportation Engineering**	**L-T-P 3-0-0**	**3 CREDITS**

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 Venkatramaiah, 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.

4th Semester	**RCI4C202**	**Transportation Engineering Laboratory**	**L-T-P 0-0-3**	**2 CREDITS**

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.

4th Semester	REN4E001	ENGINEERING ECONOMICS	L-T-P 3-0-0	3 CREDITS

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 assert, 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 Karaunagaran 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 Seelvan, “ 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.

4th Semester	ROB4E002	ORGANISATIONAL BEHAVIOUR	L-T-P 3-0-0	3 CREDITS

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

4th Semester	**RCI4C003**	**Structural Analysis-I**	**L-T-P 3-0-0**	**3 CREDITS**

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, Castigliano'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 Learing
- Structural Analysis by R.C. Hibbeler, Pearson Education

4th Semester	**RCI4C203**	**Material Testing Laboratory**	**L-T-P 0-0-3**	**2 CREDITS**

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

4th Semester	**RCI4D001**	**Construction Technology**	**L-T-P 3-0-0**	**3 CREDITS**

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

4th Semester	**RCI4D002**	**Concrete Technology**	**L-T-P 3-0-0**	**3 CREDITS**

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 rest, 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

4th Semester	**RCI4D003**	**Remote Sensing and Geographic Information System**	**L-T-P 3-0-0**	**3 CREDITS**

Module - I (07 Hrs)
Introduction , Types , Application and importance of Remote Sensing; Physics of Remote Sensing; TheElectromagnetic spectrum; Spectral Reflectance Curves; Spectral signatures; Resolution.

Module - II (10 Hrs)
Remote Sensing Platforms: Ground, airborne and satellite based platforms; Some important RemoteSensing Satellites.Sensors: Passive and Active Sensors; Major Remote Sensing Sensors; Satellite band designations andprincipal 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 RemoteSensing Data; Image Processing functions: Image Restoration, Image Enhancement, ImageTransformation, Image Classification and Analysis; Image interpretation strategies.

Module - IV (09 Hrs)

Geographic Information System: Introduction; Preparation of thematic map from remote sensing data; Co-ordinatesystems; GIS components: Hardware, software and infrastructures; GIS data types: Data Input and DataProcessing; 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.

4th Semester	RCI4G001	Introduction to Physical Metallurgy and Engineering Materials	L-T-P 3-0-0	3 CREDITS

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; recrystalization 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

4th Semester	**RCI4G002**	**Data Communication**	**L-T-P 3-0-0**	**3 CREDITS**

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.

4th Semester	RCI4G003	Analog Electronic Circuits	L-T-P 3-0-0	3 CREDITS

MODULE – I (12 Hours)

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.
Biasing of BJTs: Load lines (AC and DC); Operating Points; Fixed Bias and Self Bias, DC Bias with Voltage Feedback; Bias Stabilization; Examples.
Biasing of FETs and MOSFETs: Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design

MODULE – II (12 Hours)

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 (8 hours)

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 (6 hours)

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).

MODULE – V (7 hours)

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, 5th 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 , 9th/10th 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, 2nd Edition,2008.

- Electronic Devices and Circuits, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, (For Problem Solving)
- Electronics Circuits Analysis and Design, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition,2002.
- Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi,2nd 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, 5thedition,2008.
- Electronics devices and circuits, Anil.K.Maini, Wiley India Pvt.Ltd,2009

4th Semester	**RCN4F001**	**Constitution of India**	**L-T-P 3-0-0**	**0 CREDIT**

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.

DETAILED SYLLABUS

FOR

5th Semester B. TECH PROGRAMME

IN

CIVIL ENGINEEERING

FOR 2018-9019

ADMISSION BATCH ONWARDS

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA

Chhend Colony, Rourkela

ODISHA-769004

B. Tech in Civil Engineering (Admission Batch: 2018-2019)

5th Semester

Fifth Semester					
Theory					
Sl. No.	Category	Course Code	Course Title	L-T-P	Credit
1	PC 11		Design of Concrete Structures	3-0-0	3
2	PC 12		Water and Waste Water Engineering	3-0-0	3
3	PC 13		Geotechnical Engineering	3-0-0	3
4	PE 2		Structural Analysis-II.	3-0-0	3
			Advance Mechanics of Material	3-0-0	
			Masonry Structure	3-0-0	
5	PE 3		Railway and Airport Engineering	3-0-0	3
			Pavement Design	3-0-0	
			Traffic Engineering	3-0-0	
6	MC 5		Universal Human Values		0
Total Credit (Theory)					**15**
Practical					
1	PC 14		Design of Concrete Structures Lab	0-0-3	2
2	PC 15		Water and Waste Water Engineering Lab	0-0-3	2
3	PC 16		Geotechnical Engineering Lab	0-0-3	2
4	PSI 2		Evaluation of Summer Internship	0-0-3	1
Total Credit (Practical)					**7**
Total Semester Credit					**22**

Design of Concrete Structures (3-0-0)

Module I **(10 Classes)**

Properties of concrete and reinforcing steel, philosophy, concept and methods of reinforced concrete design, introduction to limit state method, limit state of collapse and limit state of serviceability, application of limit state method to rectangular beams for flexure, shear, bond and torsion

Module II **(8 Classes)**

Design of doubly reinforced beams, design of T and L beams, design of one way and two way slabs, design of staircases.

Module III **(8 Classes)**

Design of short and long columns with axial and eccentric loadings, Design of isolated and combined column footings

Module IV **(8 Classes)**

Retaining walls, various forces acting on retaining wall, stability requirement, design of cantilever and counterfort retaining walls,

Module V **(6 Classes)**

Design of water tanks, design requirements, design of tanks on ground, under ground and elevated water tanks.

Books:

1. Design of Reinforced Concrete Structue by N. Subramanian, Oxford University Press
2. Limit State Design by A.K.Jain, Neemchand& Bros
3. Reinforced Concrete Design by S U Pillai & D. Menon, McGraw Hill
4. Design of concrete structures by J.N.Bandyopadhyay, PHI
5. Limit State Design of Reinforced Concrete -P.C Verghese
6. Reinforced Concrete Design by S.N.Sinha, McGraw Hill
7. RCC Design-B.C.Punmia, A.K.Jain and A.K.Jain-Laxmi Publications

Digital Learning Resources:

Course Name	Design of Reinforced Concrete Structures 12 weeks
Course Link	(https://nptel.ac.in/courses/105/105/105105105/)
Course Instructor	PROF. NIRJHAR DHANG, ,IIT Kharagpur

Water and Waste Water Engineering (3-0-0)

Module – I **(08 Classes)**

General requirement for water supply, sources, quality of water, intake, pumping and transportation of water.

Module – II **(06 Classes)**

Physical, chemical and biological characteristics of water and their significance, water quality criteria, water borne diseases, natural purification of water sources.

Module – III **(08 Classes)**

Engineered systems for water treatment : aeration, sedimentation, softening coagulation, filtration, adsorption, ion exchange, and disinfection. Design of water distribution system.

Module – IV **(08 Classes)**

Generation and collection of waste water, sanitary, storm and combined sewerage systems, quantities of sanitary waste and storm water, design of sewerage system Primary, secondary and tertiary treatment of wastewater. Waste water disposal standards,

Module –V **(10 Classes)**

Basic of microbiology. Biological wastewater treatment system : Aerobic processes activated sludge process and its modifications, trickling filter, RBC, Anaerobic Processes conventional anaerobic digester, High rate and hybrid anaerobic reactors, Sludge digestion and handling, Disposal of effluent and sludge, Design problems on water distribution, sewerage, water treatment units, wastewater treatment units and sludge digestion.

Books:

1. Water Supply Engineering-Environmental Engineering v.1 by S.K.Garg, Khanna Publishers
2. Sewage Disposal and Air Pollution Engineering - Environmental Engineering v.2 by S.K.Garg, Khanna Publishers
3. Water Supply and Sanitary Engineering by B.S.BirdiDhanpat Rai Publishing Company
4. Water Supply Engineering by B. C. Punmia and A.K.Jain, Laxmi Publications
5. Water and Wastewater Technology by M.J.Hammer, PHI

Digital Learning Resources:

Course Name	WATER SUPPLY ENGINEERING, Waste water Treatment and Recycling
Course Link	https://nptel.ac.in/courses/105/105/105105201 (https://nptel.ac.in/courses/105/105/105105178//)
Course Instructor	PROF. MANOJ KUMAR TIWARI Department of Civil Engineering IIT Kharagpur

Geotechnical Engineering- I (3-0-0)

Module-I **(8 classes)**

Origin of Soil: Rock Cycle and the origin of soil, clay mineralogy, mechanical analysis of soil, grain size distribution curve, particle shape and size, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density. Consistency of soil: Atterberg limits - Liquidity index and consistency index, activity, soil structure. Engineering classification of soil: Types of Soil classification, IS, USCS, HRB and ASTM.

Module-II **(8 classes)**

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships.

Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, Factors affecting hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Module-III **(6 classes)**

Soil Compaction: mechanism and principles, Laboratory compaction, factors affecting compaction, effect of compaction on soil properties, field compaction techniques.

Module-IV **(12 classes)**

Stress Distribution: Normal and shear stresses on a plane, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination: direct and tri-axial shear test, unconfined compression test, vane shear test. Other methods of determining the un-drained shear strength of soil, sensitivity and thixotropy of clay.

Module-V **(6 classes)**

Consolidation of soils: Consolidation and compaction, primary and secondary consolidation, Terzhaghi's theory of one dimensional consolidation, consolidation test, coefficient of consolidation.

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Books:

1. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning
2. Soil Mechanics and Foundation Engineering, by K.R. Arora, Stanard Publishers
3. Soil Mechanics and Foundation Engineering by B.N.D. NarasingaRao, Wiley India Pvt.Ltd.
4. Basic and applied soil mechanics, by Gopal Ranjan, A S R Rao New Age International Publishers

Digital Learning Resources:

Course Name	GEOTECHNICAL ENGINEERING- 1
Course Link	(https://nptel.ac.in/courses/105/101/105101201
Course Instructor	Prof. Devendra Narain Singh, IIT Bombay 12 week

Structural Analysis-II (3-0-0)

Module – I **(10 Classes)**

Analysis of continuous beams and plane frames by slope deflection method and moment distribution method.

Module – II **(6 Classes)**

Aanalysis of continuous beam and simple portals by Kani's method

Module – III **(8 Classes)**

Analysis of two hinged and fixed arches for dead and live loads, Suspension cables with two hinged stiffening girders

Module – IV **(8 Classes)**

Matrix methods of analysis: flexibility and stiffness methods; Application to simple trusses and beams

Module – V **(8 Classes)**

Plastic Analysis: Plastic modulus, shear factor, plastic moment of resistance, Load factor, Plastic analysis of continuous beam and simple rectangular portals, Application of upper bound and lower bound theorems

Books:

1. Structural analysis by C.S. Reddy Mc Graw Hill
2. Structural Analysis by T.S. Thandamoorthy, Oxford University Press
3. Structural analysis a matrix approach by Pandit & Gupta, Mc Graw Hill.
4. Limit Analysis of Structures: Monikaselvam, Dhanpat Ray Publication
5. Indeterminate Structures: J.S.Kinney
6. Indeterminate Structural Analysis: C.K.Wang ,Mc Graw Hill
7. Structural Analysis by D.S.Prakash Rao, Universities Press
8. Matrix Analysis of Structures by P.K.Singh, Cengage Learning

Digital Learning Resources:

Course Name	Structural Analysis-II
Course Link	https://nptel.ac.in/courses/105/105/105105109/#
Course Instructor	Dr. P. Banerji Department of Civil Engineering IIT Bombay

Advance Mechanics of Solids (3-0-0)

Module I **(10 Classes)**

Theories of failure: Maximum principal stress theory, maximum shear stress theory, maximum strain theory, total strain energy theory, maximum distortion theory, octahedral shear stress theory graphical representation and comparison of theories of failure.

Module II **(4 Classes)**

Thick cylinders subjected to internal and external pressures, compound cylinders, computer application in analyzing stresses in thick cylinders.

Module III **(10 Classes)**

Unsymmetrical bending: Properties of beam cross selection, slope of neutral axis, stresses and deflection in unsymmetrical bending, shear centre.

Curved Beam: Bending of beam with large initial curvature, Stress distribution in beam with rectangular, circular and trapezoidal cross section, stresses in crane hooks, ring and chain links.

Module IV **(8 Classes)**

Elementary concept of theory of elasticity, stresses in three dimensional, equations of equilibrium and compatibility, plane stress, computer analysis of two dimensional state of stress or strain at a point.

Module V **(8 Classes)**

Advanced topics in strength of materials: Repeated stresses and fatigue in metals, concept of stress Concentration, notch and stress concentration factors.

Experimental stress analysis: Resistance strain gauges, strain Rosettes, Two dimensional photoelastic methods of stress analysis, stress optic law, light and dark field in a polariscope, Isoclinic and Isochromatic fringe patterns, Computer Analysis of strain from strain rosette measurement.

Books:

1 Advanced Mechanics of Solids, L.S. Srinath, Mc Graw Hill.
2. Advanced Mechanics of Materials, Kumar &Ghai, Khanna Publisher.
3. Strength of Materials by R. Subramaniam, Oxford University Press
4. Strength of Material by S. S. Ratan, McGraw Hill
5. Advanced Mechanics of Materials: Seely and Smith, John Willey, New York.
6. Mechanics of Materials by Gere & Timoshenko, CBS.

Digital Learning Resources:

Course Name	Advanced Strength of Materials
Course Link	https://nptel.ac.in/courses/112/101/112101095/
Course Instructor	Prof. S.K. Maiti Department of Mechanical EngineeringIIT Bombay

Masonry Structures (3-0-0)

Module-I **(8 Classes)**

Introduction, Masonry units, materials and types: History of masonry, Characterics of Brick, stone, clay block, concrete block, stabilized mud block masonry units-Strength, modulus of elasticity and water absorption.

Module-II **(8 Classes)**

Strength of Masonry in Compression:Behaviour of Masonry under compression, strength and elastic properties, influence of masonry unit and mortar characteristics, effect of masonry unit height on compressive strength, influence of masonry bonding patterns on strength, prediction of strength of masonry in Indian context, failure theories of masonry under compression.

Module-III **(8 Classes)**

Flexural and shear bond, flexural strength and shear strength:Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength, effect of bond strength on compressive strength,

Module-IV **(8 Classes)**

Design of load bearing masonry buildings:Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses, Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels; Wall carrying axial load, eccentric load with different eccentricity ratios, wall with openings, freestanding wall; Design of load bearing masonry for buildings up to 3 to 8 storeys using BIS codal provisions.

Module-V **(8 Classes)**

Earthquake resistant masonry buildings: Behaviour of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, BIS codal provisions
Masonry arches, domes and vaults:Components and classification of masonry arches, domes and vaults, historical buildings, construction procedure.

Books:

1. Dayaratnam P, “Brick and Reinforced Brick Structures”- Oxford & IBH
2. Sinha B.P & Davis S.R., “Design of Masonry structures”- E & FN Spon
3. Hendry A.W.,“Structural masonry”- Macmillan Educaon Ltd., 2nd edion.
4. Curtin, “Design of Reinforced and Prestressed Masonry”- Thomas Telford.
5. Sven Sahlin, “Structural Masonry”-Prence Hall.

Digital Learning Resources:

Course Name	DESIGN OF MASONRY STRUCTURES
Course Link	https://nptel.ac.in/courses/105/106/105106197
Course Instructor	PROF. ARUN MENON Department of Civil Engineering IIT Madras

Railway and Airport Engineering (3-0-0)

MODULE-I **(8 Classes)**

History of Indian railways, component parts of railway track, problems of multi gauge system, coning of wheels, alignments and survey, permanent way track components, Type of rail sections, creep of rails, wear and failure in rails , Ballast requirements, sleeper requirements, types of sleepers, various train resistances

MODULE-II **(8 Classes)**

Geometric design: Gradients and grade compensation, various speeds on a railway track, super-elevation, horizontal and vertical curves, Points and crossings, Design of simple turn-out, Signalling and interlocking,

MODULE-III **(8 Classes)**

Airport site selection, Air craft characteristics, various surface of an airport, Wind rose diagram, Geometric elements of run way and taxiway , holding apron, parking configuration , terminal building , visual aids, air traffic control, airport marking and lighting.

MODULE-IV **(8 Classes)**

Harbour Engineering: Classification of Harbour basin, general layout of harbours, Docks, Different components of docks.

MODULE-V **(8 Classes)**

Inland waterways, Inland water transportation in India, classification of waterways, economics of inland waterways transportation, national waterways

Books:

1. A text book of railway engineering , By S.C.Saxena and M.G.Arora
2. Railway Engineering by Satish Chandra & MM Agrawal, Oxford University Press.
3. Transportation Engineering, Volume-II- Railways, Airports, Docks and Harbours, Bridges and Tunnels by C. venkatramaih, Universities Press
4. Air-port Engineering by S.K.Khanna and M.G.Arora

Digital Learning Resources:

Course Name	Transportation Engineering II
Course Link	https://nptel.ac.in/courses/105/107/105107123/
Course Instructor	Prof. Rajat Rastogi, IIT Roorkee

Pavement Design (3-0-0)

Module – I **(08 Classes)**

Introduction: Classification of pavements, Difference between highway and runway pavements, Factors affecting structural design, Characteristics of traffic loading, Concept of VDF and Computation of design traffic.

Module – II **(10 Classes)**

Principles of pavement design: Concepts of structural and functional failures, Performance criteria; Analysis of pavements: ESWL, Analysis of flexible and concrete pavements.

Module – III **(10 Classes)**

Design of pavements: IRC, AASHTO and other important methods of design of bituminous and concrete pavements.

Module – IV **(06 Classes)**

Pavement evaluation techniques: Benkelman beam, Falling weight deflectometer and other equipments.

Module – V **(06 Classes)**

Concepts of pavement maintenance management.

Books:

1. Principles of Pavement Design, E. J. Yoder & M.W. Witzack, John Wiley
2. Pavement Design by R Srinivasa Kumar, Universities Press
3. Principles of Transportation Engineering, P. Chakroborty& A. Das, PHI Publication
4. Pavement Analysis and Design, Y. H. Huang, Prentice Hall

Digital Learning Resources:

Course Name	Advanced Transportation Engineering
Course Link	https://nptel.ac.in/courses/105/104/105104098/
Course Instructor	Prof. A. Das, Prof. ParthaChakraborty,IIT Kanpur,

Traffic Engineering (3-0-0)

MODULE-I **(08 Classes)**

TRANSIT SYSTEM AND ISSUES

Introduction to Mass Transport, Role of various modes of Mass Transport, Transport System Performance at National, State, Local and International levels, National Transport Policy, Urban transportation problems and their impact, Modes of mass transit- their planning, construction and operation, Case studies of existing mass transit systems
Technical and economic evaluation of mass transit projects

MODULE-II **(08 Classes)**

PUBLIC TRANSIT SYSTEM

Urban Transport System, Public Transport System Re-genesis and Technology, Physical performance of Public Transport System, Public Transport and Urban Development Strategies, Mass Transit concepts- Trip interchanges and assignments, Characteristics of Rail Transit, Vehicle Characteristics

MODULE-III **(08 Classes)**

BUS TRANSIT PLANNING AND SCHEDULING

Route Planning and Scheduling, Bus Transport System, Performance and Evaluation, Scheduling, Conceptual patterns of bus service, Network Planning and Analysis, Bus Transport System Pricing, Bus Transit System Integration, Analytical Tools and Techniques for Operation and Management, Bus Rapid Transit Systems, Case Studies

MODULE-IV **(06 Classes)**

RAIL TRANSIT TERMINALS AND PERFORMANCE EVALUATION

Performance Evaluation, Efficiency, Capacity, Productivity and Utilisation, Performance Evaluation Techniques and Application, System Network Performance, Transit Terminal Planning and Design

MODULE-V **(10 Classes)**

IMPACT OF TRANSIT

Policies and Strategies for Mass Transport, Need for Integrated Approach, Unified Transport Authorities, Institutional arrangement, Urban Transport Fund, Parking Policies, Private Sector in Mass Transport, Bus and Rail Integration, Co-ordination of Feeder Services, Transit Oriented Land Use Development., Case Studies, Urban Transportation and Land use, Impact of Transport Development on Environment, Remedial measures, Policy Decisions, Recent Trends in Mass Transportation Planning and Management

Books

1. Michael J.Bruton , "An Introduction to Transportation Planning", Hutchinson,1985
2. Michael D.Meyer and Eric J.Miller , "Urban Transportation Planning – A Decision Oriented Approach", McGraw Hill Book Company, New York,1984
3. F.D.Hobbs, "Traffic Planning and Design", PoargamonOress
4. John W.Dickey, "Metropolitan Transportation Planning" – Tata McGraw Hill Publishing Company Limited, New Delhi, 1980
5. Paul H.Wright, "Transportation Engineering – Planning and Design", John Wiley and Sons, New York, 1989.

Digital Learning Resources:

Course Name	Urban transportation planning
Course Link	https://nptel.ac.in/courses/105/107/105107067/
Course Instructor	Dr. M. Parida IIT Roorkee ,

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5Th Semester

Universal HumanValues

(Self, Society and Nature)

Pre-requisites: Universal Human Values: Self & Family (desirable); 4-day Harmony-2 Workshop (co-requisite). Please refer to AICTE Model Curriculum-Vol-II.

1. Objective:

The objective of the course is four-fold:

A. Sensitization of student towards issues in society and nature.
B. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.
C. Strengthening of self reflection.
D. Development of commitment and courage to act.

(For elaboration on some of the above, consult course description for Universal Human Values 1: Self and Family, AICTE Model Curriculum-VOL-II).

2. Course Topics :

In this Universal Human Values course, the focus is more on understanding society and nature on the basis of self and human relationships.

i) Purpose and motivation for the course.
ii) Recapitulation (from the previous course) on ideas of self, pre-conditioning, and natural acceptance.
iii) Harmony in the self. Understanding human being as co-existence of self and body. Identifying needs and satisfying needs of self and body. Self-observations. Handling peer pressure.
iv) Recapitulation on relationships. Nine universal values in relationships. Reflecting on relationships in family. Hostel and institute as extended family. Real life examples.
v) Teacher-student relationship. Shraddha. Guidance. Goal of education.
vi) Harmony in nature. Four orders of nature – material order, plant order, animal order and human order. Salient features of each. Human being as cause of imbalance in nature. (Film **"Home"** can be used.)
vii) Human being as cause of imbalance in nature. Depletion of resources – water, food, mineral resources. Pollution. Role of technology. Mutual enrichment not just recycling.
viii) Prosperity arising out of material goods and understanding of self. Separation of needs of the self and needs of the body. Right utilization of resources. lkekU; vkdka{kk ,oa egRokdka{kk, Understanding the purpose they try to fulfil.

ix) Recapitulation on society. Five major dimensions of human society. Fulfilment of the individual as major goal. Justice in society. Equality in human relationships as naturally acceptable. Establishment of society with abhaya (absence of fear).

x) Ethical human conduct. Values, character and netikataa.

xi) Professional ethics. Conduct as an engineer or scientist.

Design of Concrete Structures Lab(0-0-3)

1. Workability test of concrete:Slump test, compaction factor test and flow table test
2. Cube Test of Concrete(Nominal Mix)
3. Cylinder Test for Concrete(Nominal Mix): Determination of axial stress, longitudinal strain, lateral strain and Poision's ratio. Plotting of stress-strain curve and determination of modulus of elasticity.
4. Split Tensile Strength Test of Concrete
5. Prism test for determining modulus of rupture of concrete
6. Design of Concrete Mix (As per Indian Standard Method)
7. Failure of RC beam in bending and shear (two point and one point loading)
8.Complete design of a simple load bearing residential building comprising of beams, slab, column, footing, staircases, etc. and the detailing of steel reinforcement.

Course Name	**Design of Concrete Structures Lab**
Course Link	https://nptel.ac.in/courses/105/107/105107067/
Course Instructor	,

WATER SUPPLY AND SANITARY ENGINEERING LAB

LIST OFEXPERIMENTS:

1. ***Analysis of water Quality Parameter***

    a) Measurement of pH, Electrical conductivity
    b) Determination of Turbidity of water samples.
    c) Determination of Chlorides in water.
    d) Determination of Iron and Fluoride in water.
    e) Determination of Acidity and Alkalinity of water.
    f) Determination of Sulphate in water.
    g) Determination of Hardness of water.
    h) Determination of Residual Chlorine of water.
    i) Determination of Total Dissolved Solids.
    j) Determination of optimum coagulant dosage.
    k) Microbiological culture analysis of bacterial samples
    l) MPN Test

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2. ***Analysis of Waste Water Characteristics***

    a) Determination of Total Solids, Settlable Solids, Dissolved Solids, Suspended Solids and Volatile Solids.
    b) Determination of Dissolved Oxygen, COD and BOD.
    c) Determination of Ammonia–nitrogen and Nitrates.

Digital Learning Resources:

Course Name	Environmental Engineering 1
Course Link	https://ee1-nitk.vlabs.ac.in/
Course Instructor	NIT Suratkal,

GEOTECHNICAL ENGINEERING-1 LAB

1. *Determination of specific gravity of soil grains*
2. *Determination of grain size distribution of soil*
   (a)Sieve test (b) Hydrometer/ pipette test
3. *Determination of Atterberg limits of soil*
   Liquid limit (b) plastic limit (c) shrinkage limit
4. *Measurement of soil compaction in the field*
   Core cutter method (b) Sand replacement method
5. *Determination of Density – Water content relationship of soil.*
   Proctor compaction test (ii) Modified Proctor compaction test (c) Use of Proctor penetration needle
6. *Determination of relative density of granular soil*
7. *Determination of shear strength parameters of soil*
   (a)Shear Box test (b) Tri-axial compression test (c) Unconfined compression test (d) Vane shear test
8. *Determination of consolidation characteristics of soil using fixed ring Oedometer*
9. *Determination of California Bearing Ratio (CBR) of soaked and un-soaked soil specimens*
10. *Determination of coefficient of permeability of soil*
    (a)Constant head permeameter (b) Falling head permeameter

Digital Learning Resources:

Course Name	Soil Mechanics Lab
Course Link	http://smfe-iiith.vlabs.ac.in/
Course Instructor	IIIT Hyderabad

BIJUPATNAIKUNIVERSITY OF TECHNOLOGY, ODISHA

ROURKELA

Curriculum and Syllabus

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

Semester (6th)

Sixth Semester							
Theory							
Sl. No.	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**	**University Marks**	**Internal Evaluation**
1	PC		Design of Steel Structures	3-0-0	3	100	50
2	PC		Hydrology &Irrigation Engineering	3-0-0	3	100	50
3	BS		Optimization in Engineering	3-0-0	3	100	50
4	PE		Foundation Engineering	3-0-0	3	100	50
			Ground Improvement Techniques.	3-0-0			
			Environmental Geo Techniques	3-0-0			
5	OE		Human Resources Management	3-0-0	3	100	50
			Artificial Intelligence and Machine Learning	3-0-0			
			Renewable Power Generation Systems	3-0-0			
6	MC*****	RIK6F001	Essence of Indian Knowledge Tradition-1	3-0-0	0	-	100 (Pass mark is 37)
Total Credit (Theory)					**15**		
Total Marks						**500**	**250**
Practical							
1	PC		Steel Structures Lab	0-0-3	2		100
2	PC		Irrigation Engineering Lab	0-0-3	2		100
3	PSI		Future Ready Contributor Develop Model Lab	0-0-3	2		100
4	PSI		Seminar - I	0-0-3	1		100
Total Credit (Practical)					**7**		
Total Semester Credit					**22**		
Total Marks							**400**
SUMMER INTERNSHIP TRAINING FOR 45 DAYS							

***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.**

6th Semester	RCI6C001	Design of Steel Structures	L-T-P 3-0-0	3 Credits

Module I **10 HOURS**

Introduction, advantages/disadvantages of steel, structural steel, rolled steel section, various types of loads, design philosophy.

Limit state design method, limit states of strength and serviceability, probabilistic basis for design Riveted, bolted and pinned connections,

Welded connections-assumptions, types, design of fillet welds, intermittent fillet weld, plug and slot weld, failure of welded joints, welded joints vs bolted and riveted joints

Module II **6 HOURS**

Tension members, types, net cross-sectional area, types of failure, slenderness ratio, design of tension members, gusset plate.

Module III **6HOURS**

Compression members, effective length, slenderness ratio, types of cross-section, classification of cross section,

Design of axially loaded compression members, lacing, battening, design of column bases, and foundation bolts.

Module IV **8 HOURS**

Design of beams, types of c/s, lateral stability of beams, lateral torsional buckling, bending and shear strength, web buckling and web crippling, deflection, design procedure.

Module V **6HOURS**

Plate girders- various elements and design of components Eccentric and moment connections, roof trusses

Books:

1. Design of Steel Structures- Limit State Method by N. Subramanian, Oxford University Press
2. Limit State Design of Steel structures by S.K. Duggal, Mc-Graw Hill
3. Design of steel structures by S.S.Bhavikatti, I.K. International Publishing house.
4. Design of Steel Structures by K. S. Sairam, Pearson
5. Steel Design by William T. Segui, Cengage Learning
6. Fundamentals of Structural Steel Design by M.L.Gambhir, Mc Graw Hill
7. Steel Structures-Design and Practice by N. Subramanian, Oxford University Press

Books:

Digital Learning Resources:

Course Name	Design of Steel Structure
Course Link	https://nptel.ac.in/courses/105/105/105105162/
Course Instructor	PROF. DAMODAR MAITY

6th Semester	RCI6C002	Hydrology&Irrigation Engineering	L-T-P 3-0-0	3 Credits

MODULE-I **09HOURS**

Hydrologic cycle, World water balance; Forms, types & measurement of precipitation; Mean precipitation over an area; Curves of precipitation: Depth-area-duration, Intensity-duration-frequency & Depth-duration-frequency; Probable maximum precipitation; World's greatest observed rainfalls; Abstractions of precipitation: Measurement of evaporation; Evapotranspiration & its equations; Infiltration: measurement & indices.

MODULE-II **09HOURS**

Major methods for Measurement of stage, velocity & streamflow; Stage-discharge relationship: linear & log-log; Runoff characteristics of streams; Runoff volume estimation by Curve Number method; Flow mass curve & reservoir capacity estimation; Hydrographs: components, affecting factors & base flow separation methods; Unit hydrographs (UHs): derivation, use & limitations; UHs of different durations; Peak flood estimation by Rational method, empirical formulae, enveloping curves & Gumbel's Method.

MODULE-III **09HOURS**

Irrigation: necessity, advantages & disadvantages; Water distribution techniques in farms: free flooding, border flooding, check flooding, basin flooding, furrow irrigation, sprinkler irrigation & drip irrigation; Crop water requirement: duty, delta, base period & crop period; Irrigation efficiencies; Soil moisture - irrigation frequency relationship; Irrigation channels: classification & alignment; Distribution system, water losses in irrigation channels; Stable & regime channel design: comparison of Kennedy's & Lacey's Theories; Irrigation canal lining: types, advantages, economics & preliminary design.

MODULE-IV **09HOURS**

Types of Cross-Drainage (CD) Works, , Design considerations for CD works; Diversion Head works: Types of weirs and barrages, Layout of a diversion head works; Design of weirs and barrages: Comparison among Bligh's creep theory, Lane's weighted creep theory and Khosla's method of independent variables, Exit gradient; Canal Falls: Necessity, Proper location, Types,Gravity Dams: Typical cross section, Various forces acting on gravity dam, Combination of forces for design, Modes of failure and criteria for structural stability, High and low gravity dams, Typical section of low gravity dam; Earth Dams: Types, Causes of failure, Preliminary section, Seepage control. Spillways: Brief study of various types.

Books:

1. Irrigation Engineering and Hydraulic Structures by S. K. Garg, Khanna Publication, New Delhi
2. Irrigation Engg. By B.C. Punmia and Pande, Laxmi Publication, New Delhi
3. Engineering Hydrology by K Subramanya, McGraw Hill Education, New Delhi
4. Hydrology Principles Analysis Design by H M Raghunath, New Age International Publishers, New Delhi

Digital Learning Resources:

Course Name	IRRIGATION AND DRAINAGE
Course Link	https://nptel.ac.in/courses/126/105/126105010/
Course Instructor	PROF. DAMODHARA RAO MAILAPALLI Department of Agricultural and Food Engineering IIT Kharag

6th Semester		Optimization in Engineering	L-T-P 3-0-0	3 Credits

Module I: **(10 Hours)**

Idea of Engineering optimization problems, Classification of optimizationalgorithms, modeling of problems and principle of modeling. Linear Programming:Formulation of LPP, Graphical solution, Simplex method, Big-M method, Revised simplex method, Duality theory and its application, Dual simplex method , Sensitivity analysis in linear programming.

Module II: **(10 Hours)**

Transportation problems:Finding an initial basic feasible solution by NorthwestCorner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimalitytest, MODI method, Stepping stone method. **Assignment problems:** Hungarian method for solution of Assignment problems. Integer Programming: Branch and Bound algorithm for solution of integer programming problems.

Module III: **(12 Hours)**

Non-linear programming: Introduction to non-linear programming. Unconstraintoptimization: Fibonacci and Golden Section Search method. Constrained optimization with equality constraint: Lagrange multiplier, Projected gradient method. Constrained optimization with inequality constraint: Kuhn-Tucker condition, Quadratic programming.

Module IV: **(6 Hours)**

Queuing models: General characteristics, Markovian queuing model, M/M/1model, Limited queue capacity, multiple server, Finite sources, Queue discipline.

Books:

[1] Operations Research- Principle and Practice, A. Ravindran, D. T. Philips, J. Solberg, Second edition, Wiley India Pvt Ltd.
[2] Operation Research, Prabhakar Pai ,Oxford University Press
[3] Optimization for Engineering Design, Kalyanmoy Deb, PHI Learning Pvt Ltd.
[4] Operations Research, H.A.Taha, A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, Pearson Education, Eighth Edition.
[5] Engineering Optimization, S S Rao, New Age International Pvt Ltd, 2003.
[6] Linear and Non-linear Optimization, **S**tephen G. Nash, A. Sofer, McGraw Hill, 2nd Edition.
[7] Engineering Optimization, A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, Wiley India Pvt. Ltd, Second edition.
[8] Operations Research, F.S.Hiller, G.J.Lieberman, Tata McGraw Hill, Eighth Edition, 2005.
[9] Operations Research, P.K.Gupta, D.S.Hira, S.Chand and Company Ltd, 2014.

Digital Learning Resources:

Course Name	CONSTRAINED AND UNCONSTRAINED OPTIMIZATION
Course Link	https://nptel.ac.in/courses/111/105/111105100/
Course Instructor	PROF. ADRIJIT GOSWAMI, PROF. DEBJANI CHAKRABORTY Department of Mathematics IIT Kharagpur

6th Semester	RCI6D001	Foundation Engineering	L-T-P 3-0-0	3 Credits

Foundation Engineering **8 HOURS**

Module:I

Lateral Earth Pressure and Retaining Structures: Concept of earth pressure, Earth pressure at rest,active and passive earth pressure for both cohesionless and cohesive soils, Earth pressure theories:Rankine's theory, Coulomb's Wedge theory, Graphical methods: Rebhan's and Culmann's graphicalsolutions, Stability conditions for retaining walls.

Module: II **10HOURS**

Bearing Capacity: Definitions, Rankine's analysis, Types of failures: General and local shear failure,Terzaghi's Analysis, Brinch-Hansen analysis, Meyerhof's analysis, Vesics's bearing capacityequation, Effect of water table on bearing capacity, IS code method for computing bearing capacity,

Field Methods: Plate load test and its limitations, Standard penetration test.

Shallow Foundations: Types of foundations: Spread footing, combined and strap footing, mat or raftfooting, Settlement of footings.

Module: III **10HOURS**

Deep Foundations: Difference between shallow and deep foundations, Types of deep foundations.

Pile Foundations: Types of piles, pile driving, load carrying capacity of piles-static and dynamic formulae, Pile load test and its limitations, correlation with penetration tests, Group action in pilessettlementand efficiency of pile groups in clay, negative skin friction, Under reamed pile foundation. Basics of well foundation - types, component parts and ideas about the forces acting on a well foundation.

Module: IV **8 HOURS**

Subsoil Exploration: Necessity and planning for subsoil exploration, Methods - direct (test pits and trenches), indirect (sounding, penetration tests and geophysical methods).

Soil sampling – types of samples, standard penetration test, static and dynamic cone penetration test, in-situ vane shear test, Rock coring, soil exploration report.

Books:

1. Principles of Foundation Engineering by B. M. Das, Cenage Learning
2. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New Age International Publishers
3. Geotechnical Engineering by C. Venkatramiah, New Age International Publishers
4. Geotechnical Engineering by S. K. Gulati & Manoj Gupta, Mc Graw Hill
5. Soil Mechanics and Foundations by B. C. Punmia et al., Laxmi Publications
6. Soil Mechanics & Foundation Engineering by B.N.D. Narasinga Rao, Wiley

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Digital Learning Resources:

Course Name	FOUNDATION ENGINEERING
Course Link	https://nptel.ac.in/courses/105/105/105105176/
Course Instructor	PROF. KOUSIK DEB Department of Civil Engineering IIT Kharagpur

6th Semester	RCI6D002	Ground Improvement Techniques.	L-T-P 3-0-0	3 Credits

Module – I **8 HOURS**

Introduction, Necessity of ground improvement, selection of ground improvement techniques, stabilization ofexpansive soil.

Module-II **8 HOURS**

Dewatering, Well points-Vacuum / electro osmotic methods, Analysis of seepage, Two Dimensional Flow, heattreatment, ground freezing., Analysis and design of dewatering systems.

Grouting types, Properties, Method of grouting, Ground selection and control.

Module – III **8 HOURS**

Compaction, Methods of compaction, Engineering properties of compacted soil, Field compaction and its control. dynamic compaction, Vibro flotation, Compaction piles, Consolidation, Sand drains, Preloading, Stone columns, Construction methods, Merits and demerits of various techniques

Module – IV **6 HOURS**

Soil stabilization, Use of chemical additives,

Module – V **6 HOURS**

Reinforced earth, Concept, Materials, Application and design, Use of geo-synthetics and geo-cells in construction work.

Books:

1.Grond improvement techniques by P.P.Raj, Laxmi Publications.
2.Foundation Design and Construction, M.J. Tomlinson
3. Foundation Engineering, G.A. Leonard, Tata McGraw Hill
4. Modern Geotechnical Engineering, Alam Singh, IBT Publishers
5.GeotechnicalEngineering.ShashKGulati&ManojDatta,TataMc-GrawHill

Digital Learning Resources:

Course Name	Ground Improvement Techniques - Video course
Course Link	https://nptel.ac.in/courses/105/108/105108075/
Course Instructor	Dr. G.L. Sivakumar Babu Department of Civil Engineering, IISc Bangalore

6th Semester	RCI6D003	Environmental Geo Techniques	L-T-P 3-0-0	3 Credits

Module- I **8 HOURS**

Introduction: Scope, importance, waste generation, subsurface contamination, Geosynthetics: Types, functions, applications.

Module- II **8 HOURS**

Forms of waste and their properties: Municipal waste, mineral waste, industrial waste, hazardous waste, index properties, strength, compressibility and permeability of municipal and mineral waste.

Module- III **8 HOURS**

Selection of waste disposal sites, factors affecting site selection, Landfills for municipal and hazardous waste: components of landfills, layouts, dailycells, base lining systems.

Module- IV **6HOURS**

Ash ponds and mine tailing impoundments: slurry deposition of mine tailing and coal ash in impoundments, layouts, components, design of tailing dam/ash dykes.

Module- V **6HOURS**

Remediation: Principle of remediation: Planning, source control, soil gas extraction, soil washing, and bio-remediation.

Books:

1. Geotechnology of waste management, I. S. Oweis and R. P. Khera, Butterwarths, London.
2. Engineering with geosynthetics, Ed. G. V. Rao and G.V.S.S. Raju, Tata McGraw Hill
3. Geotechnical practice for waste disposal, D. E. Daniel, Chapman and Hall, London.

Digital Learning Resources:

Course Name	ENVIRONMENTAL GEOTECHNICS
Course Link	https://nptel.ac.in/courses/105/101/105101196/
Course Instructor	PROF. D. N. SINGH, Department of Civil Engineering, IIT Bombay

6th Semester		Human Resources Management	L-T-P 3-0-0	3 Credits

Module I: **8 HOURS**

Concept scope and objectives of HRM. Relationship between HRM and HRD. The challengesfor HRM – Environmental, organizational and Individual. Role and functions of HR managers inthe changing business scenario. Human Resources Planning – overview, Recruitment – concept,objectives, legal framework regulating recruitment in India, Selection – Objectives and methods,Test and interviews, Induction and orientation, validity and reliability of Tests and interviews.

Module II: **8 HOURS**

Career Planning – concept, objectives. Different stages of career and its implications, Methods ofcareer planning and development, Promotion – types and process, Transfer – types. Separationsincluding lay off and retrenchment. Performance Management – concept and objectives.

Module III: **6 HOURS**

Performance Appraisal – concept objectives and methods – management by objectives (MBO),Assessment centre, 360 degree feedback. Appraisal errors. Competency mapping – concept,objectives and the process.

Module IV: **8 HOURS**

Compensation Management – objectives and principles. wage & salary. Wage concept – minimum wage, Fair wage, living wage. nominal wage and real wage. Components of wages, methods of wage determination, job evaluation – methods wage differentials and its functions.

Module V: **6 HOURS**

Training and Development – Training need Assessment, Types of Training Programs – on the job and off the job training programs, Evaluation of effectiveness of training programs.

Books

1. Personnel & HRM – P. subha Rao, Himalaya Publishing House.
2. HRM - Text and cases – Aswathappa, THM
3. Managing Human Resources – Gomez, Belkin &Cardy, PHI. HRM – Snell, Bohlander, Vohra – Cengage Publication

Digital Learning Resources:

Course Name	PRINCIPLES OF HUMAN RESOURCE MANAGEMENT
Course Link	https://nptel.ac.in/courses/110/105/110105069/
Course Instructor	PROF. ARADHNA MALIK, Department of Management Studies, IIT KGP

6th Semester		Artificial Intelligence and Machine Learning	L-T-P 3-0-0	3 Credits

Module-I: **(12 hours)**

INTRODUCTION –The Foundations of Artificial Intelligence; - INTELLIGENT AGENTS – Agents and Environments, Good Behaviour: The Concept of Rationality, the Nature of Environments, the Structure of Agents, SOLVING PROBLEMS BY SEARCH – Problem-Solving Agents, Formulating problems, Searching for Solutions, Uninformed Search Strategies, Breadth-first search, Depth-first search, Searching with Partial Information, Informed (Heuristic) Search Strategies, Greedy best-first search, A* Search, CSP, Means-End-Analysis.

Module-II: **(12 hours)**

ADVERSARIAL SEARCH – Games, The Mini-Max algorithm, optimal decisions in multiplayer games, Alpha-Beta Pruning, Evaluation functions, Cutting off search, LOGICAL AGENTS – Knowledge-Based agents, Logic, Propositional Logic, Reasoning Patterns in Propositional Logic, Resolution, Forward and Backward chaining - FIRST ORDER LOGIC – Syntax and Semantics of First-Order Logic, Using First-Order Logic , Knowledge Engineering in First-Order Logic - INFERENCE IN FIRST ORDER LOGIC – Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution

Module-III: **(6 hours)**

UNCERTAINTY – Acting under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and its Use, PROBABILISTIC REASONING – Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distribution, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks

Module-IV: **(10 hours)**

LEARNING METHODS – Statistical Learning, Learning with Complete Data, Learning with Hidden Variables, Rote Learning, Learning by Taking Advice, Learning in Problem-solving, learningfrom Examples: Induction, Explanation-based Learning, Discovery, Analogy, FormalLearning Theory, Neural Net Learning and Genetic Learning. Expert Systems: Representingand Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Books:

[1] Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill,3rd ed.,2009

[2] Stuart Russell, Peter Norvig, *Artificial Intelligence -A Modern Approach*, 2/e, Pearson, 2003.

[3] Nils J Nilsson, *Artificial Intelligence: A New Synthesis*, Morgan Kaufmann Publications,2000

[4] Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010

[5] S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

Digital Learning Resources:

Course Name: Artificial Intelligence Search Methods For Problem Solving
Course Link: https://swayam.gov.in/nd1_noc20_cs81/preview
Course Instructor: Prof. D. Khemani, IIT Madras

Fundamentals of Artificial Intelligence

Course Name:
Course Link: https://swayam.gov.in/nd1_noc20_me88/preview
Course Instructor: Prof. S. M. Hazarika, IIT Guwahati

Course Name: Introduction to Machine Learning
Course Link: https://nptel.ac.in/courses/106/105/106105152
Course Instructor: Prof. S. Sarkar, IIT Kharagpur

Course Name: Machine Learning
Course Link: https://nptel.ac.in/courses/106/106/106106202
Course Instructor: Prof. Carl Gustaf Jansson, IIT Madras

6th Semester		Renewable Power Generation Systems	L-T-P 3-0-0	3 Credits

Module I: **(15 Hours)**

Introduction: Conventional energy Sources and its Impacts, Non conventional energy– seasonalvariations and availability, Renewable energy – sources and features, Distributed energy systemsand dispersed generation (DG). Solar Energy: Solar processes and spectral composition of solar radiation. Solar Thermal system-Solar collectors, Types and performance characteristics, Applications-Solar water heating systems(active & passive) , Solar space heating & cooling systems , Solar desalination systems, Solar cooker.Solar photovoltaic system-Operating principle, Photovoltaic cell concepts, Cell, module, array,Losses in Solar Cell, Effects of Shadowing-Partial and Complete Shadowing, Series and parallelconnections, Cell mismatching, Maximum power point tracking, Applications-Battery charging,Pumping, Lighting, Peltier cooling. Modelling of PV cell.

Module II: **(10 Hours)**

Wind Energy: Wind energy, Wind energy conversion; Wind power density, efficiency limit for windenergy conversion, types of converters, aerodynamics of wind rotors, power ~ speed and torque speed characteristics of wind turbines, wind turbine control systems; conversion to electricalpower: induction and synchronous generators, grid connected and self excited induction generatoroperation, constant voltage and constant frequency generation with power electronic controlsingle and double output systems, reactive power compensation, Characteristics of wind powerplant, Concept of DFIG.

Module III: **(9 Hours)**

Biomass Power: Principles of biomass conversion, Combustion and fermentation, Anaerobic digestion, Types of biogas digester, Wood gassifier, Pyrolysis, Applications. Bio gas, Wood stoves,Bio diesel, Combustion engine, Application.

Module IV: **(6 Hours)**

Hybrid Systems: Need for Hybrid Systems, Range and type of Hybrid systems, Case studies ofDiesel-PV, Wind-PV, Microhydel-PV, Biomass-Diesel systems, electric and hybrid electric vehicles.

Books:

[1] Godfrey Boyle“Renewable Energy- Power for a Sustainable Future”,Oxford University Press.
[2] B.H.Khan, “Non-Conventional Energy Resources”,TataMcGrawHill, 2009.
[3] S. N. Bhadra, D. Kastha, S. Banerjee, “Wind Electrical Systems”,Oxford University Press, 2005.
[4] S. A. Abbasi, N. Abbasi, “Renewable Energy Sources and Their Environmental Impact”, Prentice Hall of India, New Delhi, 2006

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Digital Learning Resources:

Course Name:	Energy Resources and Technology
Course Link:	https://nptel.ac.in/courses/108/105/108105058/
Course Instructor:	Prof. S Banerjee, IIT Kharagpur

6th Semester	RIK6F001	Essence of Indian Knowledge Tradition-1	L-T-P 3-0-0	0 Credits

Course Objective:

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Course Outcomes:

- Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.

Course Content:

- Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गान्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाङ्ग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

Books:

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, VidyanidhiPrakasham, Delhi, 2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, VidyanidhiPrakasham, Delhi, 2016 9. P R Sharma (English translation), ShodashangHridayam

6th Semester	**RCI6C201**	**Steel Structures Lab**	**L-T-P 0-0-3**	**2 Credits**

1. Design and detailing of steel roof trusses/ industrial buildings
2. Design of columns(with lacing and battening) and column bases
3. Design of plate girders and gantry girder
4. Detailing of structural steel connections, seated and framed connections

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Course Name	Design of Steel Structure	
Course Link	https://nptel.ac.in/courses/105/105/105105162/	
Course Instructor	PROF. DAMODAR MAITY	

6th Semester	RCI6C202	Irrigation Engineering Lab	L-T-P 0-0-3	2 Credits

Design of Irrigation Structure (Sessional/Practical) (0-0-3)
Course Objectives:
Gaining knowledge regarding design of various hydraulic structures and Irrigation systems.
Course Content:
1. Canal design:
a.Canal Dimension study
b.Canal Fall: Design of any one fall.

2. Land drainage: Depth and spacing of Tile drains.

3. Design of Cross Drainage Works

4. Gravity Dam Design
a.Profile of the dam, Forces on Dam, Safety of Dam
b.Shear stress, Principal Stress on Dam

5. Earthen Dam:
a.Seepage line determination
b.Slope stability design

6. Design and detailing of any one type of fall.

7. Spillway: design of any one type of spillway

Books:
1. S.K. Garg, Irrigation Engineering and Hydraulic Structure , Khanna publisher.

2. J.K.Sharma and Laxmi Narain, Analysis and Design of Hydraulic Structures, Krishna Prakashan Media.
3. Dr. V.C. Agarwal, Irrigation Engineering And Hydraulic Structures, S.K. Kataria& Sons

Digital Learning Resources:

Course Name	IRRIGATION AND DRAINAGE
Course Link	https://nptel.ac.in/courses/126/105/126105010/
Course Instructor	PROF. DAMODHARA RAO MAILAPALLI Department of Agricultural and Food Engineering IIT Kharag

6th Semester		Future Ready Contributor Program	L-T-P 0-0-3	2 Credits

Outcomes: The Future-ready Contributor Program aims to accomplish the following outcomes in the lives of students–

- Improve the employability of students by giving them the right work ethic and thinking that employers are looking for.
- Build their confidence with which they can go into any job and contribute meaningfully.
- Improve their ability to engage better in the workplace and to be able to handle the challenges that come up there.
- Build their career-worthiness and help them develop into future-ready contributors with ability to navigate a career in a volatile, changing world.
- Widen their choices of career and success, so that they are able to open up more opportunities for themselves and take up unconventional career pathways.
- Enable them recognize how they as technical professionals, can participate and make a positive contribution to their communities and to their state.

The Program content is also designed to expose students to real-world workplace scenarios and sensitize them to some of the challenges faced in society around them, especially in the local communities around them and in their own state of Odisha.

The Contributor Program syllabus has been evolved and fine-tuned over several years, to –

a) address the changing need and contemporary challenges being faced by industry and what employers of today are looking for in the people they hire;
b) working extensively with universities and students and an appreciation of their challenges and concerns;
c) guided by the higher ideas and principles of practical Vedanta in work.

Sr. No.		Content	Total Hrs
1	**Part 1 : Developing self-efficacy and basic inner strength**	**Who is a Future-ready Contributor?** *In this topic, students understand the new work environment, expectations from future workforce, and importance of being a future-ready contributor. This enables students to transform their expectation of themselves in work*	3 hrs lab sessions (discovery-based facilitator led)
2		**Self-esteem & Growth Identity** *In this topic, students learn how to develop a deeper and more resilient self esteem and how to adopt a growth identity/ mindset, that is more appropriate to the demands of the future workplace.*	Same as above
3		**Become a Creator of one's destiny** *In a "victim stance", we see the career environment as full of difficulties and hurdles. We feel powerless or blame our circumstances for not having many opportunities. This makes us fearful of uncertainty and makes us settle for jobs where we remain mediocre. In this topic, students discover the "creator of destiny stance" to challenges and situations. This stance helps them take ownership & responsibility to shape destiny, build a new future & find answers to challenges; and stop being complainers.*	Same as above
4	**Part 2 : Building ability to make more effective career choices**	**Achieving Sustainable Success** *In this topic, students discover how to achieve sustainable or lasting success, by making themselves success-worthy. Where their focus shifts to building one's "engine of success" rather than being on chasing the "fruits of success". This is important, because over a lifetime of work, all people go through ups and downs – where the fruits are not in their control. People who are focused on the fruits of success, fall prey to disappointment, loss in motivation, quitting too early, trying to find shortcuts – when fruits don't come. Whereas people focused on building their engine of success continue to contribute steadily, irrespective of whether fruits come or not. This helps them make better choices in life, that leads to steady success & long-term career fulfillment in an uncertain world.*	Same as above
5		**Career Development Pathways for a changing world**	Same as above

		In this topic, students explore a range of diverse "career development models" and the possibilities for contribution each opens up to them. This helps them open up hidden opportunities that such an environment offers. And free themselves from a herd mentality when making career choices.	
6		**Make an impact in every part of one's life** *In this topic, students learn how to expand the contribution possible in any role they have. This helps them take charge of own career growth & discover their power to contribute in any role or job.*	Same as above
7	**Part 3 : Building ability to become solution and value creating individuals in the world**	**Think Solutions** *The market environment in which organizations are operating, is becoming increasingly dynamic and uncertain. So, employers are increasingly seeking out people who can innovate and figure out solutions in the face of any challenge (unlike in the past when it was the people who were most efficient and productive, who were valued by organizations). At the heart of innovation lies this way of thinking of "finding solutions" rather than "seeing problems or roadblocks". Students learn how to build this way of thinking, in this topic.*	Same as above
8		**Value Thinking** *Companies are also looking for employees who do not just work hard, or work efficiently or productively - but those who will make a valuable difference to the fortunes of the company. This difference may come from innovation, but it may also come from focusing on the right things and identifying what really matters – both to the company and to the customers. In this topic, students learn how to build this capability.*	Same as above
9		**Engaging Deeply** *The environment we live in is becoming increasingly complex because more and more things are getting interconnected, new fields are emerging, technologies are rapidly changing, capabilities and knowledge one is trained in will become fast obsolete. In such a scenario, the student's ability to quickly understand and master what is going on, dive deep, get involved in any area, rapidly learn new capabilities that a job demands, is*	Same as above

		important. In this topic, students learn how to engage deeply. Learning how to dive deep, to quickly understand what is going on, get involved in any area, and rapidly learn.	
10	**Part 4 : Building ability to work collaboratively and as good citizens of organizations and the country**	**Enlightened self-interest & collaboration at work** *The changing nature of work in organizations and in the global environment, is increasingly demanding that people work more collaboratively towards shared goals and more sustainable goals. A key to working successfully when multiple stakeholders are involved, is "thinking in enlightened self-interest". In this topic, students learn how to widen their thinking from "narrow self-interest" to "enlightened self-interest" to work more effectively in teams & collaboratives.*	Same as above
11		**Human-centered thinking & Empathy** *In this topic, students learn to recognize & respond to human needs and challenges – the way of thinking at the heart of user-centric designs & customer-centricity.*	Same as above
12		**Trust Conduct** *The biggest currency in a sustainable career is "trust" i.e. being trusted by team members, bosses, customers. When we are trusted, people listen to us, they are willing to give us the chance to grow, give us the space to make mistakes, and work seamlessly with each other without always having to "prove ourselves". In this topic, students learn how to build trust with people they engage with.*	Same as above
Contribution Project Lab Sessions		*3 Contribution projects that help them apply contributor thinking. After students complete their project work (beyond the classroom), each project ends with this 3 hr lab session where they build their project output and present.*	9 hrs (3 hr lab sessions for each of 3 projects)
Project work		*The above Contribution Projects require research, and may need field work beyond the classroom that students are expected to do.*	Beyond classroom

Lab Sessions:

- Students will have to attend twelve discovery-based lab sessions to build new models of thinking & capacities (3 hrs per module)
- They will work closely with their peers to discuss and understand these new models of thinking.
- Their learning will be facilitated by trained college faculty.

Contribution Projects

- Three contribution projects that help them apply contributor thinking
- These will require research and also may need field work
- Each ends with a 3 hr lab session where they build their project output and present

BIJUPATNAIKUNIVERSITY OF TECHNOLOGY, ODISHA

ROURKELA

Curriculum and Syllabus

B. Tech (*CivilEngineering*) from the Admission Batch 2018-19

Semester (7th)

Seventh Semester							
Theory							
Sl No	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**	**University Marks**	**Internal Evaluation**
1	HS	RED7E001	Entrepreneurship Development	3-0-0	3	100	50
2	PE	RCI7D001	Prestressed Concrete	3-0-0	3	100	50
		RCI7D002	Design of Concrete Structures-II				
		RCI7D003	Estimating, Costing and Professional Practice				
3	PE	RCI7D004	Integrated Watershed Management	3-0-0	3	100	50
		RCI7D005	Ground Water Hydrology				
		RCI7D006	Water Resource Engineering				
4	OE	RMM7E003	Marketing Management	3-0-0	3	100	50
		RGT6A003	Green Technology				
		RIS7B001	Industrial Safety Engineering				
5	OE	REV5D004	Disaster Management	3-0-0	3	100	50
		RIP7E002	Intellectual Property Right				
		RAE6G001	Finite Element Method				
6	OE	RIT7D001	Internet of Things	3-0-0	3	100	50
		RCS7D007	Soft Computing				
		RIT7D006	E-Commerce & ERP				
7	MC*	RIK7F001	Essence of Indian Knowledge Tradition - II	3-0-0	0		100 (Pass Mark is 37)
Total Credit (Theory)					**18**		
Total Marks						**600**	**300**
Practical							
1	PSI	RMP7H201	Minor Project	0-0-6	3		200
2	PSI	RSM7H202	Seminar - II	0-0-3	1		100
3	PSI	RCV7H203	Comprehensive Viva	0-0-3	1		100
Total Credit (Practical)					**5**		
Total Semester Credit					**23**		
Total Marks							**400**

***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.**

7th Semester	RED7E001	Entrepreneurship Development	L-T-P 3-0-0	3 Credits

Module I: **(10 hours)**

Entrepreneurship: Concept of entrepreneurship and intrapreneurship, Types of Entrepreneurs, Nature and Importance, Entrepreneurial Traits and Skills, Entrepreneurial Motivation and Achievement, Entrepreneurial Personality

Module II: **(08 hours)**

Entrepreneurial Environment, Identification of Opportunities, Converting Business Opportunities into reality. Start-ups and business incubation, setting up a Small Enterprise. Issues relating to location, Environmental Problems and Environmental pollution Act, Industrial Policies and Regulations

Module III: **(10 hours)**

Need to know about Accounting, Working capital Management, Marketing Management, Human Resources Management, and Labour Laws. Organizational support services - Central and State Government, Incentives and Subsidies.

Module IV: **(12 hours)**

Sickness of Small-Scale Industries, Causes and symptoms of sickness, cures of sickness, Role of Banks and Governments in reviving industries.

Books:

[1] Entrepreneurship Development and Management, Vasant Desai, HPH
[2] Entrepreneurship Management, Bholanath Dutta, Excel Books
[3] Entrepreneurial Development, Sangeeta Sharma, PHI
[4] Entrepreneurship, Rajeev Roy, Oxford University Press

Digital Learning Resources:

Course Name: Entrepreneurship
Course Link: https://nptel.ac.in/courses/110/106/110106141/
Course Instructor: Prof. C Bhaktavatsala Rao, IIT Roorkee

Course Name: Entrepreneurship Essentials
Course Link: https://nptel.ac.in/courses/127/105/127105007/
Course Instructor: Prof. Manoj Kumar Mondal, IIT Kharagpur

7^{th} Semester	RCI7D001	Prestressed Concrete	L-T-P 3-0-0	3 Credits

Module I: **(10 hours)**

Prestressing system, materials and codes: Basic concept, Losses of prestress, analysis of prestress and bending stresses. Need for high strength steel and concrete. Advantages and applications. Pre-tensioning and post tensioning systems.

Module II: **(08 hours)**

Design of beams : Analysis and design of section for bending and shear, pressure line, concept of load balancing, cracking moment, bending of cables, limit state analysis and design, anchorage zone stresses, design of end block, Application to bridges.

Module III: **(08 hours)**

Selection of prestress concrete members, short term and long term deflections of uncracked members.

Module IV: **(08 hours)**

Flexural strength of prestressed concrete sections,Continuous beams, Design concept concordancy of cables, Secondary design consideration

Module V: **(06 hours)**

Design pre-tensioned and post tensioned beam.

Books:

[1] Prestressed Concrete, N Krishna Raju, Tata McGraw-Hill
[2] Design of Prestressed Concrete Structures, T Y Lin, Ned H Burns, John Wiley & Sons
[3] Prestressed Concrete Structures, P. Dayaratnam, P. Sarah,Medtech Publisher

Digital Learning Resources:

Course Name: Prestressed Concrete Structure
Course Link: https://nptel.ac.in/courses/105/106/105106118/
Course Instructor: Dr.Amlan K. Sengupta,Prof.Devdas Menon, IIT Madras

7th Semester	RCI7D002	Design of Concrete Structures-II	L-T-P 3-0-0	3 Credits

Module I: **(06 Hours)**

Design of Foundations:

Combined Footing: Rectangular,Trapezoidal,raft,strap,pile foundation:single/group pile.

Module II: **(06 Hours)**

Design of Water tanks: Design requirements, Design of elevated and Intze type water tanks. Calculation of dimensions; Design of top dome; Design of top ring beam ; Design of cylindrical wall ; Design of bottom ring beam, Design of portal frames and domes by LSM and using latest IS codes.

Module III: **(10 Hours)**

Earthquake Engineering: Introduction to EQ Engineering: Cyclic behaviour of concrete and reinforcement, significance of ductility, ductility of beam, design and detailing for ductility, simple problems based on above concept, Computation of earthquake forces on building frame using Seismic Coefficient Method as per IS 1893-2016.

Module IV: **(08 Hours)**

Prestressing systems: materials,basic concepts and design of prestressing, losses of prestress, analysis of prestressed beams and slab (pretension and post tension), advantages and application.

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

Bridge Engineering**:** Introduction: classification and components of a standard bridge, economical span, location of piers and abutments, vertical clearance above HFL, scour depth and choice of bridge type.

Standard Loadings for Road Bridges, Impact effect and impact factor calculation for RCC andsteel bridges,Design of single vent rectangular slab culvert.

Books:

[1] Advanced Concrete Structure Design by P. C. Verghese, Prentice Hall of India
[2] Limit state design- A K Jain, Nem Chand and Brothers
[3] Reinforced Concrete Vol. II [Advanced reinforced concrete] By Dr. H. J. Shah Edition
[4] P. Dayaratham, Design of Reinforced Concrete Structures, New Delhi, Oxford and IBH Publishing Co
[5] Limit state design of reinforced concrete by B.C. Punmia, AK Jain and A.K. Jain, Laxmi Publishers New Delhi 2007
[6] J. Krishna and O. P. Jain, Plain and Reinforced Concrete Vol-I & II, Nem Chand and Bros., Roorkee.

7^{th} Semester	RCI7D003	Estimating, Costing and Professional Practice	L-T-P 3-0-0	3 Credits

Module-I: **(08 hours)**

Quality estimation:

Principles of estimation, methods and units, Estimation of materials in buildings, Culverts and bridges.

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

Specifications-Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.

Rate analysis-Purpose, importance and necessity, factors affecting Analysis of rates, Prime cost, Schedule rates, Analysis of rates for various types of works.

Tender- Types of Tender, Preparation of tender documents, inviting tenders,general and special conditions, contract types. termination of contracts, penalty and liquidated charges, Settlement of disputes, Arbitration, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, Introduction to e-tendering.

Module-III: **(08 hours)**

Objective and functions of management in construction.

Project Management: Project Planning, Scheduling and Controlling, Bar charts: Development of Bar charts and its shortcomings. Network techniques: Event, activity, Dummy activity. Network rules, Numbering of events, Critical Path Method, Critical activities, Slack, Project Evaluation and Review Techniques (PERT): Time estimates, Different types of Float of activity, Probability of meeting schedule date for the project.

Module-IV: **(08 hours)**

Cost Model: Project cost, indirect and direct cost, slope of direct cost curve, optimum project duration, contracting the network for cost optimization. Introduction to updating, resources smoothing and resources leveling

Module-V: **(08 hours)**

Quality Control: Quality Control by Statistical Methods, Sampling Plan, Control Charts, X Chart, R Chart, C chart and P Chart. Introduction to construction safety.

Books:

[1] Estimating and Costing in Civil Engineering Theory & Practice, B.N. Dutta, UBS Publishers
[2] PERT and CPM, L.S. Sreenath, East West Press
[3] Civil engineering contracts and estimates by B.S. Patil, University Press
[4] Construction Management and Planning, B Sengupta & H Guha, Tata McGraw Hill
[5] PERT & CPM, L. S. Sreenath. East - West Press
[6] Relevant IS Code: National Building Code-2016

Digital Learning Resources:

Course Name:	Construction Economics and Finance
Course Link:	https://nptel.ac.in/courses/105/103/105103023/
Course Instructor:	Dr. Bulu Pradhan, IIT Guwahati.

7th Semester	RCI7D004	Integrated Watershed Management	L-T-P 3-0-0	3 Credits

Module I: **(12 Hours)**

Introduction, watershed behaviour, effects of land use and its change on hydrological cycle components, Land capability and suitability classification.

Measurement of meteorological (temperature, wind speed, sunshine hours, atmospheric pressure, relative humidity) and hydrological (suspended sediment and bed load) parameters Modelling Runoff with SCS methodology, modifications suggested for Indian conditions, case study

Module II: **(14 Hours)**

Erosion process–Factors affecting erosion, Types of erosion Assessment of erosion, Modelling Erosion using USLE, RUSLE, introduction to few other models, Indian studies, case study

Control measures for soil erosion – vegetative and mechanical (including design), for agricultural and non-agricultural lands Wind erosion and its modelling, control measures.

Module III: **(06 Hours)**

Crop water management and crop planning with special reference to different agro-ecological zones in India Water conservation practices for deserts

Module IV: **(04 Hours)**

Watershed development in India, Common Guidelines, Allocation of funds Wetland management- types, hydrologic conditions and water budget, hydrological and ecological functions, the Ramsar convention

Module V: **(04 Hours)**

Drought and its management-causes and impacts, definition, management objectives and strategy-short term and long term measures.

Books:

[1] Sharda V.N., Sikka A.K. and Juyal G.P. (2006) Participatory Integrated Watershed Management: A Field Manual, Central Soil and Water Conservation Research and Training Institute, 218, Kaulagarh Road, Dehradun.

[2] Tideman E.M. (1999) Watershed Management–Guidelines for Indian Conditions, Omega Scientific Publishers, New Delhi.

[3] . Common Guidelines for Watershed Development Projects (2008) Government of India.

[4] Dhruva N.V.V. (2002) Soil and Water Conservation Research in India, Indian Council of Agricultural Research, KrishiAnusandhanBhavan, Pusa, New Delhi- 110012.

[5] Dhruva N.V.V., Sastry G. and Patnaik U.S. (1990) Watershed Management, Indian Council of Agricultural Research, New Delhi.

[6] Frevert R.K., Schwab G.O., Edminster T.W. and Barnes K.K. (2009) Soil and Water Conservation Engineering, 4th Ed, John Wiley and Sons, New York.

[7] Jain S.K. and Singh V.P. (2006) Water Resources Systems Planning and Management, Reed Elsevier India Pvt. Ltd., New Delhi. 6. James L.D. and Lee R.R. (1971) Economics of Water Resources Planning, McGraw Hill Book Company.

Digital Learning Resources:

Course Name:	Watershed Management
Course Link:	https://nptel.ac.in/courses/105/101/105101010/
Course Instructor:	Dr. T.I. Eldho, IIT Bombay.

7th Semester	RCI7D005	Ground Water Hydrology	L-T-P 3-0-0	3 Credits

Module-I: **(12 Hours)**

Hydrologic cycle, Water balance, Occurrence of ground water: Origin, geological formations as aquifers,type of aquifers, groundwater basins, springs. Darcy's Law, validity of Darcy's Law permeability,laboratory and field measurement of permeability, groundwater Flow lines. Steady flow to a well, steady radial flow to a well in confined aquifer and unconfined aquifer, Unsteady radial flow into a confinedaquifer, Non equilibrium Theis equation, Theis method of solution, multiple well system.

Module-II: **(10 Hours)**

Methods of constructions of deep and shallow wells: The percussion (or cable tool) method of drilling,

Direct circulation hydraulic rotary method, Down the hole hammer method, well logs-receptivity logging,testing of wells for yield, Effect of irrigation, stream flow, rainfall on groundwater fluctuations, seasonaland secular variations, fluctuation due to miscellaneous causes.

Surface and Subsurface investigations of groundwater: Geophysical exploration, Electrical resistivitymethod, aerial photo interpretation, remote sensing applications to ground water exploration, test drilling,

Artificial recharge by water spreading, through pits and shaft, recharge through other methods;

Module-III: **(10 Hours)**

Ground water pollution: Municipal sources, liquid wastes from domestic uses, solid wastes, Industrialsources, tank and pipeline leakage, Mining activity, agricultural sources, septic tank and cesspools, salinewater intrusion in coastal aquifers, methods to control saline water intrusion.

Module-IV: **(08 Hours)**

Groundwater management: Concepts of Basin management, Equation of hydrologic equilibrium,groundwater basin investigations, conjunctive use of surface and groundwater.

Books:

[1] Groundwater Hydrology, D. K. Todd, John Wiley and Sons.
[2] Ground Water, H. M. Raghunath, New Age International Publishers.
[3] Groundwater and Tube Wells, S. P. Garg, Oxford and IBH Publishing Co., New Delhi.

Digital Learning Resources:

Course Name:	Ground water hydrology
Course Link:	https://nptel.ac.in/courses/105/103/105103026/
Course Instructor:	Dr.Rajib Kumar Bhattacharya, IIT Guwahati

7th Semester	RCI7D006	Water Resource Engineering	L-T-P 3-0-0	3 Credits

Module-I: **(06 hours)**

Introduction - Hydrologic cycle and significance of its components; Clouds, Precipitation, interception, evaporation, evapo-transpiration, depression storage, infiltration, Interflow and surface runoff.

Precipitation - Measurement of precipitation, rain gauge network, adequacy of Rain gauge station, Test for consistency of record, Estimation of missing data, Mean precipitation over an area, depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship

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

Runoff: Runoff characteristics of streams, Catchment characteristics, Rainfall-Runoff Correlation, runoff volume: empirical equations, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve,

Reservoir Planning: capacity of reservoirs, Calculation of storage Volume of reservoir from mass curve, Maintainable demand, Variable demand, Sequent Peak Procedure

Module-III: **(08 hours)**

Hydrograph: factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph: derivation, limitations, different duration, Synthetic unit hydrograph, IUH.

Flood:flood estimation, Rational Method, Empirical formula, frequency analysis, Flood Routing, Reservoir routing and Channel routing,

Module-IV: **(08 hours)**

Drought: Definition and Classification, Methods of Water Harvesting, Environmental flow, Environmental flow assessment

Open Channel Flow: Classification of flows, Velocity Distribution, Equation of continuity, energy equation, momentum equation, energy-depth relations, Specific Energy, Critical depth and its computation, critical, subcritical, supercritical flow,

Module- V: **(10 hours)**

Open Channel flow: Uniform flow, Chezy'sKutter's equation, Manning's Formula, Most economical Section, Non-uniform flow, Gradualvaried flow, classifications of flow profiles, Controlled sections; Rapidly Varied flow, Hydraulic jumps

Books:

[1] Engineering Hydrology, K Subramanya, McGraw Hill.
[2] Applied Hydrology, K N Muthreja, Tata McGraw Hill.
[3] Flow in Open Channels, K Subramanya, McGraw Hill
[4] Open Channel Hydraulics, VenTeChowMcGraw Hill Book Company
[5] Water Resources Engineering, L W Mays, Wiley.
[6] Engineering Hydrology, C S P Ojha, R Berndtsson and P Bhunya,, Oxford.
[7] Hydrology and Water Resources Engineering by K. C. Patra, Narosa Publishing House,New Delhi

Digital Learning Resources:

Course Name:	Water Resource Engineering
Course Link:	https://nptel.ac.in/courses/105/104/105104103/
Course Instructor:	Dr.Pranab K Mohapatra, Prof. Rajesh Srivastava, IIT Kanpur.

7th Semester	RMM7E003	Marketing Management	L-T-P 3-0-0	3 Credits

Module I: **(12 Hours)**

Marketing Management: Concept, Process, Functions and relevance in the current context. Marketing Environment: Elements of micro and macro environment Competition Analysis: Factors contributing to competition, porter's five forces model, Identifying and analyzing competitors.

Marketing Planning: Exploring Opportunity, Product -market selection, Marketing Planning Process. Market Research and Information Systems: Research Process, The Internet and World Wide Web based Information collection and processing, Database, Data Warehouses and Data Mining, Global Market Research. Consumer Behaviour: Factors influencing consumer behavior, consumer decision process. Organizational buying behaviour.

Module II: **(12 Hours)**

Market Segmentation, Targeting and Positioning: Definition, Bases of segmenting consumer and Industrial markets. Target Market strategies: Market Positioning. Market Demand Forecasting: Key Terms, Forecasting Tools: Short term tools: Moving average and Exponential smoothing methods, Long-term forecasting Tools: Time series analysis, Econometrics methods, Qualitative tools : Buying Intention Survey, Sales Force Opinion and Delphi Techniques.

Product Planning: Product Life Cycle, New Product Development Process, Branding Strategy, Positioning a Brand, Brand Equity, Packaging and Labeling, Product-mix and Product Line, Planned Obsolescence.

Module III: **(12 Hours)**

Pricing Decision: Objectives and Factors influencing pricing, Pricing method and strategies. Integrated Marketing Communication(IMC)- Concept of IMC, the marketing communication process, Promotion Mix, elements of promotion mix, Direct marketing. Channels of Distributions: Types of intermediaries, functions of distribution channels, channel levels, Designing Distribution Channels, Physical Distribution, Supply Chain Management (Basic only). Trends in Marketing: Green Marketing, Customer Relationship Management, E-marketing, Rural Marketing and Service Marketing (concepts only)

Books:

1. Etzel , Walker ,Stanton and Pandit, Marketing, 14/e, Tata McGraw Hill.
2. Saxena,"Marketing Management" Tata McGraw Hill, 4/e.
3. Grewal, Levy, 'Marketing' Tata McGraw Hill, special Indian edition.
4. Karunakaran "Marketing Management", Himalaya PublishingHouse, 2010/e.
5. Kotler, Keller,Koshy and Jha, "Marketing Management", 13/e, Pearson Education

7th Semester	RGT6A003	Green Technology	L-T-P 3-0-0	3 CREDITS

Module I: (12 Hrs)

Global Warming and its effect:- Introduction and physical definition of global warming, the New Carbon Problem: Accumulation, Long Half-Life, Heating Potential, Carbon Emission Factors, Carbon Absorption in Nature, The Global Emission Situation and its effect in India, The Kyoto and Other Protocols and its view in India, Effect of climate change and its impact. Planning for the Future to reduce global warming:- Steps taken to Control Carbon Emissions universally, Use of Promotional and Punitive Mechanisms for Reducing Carbon in Atmosphere, The General Approach in Planning for the Future, Developing Countrywide Adaptive Measures for Safety of Local People, Developing Mitigative Measures for Global Reduction of Carbon, India's National Action Plan on Climate Change (NAPCC) till date, National Mission for a Green India, The MRV Debate.

Module II: (8 Hrs)

Opportunities in Control of Carbon Emissions and Accumulation:- Essential Steps for Control of Carbon Emissions and Accumulation, Procedure to develop own Priorities and Business Opportunities in India for control of carbon emissions and accumulation, Needs a Mix of Green and Traditional Power Sources in India, A Logical Approach for Carbon Reduction, Need in India —More Forests, Less Deforestation and payment rates procedure for controlling carbon emissions and its Promotional Mechanisms at India. Green Technologies for Energy Production: - Various Technologies Available for Energy Production, Cost Comparison of a Few Typical Systems for Power Generation, Sources of Energy Production Already in Use, Alternative Methods Ready for Use, Green Technologies Needing some Prior R&D Work.

Module III: (10 Hrs)

Green Technologies for Personal and Citywide Application: - Measures to be taken for Green city, Carbon Emission Reduction at Personal Level, Carbon Emission Reduction at Local Authority and Citywide Level, Carbon Emissions from Imports. Green Technologies for Specific Applications:- Promotion of 'Green' Buildings, Guidelines, The Energy Conservation Building Code (ECBC), Green Hotels and Hospitals, Green Technologies for Transport, Green Roads, Ports and Harbours, Industries, Carbon, Carbon Emissions from a Few Selected Industries in India, The Changing Scenario in Cities, Need for Wider Application to Town Planning and Area Re-Development Projects, 'Green' Infrastructure for Municipal Services, Bringing up Indian Villages, Green Services for Crematoria, Spreading Message to all Stakeholders.

Module IV: (10 Hrs)

Some High-tech Measures for Reducing Carbon Emissions: - Use of Solar Power with Satellite-Based Systems, Use of Carbon Capture and Storage (Sequestration), Microorganisms, A Quick SWOT Analysis.Recommended Plan of Action: - India's National Action Plan Take Us to a Low-Carbon Path, The Missions Help Develop Awareness, few case studies on Projects undertakenby Various Countries, Adaptive Measures Essential for Indian People to Cope with Climate Change

Books

[1] Green Technologies, Soli J. Arceivala, McGraw Hill Education

[2] Green Technologies and Environmental Sustainability edited by Ritu Singh, Sanjeev Kumar

Digital Learning Resources:

Course Name: Sustainable Materials and Green Buildings

Course Link:https://nptel.ac.in/courses/105/102/105102195/

Course Instructor:Dr. B. Bhattacharjee, IIT Delhi

7^{th} Semester	RIS7B001	Industrial Safety Engineering	L-T-P 3-0-0	3 CREDITS

Module-I: **(7 hours)**

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment
and methods.

Module-II **(7 hours)**

Fundamentals of maintenance engineering: Definition and aim of maintenanceengineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Module-III:(7 hours)

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Module-IV: **(7 hours)**

Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of faultfinding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Module-V: **(8 hours)**

Periodic and preventive maintenance: Periodic inspection-concept and need,degreasing, cleaning and repairing schemes, overhauling of mechanical components,overhauling of electrical motor, common troubles and remedies of electric motor, repaircomplexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

7th Semester	REV5D004	Disaster Management	L-T-P 3-0-0	3 CREDITS

Module I **(12 hr)**

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

Module II **(6 hr)**

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

Module III **(6 hr)**

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

Module IV **(12 hr)**

Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

Books

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.

3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.

2. National Disaster Management Plan, Ministry of Home affairs, Government of India

http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf

7^{th} Semester	RIP7E002	Intellectual Property Right	L-T-P 3-0-0	3 Credits

MODULE-I (12Hours)

Introduction: Intellectual property: meaning, nature and significance, need for intellectual property Right (IPR), IPR in India – Genesis and development, IPR in abroad, Examples: - Biotechnology Research and Intellectual Property Rights Management. What is a patent, what can be protected by a patent, why should I apply for a patent? Patent Law, Patentability requirements, non-Patentable subject matters, Layout of the Patents. Procedure for domestic and international filing of applications, Restoration, Surrender and Revocations of Patents, Rights of Patentee and Working of Patent, Licensing and Enforcing Intellectual Property.

MODULE-II (10Hours)

Copyrights: Copyright: meaning, scope; What is covered by copyright? How long does copyright last? Why protects copyright? Related rights, Rights covered by copyright. Ownership: Duration, Division, Transfer and Termination of Transfers.

MODULE-III (10Hours)

Infringement and Remedies: Literal and non-literal infringement, Role of claims, Doctrines on infringement: Equivalent doctrine, Pith and Marrow doctrine, Comparative test. Defences: Gillette Defence, General grounds, Patents granted with conditions, Parallel import. Remedies: Civil, Administrative.

MODULE-IV (08Hours)

State Law: Trade Secret, Contract, Misappropriation, Right of Publicity Trademarks, Trade Secret - Overview, Requirements, Misappropriation of Trade Secret, Departing Employees, Remedies, Criminal Liability, Misappropriation, Clickwrap Agreements, Idea Submissions; Right of Publicity, Federal Pre-emption, Review.

Books:

[1] W. R. Cornish and D. Llewellyn, Intellectual Property: Patents, Copyrights, Trade Marks and Allied Rights, Sweet & Maxwell.
[2] Lionel Bently and Brad Sherman, Intellectual Property Law, Oxford University Press.
[3] P. Narayanan, Intellectual Property Law, Eastern Law House
[4] B. L. Wadehra, Law Relating to Intellectual Property, Universal Law Publishing Co.
[5] V. K. Ahuja, Law Relating to Intellectual Property Rights, LexisNexis
[6] AjitParulekar and Sarita D'Souza, Indian Patents Law – Legal & Business Implications;Macmillan India ltd, 2006
[7] P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

7^{th} Semester	RAE6G001	Finite Element Method	L-T-P 3-0-0	3 Credits

Module – I INTRODUCTION

Review of basic approximate methods of analyses – Stiffness and Flexibility matrix for simple cases – Governing equation and convergence criteria of finite element method.

Module – II DISCRETE ELEMENTS

Bar, Frame, beam elements – Application to static, dynamic analysis.

Module – III CONTINUUM ELEMENTS

Various types of 2-D-elements Application to plane stress, plane strain and axisymmetric problems.

Module – IV ISOPARAMETRIC ELEMENTS

Applications to two and three-dimensional problems(four, eight and nine nodded element), Numerical Integration

Module – V FIELD PROBLEM

Applications to other field problems like heat transfer and fluid flow.

Books

1. Tirupathi.R.C and Ashok D.B, "Introduction to Finite Elements in Engineering", Prentice Hall India, Third Edition, 2003.

2. Reddy J.N. "An Introduction to Finite Element Method", McGraw-Hill, 2000.

3. Krishnamurthy, C.S., "Finite Element Analysis", Tata McGraw-Hill, 2000.

4. Bathe, K.J. and Wilson, E.L., "Numerical Methods in Finite Elements Analysis", Prentice Hall of India, 1985.

7th Semester	RCS7D007	Soft Computing	L-T-P 3-0-0	3 Credits

Module I: **(14 Hrs)**

Basic tools of soft Computing: Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non - linear Error surface and optimization

Fuzzy Logic Systems: Basics of fuzzy logic theory, Crisp and fuzzy sets; Basic set operations; Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference; Defuzzification; Fuzzy logic control; Mamdani and Takagi and Sugeno architectures. Applications to pattern recognition.

Module II: **(14 Hrs)**

Neural networks: Single layer networks, Perceptron; Activation functions; Adaline- its training and capabilities, weights learning, Multilayer perceptrons; error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm, Kohenen self - organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information; systems (ANFIS).

Module III: **(8 Hrs)**

Evolutionary Computing: Genetic algorithms: Basic concepts, encoding, fitness function, reproduction. Differences of GA and traditional optimization methods. Basic genetic, basic evolutionary programming concepts Applications, hybrid evolutionary algorithms.

Books:

1. F. O. Karry and C. de Silva, "Soft Computing and Intelligent Systems Design - Theory, Tools and Applications". Pearson Education. (Printed in India).
2. J. S. R. Jang. C. T. Sun and E. Mizutani, "Neuro-fuzzy and soft-computing". PHI Pvt. Ltd., New Delhi.
3. Fredric M. Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGraw Hill.
4. S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India. 4) V. Keeman,"Learning and Soft computing", Pearson Education, India.
5. R. C. Eberhart and Y. Shi, "Computational Intelligence Concepts to Implementation". Morgan Kaufmann Publishers (Indian Reprint).

7^{th} Semester	RIT7D006	E-Commerce and ERP	L-T-P 3-0-0	3 Credits

Module I

Overview of Electronic Commerce, Driving the Electronic Commerce Revolution, The Internet, Portals. Open Systems Inter Connection (OSI) Model, XML, Data Warehousing, BuildingOwnWebSite,InternetSecurity

Module II

E-Commerce and Internet, Electronic Market, Business to Business E-Commerce, Four C`s (Convergence, Collaborative Computing, Content Management and Call Center), Wireless Application Protocol (WAP), Intranet and Extranets. Data Interchange (EDI), Electronic PaymentSystems,E-Security

Module-III

Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to consider in planning designing and implementation of cross functional integrated ERP systems. Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.

Module IV

ERP IMPLEMENTATION: Planning Evaluation and selection of ERP systems, Implementation life cycle - ERP implementation, Methodology, Data Migration, Success and Failure factors of ERP Implementation. Extended ERP systems and ERP add-ons - CRM, SCM, Manufacturing prospective, Business analytics .

Book:

1. E- Commerce and Enterprise Resource Planning; CSV Murthy, HPH
2. Enterprise Resource Planning- Concepts and Practices ; V K Garg and N K Venkatkrishna, PHI
3. Enterprise Resource Planning; AlexixLeon ; TMH

7th Semester	RIK7F001	Essence of Indian Knowledge Tradition - II	L-T-P 3-0-0	0 CREDITS

Course Objectives:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyse it and apply it to their day to day life

Course Outcomes :

At the end of the Course, Student will be able to:

1. Identify the concept of Traditional knowledge and its importance.
2. Explain the need and importance of protecting traditional knowledge.
3. IIllustrate the various enactments related to the protection of traditional knowledge.
4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
5. Explain the importance of Traditional knowledge in Agriculture and Medicine.

Module-1:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

Module-2:

Protection of traditional knowledge:The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Module-3:

Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

Module-4:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

Module-5:

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their

food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino.

Digital Learning Resources:

Course Name:	Ayurvedic Inheritance of India
Course Link:	https://nptel.ac.in/courses/121/106/121106003/
Course Instructor:	Dr M. S. Valiathan, IIT, Madras

https://www.youtube.com/watch?v=LZP1StpYEPM

EIGHTH SEMESTER(COMMON TO ALL BRANCHES OF B.Tech)							
Theory							
Sl No	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**	**University Marks**	**Internal Evaluation**
-	-	-	-		0		
				Total Credit (Theory)	**0**		
				Total Marks			
				Practical			
1	PSI	RMP8H201	Major Project / Internship	0-0-12	6		400
				Total Credit (Practical)	**6**		
				Total Semester Credit	**6**		
				Total Marks			**400**