Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Syllabus for

T.Y.B. Tech.

Civil Engineering (Pattern 2017)

Department of Civil Engineering

Vision:

Excellence in Civil Engineering Education

Mission:

M1: Make competent Civil Engineers with high level of professional, moral and ethical values

M2: Impart highest standards in theoretical as well as practical knowledge and skill set

M3: Establish Center of Excellence in major areas of Civil Engineering to respond to the current and future needs of the industry, higher studies as well as research

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1: Graduates will have successful career in the field of Civil Engineering

PEO 2: Graduates will respond to growing demands of society through professional and ethical practices

PEO 3: Graduates will pursue lifelong learning including higher studies in the field of Civil Engineering

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO):

PSO1: Engineering graduates will be able to plan and execute various activities on construction projects.

PSO2: Engineering graduates will be able to analyze and design components of civil engineering systems

Department of Civil Engineering

Third Year B. Tech. Civil Engineering (TYBT) - Semester V (Pattern 2017)

Course Code	Course	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
						Formative Assessment			Summative Assessment			
						ISE		CE	ESE	PR/ OR		
			L	T	P	T1	T2					
CVUA31171	Fluid Mechanics - II*	TH	3	-	-	15	15	20	50	-	100	3
CVUA31172	Environmental Engineering-I*	TH	3	-	-	15	15	20	50	-	100	3
CVUA31173	Design of Structures – I*	TH	3	-	-	15	15	20	50	-	100	3
CVUA31174	Foundation Engineering	TH	3	-	-	15	15	20	50	-	100	3
IE31175	Interdisciplinary Elective - I	TH	3	-	-	15	15	20	50	-	100	3
CVUA31176	Lab. Practice - III	CE-PR/OR	-	-	6	-	-	50	-	50	100	3
CVUA31177	Employability Skills (Building Design and Drawing)	CE	2	-	2	-	-	50	-	-	50	3
CVUA31178	Mini Project	CE	–	1	2	-	-	50	-	-	50	2
A3	Audit Course	-	-	-	-	-	-	-	-	-	-	-
	Total	-	**17**	**1**	**10**	**75**	**75**	**250**	**250**	**50**	**700**	**23**

Theory: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, #1 hr. = 1 Credit, Audit Course: No Credits
*Courses have lab practice component of 2 hrs. /week each under Lab Practice head.

Interdisciplinary Elective - I

IE31175CS: Internet of Things
IE31175ET: Industrial Automation
IE31175ME: Product Design Engineering
IE31175CV: Optimization Techniques
IE31175IT: Human Computer Interaction

Department of Civil Engineering

Third Year B. Tech. Civil Engineering (TYBT) - Semester VI (Pattern 2017)

Course Code	Course	Course Type	Teaching Scheme			Examination Scheme					Total	Credits
						Formative Assessment			Summative Assessment			
			L	T	P	ISE T1	ISE T2	CE	ESE	PR/ OR		
CVUA32171	Environmental Engineering – II*	TH	3	-	-	15	15	20	50	-	100	3
CVUA32172	Water Resources Engineering*	TH	3	-	-	15	15	20	50	-	100	3
CVUA32173	Elective II*	TH	3	-	-	15	15	20	50	-	100	3
CVUA32174	Lab. Practice IV	CE-PR/OR	-	-	6	-	-	50	-	50	100	3
CVUA32175A/ CVUA32175B	Internship / Value Added Courses	CE-PR/OR	0/ 4	-	16/ 8	-	-	50	-	50	100	8
A3	Audit Course	AU	-	-	-	-	-	-	-	-	-	-
	Total	-	**9/ 13**	-	**22/ 14**	**45**	**45**	**160**	**150**	**100**	**500**	**20**

Value added course (Theory 60 Hrs. and Practical 120 Hrs.) will have 4 Hrs. Theory/Week and 8 Hrs. Practical/Week. Students those who will register for Value added course will earn the required credits in the regular semester. However, Students who will register for internship, commencement of internship will start from 1st June and will be of Eight weeks (June-July). However, students will be encouraged to register for both the Value Added Course and Internship. In that case, two courses; Elective-IV (Final Year B.Tech., Semester-I) and Open elective (Final Year B.Tech., Semester-II) will wave off to compensate the additional eight credits earned by the student for value added course and Internship at Third Year B.Tech. (Semester-II).

Theory: 1Hr. = 1 Credit, Practical: 2 Hrs. = 1 Credit, #1 hr. = 1 Credit, Audit Course: No Credits
*Courses have lab practice component of 2 hrs./week each under Lab Practice head.

Elective II

CVUA32173A: Advanced Concrete Technology
CVUA32173B: Construction Management
CVUA32173C: Urban Planning

Value Added Courses

CVUA32175B1: Green and Energy Efficient Building Technology
CVUA32175B2: Mechanical Electrical and Plumbing Engineering System

IE32175B1: General Studies for Indian Services and National Service Scheme
IE32175B2: Social Enterprise and Entrepreneurship
IE32175B3: National Service Scheme and Social Entrepreneurship

BOS Chairman Dean Academics Director

Semester – I

Fluid Mechanics – II (CVUA31171)

Teaching Scheme
Credits: 3
Lectures: 3 hrs./ week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Course Objectives:

- To apply principles learnt in Fluid Mechanics I to various applications like flow around submerged bodies, unsteady flow, open channel flow, hydraulic machines.

Course Outcomes: At the end of the course the students will be able to:

1. **Determine** drag, lift forces on submerged bodies and solve unsteady flow problems of time of emptying a tank, water hammer.
2. **Apply** Manning's and Chezy's equation for uniform flow computations and **design** hydraulically most efficient channel section for uniform flow.
3. **Determine** depth energy relationship using sp. Energy, sp. Force, critical flow concepts and **compute** the sequent depth ratio, energy loss in a hydraulic jump occurring in horizontal rectangular channel.
4. **Classify** the water surface profiles and solve dynamic equation of GVF using direct step method.
5. **Determine** impact of jet on flat plates, curved vanes and **understand** working of centrifugal pump.
6. **Understand** working of Pelton wheel, Francis's turbine and **design** the Pelton wheel turbine

Unit I - Fluid Flow around Submerged Objects& Unsteady Flow

Fluid Flow around Submerged Objects: Definitions and expressions for drag, lift, drag coefficient, lift coefficient, Types of drag, drag on sphere, cylinder, flat plate and Aerofoil, Karman's vortex street, Development of lift on cylinder (Magnus effect) and Aerofoil, Induced drag on Aerofoil, Polar diagram.
Unsteady Flow: Flow through orifice under varying head, Fluid compressibility, Celerity of elastic pressure wave through fluid medium; Water hammer phenomenon.

Unit II– Uniform flow in Open Channels

Classification of channels and Channel flows, Basic governing equations of Channel flow One dimensional approach, Geometric elements of channel, Velocity distribution in open channel flow, uniform flow formulae viz., Chezy's formula, Manning's formula, Factors affecting Manning's roughness coefficient, Uniform flow computations, Most efficient channel section.

Unit III- Critical flow in Open Channels

Specific energy, Specific force, Critical depth, Conditions for occurrence of critical flow; Froude's number, critical flow, Critical flow computations, channel transitions, Phenomenon of hydraulic jump, Application of momentum equation to hydraulic jump in rectangular channel Energy dissipation in hydraulic jump, Practical uses of hydraulic jump.

Unit IV– Gradually Varied flow

Basic Assumptions of GVF; Differential equation of GVF - Alternative forms; Classification of channel bed slopes, Various GVF profiles, their general characteristics and examples of their occurrence; Control section. Gradually varied flow computations: Direct Step method, Graphical Integration method,

Standard Step method, Ven-Te Chow method.
Unit V: Impact of jet and Centrifugal pump
a) Impact of Jet: Force and work done due to impact of jet on stationary and moving, flat andcurved surfaces using linear momentum principle. b) Centrifugal Pumps: General Classification, theory, working, Work done by impeller, Heads and efficiencies, minimum starting speed, Cavitation in centrifugal pumps, multistage pumping.
Unit VI: Hydraulic turbines
Elements of hydropower plant; hydraulic turbines- Classification, heads and efficiencies, Design and governing of Pelton Wheel, Francis turbine-parts and working, Cavitation in hydraulic turbines, Performance of hydraulic turbines, Prediction of performance in terms of unit quantities and specific quantities, Specific speed, Characteristic curves, Dimensional analysis as applied to hydraulic turbines, selection of turbines
Text books: 1. Hydraulics and Fluid Mechanics by P. N. Modi and S. N. Seth Standard book house 2. Open Channel Flow by K Subranmanya, TMH, Third Ed 3. Open Channel Flow: K. G. RangaRaju - Tata McGraw Hill.
Reference Books: 1. Engineering Fluid Mechanics by R. J. Garde and A. G. Mirajgaonkar, Scitech Publications, 2003 2. Fluid Mechanics and Machinary by C. S. P. Ojha, R. Berndtsson, P. N. Chandramouli, Oxford University Press, 2010 3. Flow through Open Channels by Rajesh Srivastava, Oxford University Press, 2015

Environmental Engineering - I (CVUA31172)

Teaching Scheme
Credits : 3
Theory: 3 hrs./week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Mark

Course Objectives:

- To prepare students with an ability to understand different water demands and various standards of Water.
- To prepare students with an ability to understand designing of water treatment system and apply same in future.
- To increase the awareness amongst the students for Importance of water& their management.
- To increase the awareness among the students regarding air & noise pollution.

Course Outcomes: At the end of the course the students will be able to:

1. **Analyze** the system for control of particulate matter and gaseous pollution.
2. **Analyze** the solid waste management system
3. **Study** water distribution system.
4. **Design** water treatment process.
5. **Design** of filtration and disinfection process.
6. **Study** advances in water treatment process.

Unit I – Air Pollution & Noise Pollution Control

Ambient air pollution measurement technique, stack sampling. Control of Particulate Matter by ESP, Bag House, Cyclone Separator and gravity settling chamber. Control of gaseous pollution by Absorption, adsorption, catalytic converter and incineration. Measurement of ambient noise level and control technique.

Unit II – Solid Waste & Hazardous waste management

Basic concept in solid waste, population forecasting for city, generation of waste, collection, transfer of solid waste, transportation of solid waste. Characteristics of solid waste.
Disposal of solid waste: Disposal technique such as aerobic, anaerobic, incineration, pyrolysis, power generation etc.
Hazardous waste: Characteristics of hazardous waste, effect on environment. Method of disposal of hazardous waste.

Unit III – Water transportation, distribution and leakage detection system

Water transportation appurtenances such as pipe and its material, pumps design, joints, valve etc. Water distribution system, types of water supply scheme, continuous & intermittent system, their component. Types of ESR structure and design of ESR. Leak detection & maintenance of distribution system.

Unit IV- Water treatment process and its design

Water treatment flow diagram, theory of treatment process for ruler, town and metro city. Water characteristics, Design of aeration, sedimentation & flocculator with all the design criteria. Theory of coagulation and its various types

Unit V - Filtration process & Disinfection

Filtration theory and mechanism, filter material, types of filter (rapid sand filter, slow sand filter, pressure filter, multimedia filter & dual media filter), under drainage system, working and cleaning of filter, Design of rapid sand filter. Methods of disinfection in water, chicks law, calculation of chlorine demand and chlorine dose.

Unit VI- Advanced Water treatment process
Methods water softening methods: lime-soda , Ion exchange & zeolite process. Demineralization of Water: By using methods like R.O. & Electro dialysis. De-fluoridation & fluoridation. Methods for removal of Odour and colour from water. Smart water supply for smart city and SCADA system.
Text books: 1. Water Supply Engg. Vol. -1 By S.K. Garg 2. Environmental Engg. Vol. 2 By S.K. Garg 3. Water Supply Engg. Vol. 1 By B. C. Punmia
Reference books: 1. Water Supply & Sanitary Engg. By G.S. Birdi - Laxmi publications (p) Ltd. New Delhi 2. Water & Waste Water Technology by Mark J. Hammer Prentice – Hall of India, New Delhi 3. Environmental Engineering – H.S. Paeavy & D.R. Rowe Mc Graw Hill Book Co. New Delhi 4. Water & Waste Water Technology G.M. Fair & J.C. Geyer.

Design of Structures I (CVUA31173)

Teaching Scheme

Credits: 3
Lecture: 3 hrs. /week

Examination Scheme

Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Course Objectives:

- To develop the ability to understand the effect of various loads on components of steel structure, the actual behavior of members & connections in steel structures subjected to combination of various loads, basic concepts in design of various steel structural components based on provisions of Indian Standard code.

Course Outcomes: At the end of the course the students will be able to:

1. **Understand** the composite action of reinforced concrete, design philosophies and explain the behavior of reinforced concrete section under flexure.
2. **Analyze and design** singly, doubly and flanged reinforced concrete section subjected to flexure using Limit State Method as per guidelines given in Indian Standard Code.
3. **Analyze and design** reinforced concrete section subjected to shear, torsion and bond using Limit State Method as per guidelines given in Indian Standard Code
4. **Design** one way and two way reinforced concrete slabs and dog legged staircase using Limit State Method as per guidelines given in Indian Standard Code
5. **Design** reinforced concrete short column and isolated column footing subjected to gravity loads using Limit State Method as per guidelines given in Indian Standard Code.
6. **Understand** basic concepts, prestressing systems, applications, prestress losses of prestressed concrete section and **calculate** the resultant stress in prestressed concrete section subjected to flexure using stress concept at transfer of prestressing force and at service condition
7. **Demonstrate** the ability to develop structural drawings for R.C.C. framed structure using modern engineering tools individually and / or through teamwork.

Unit I – Introduction to Steel Structures and Plastic Theory

Introduction to Steel Structures & their types, Role of the designer, Advantages of structural steel, Types/grades of structural steel, Mechanical properties of steel, various rolled steel sections (Angle, Channel, I – s/n,) relevant IS specifications such as IS:800-2007, IS:808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6), IS:4000-1992. Philosophy of limit state design for strength and serviceability (Including introduction to working stress method, Ultimate Load Method), partial safety factor for load and resistance. Introduction to plastic theory: Plastic hinge concept, plastic collapse load, plastic moment, shape factor, plastic section modulus, plastic analysis of beams. Classification of cross section such as plastic, compact, semi-compact and slender.

Unit II - Design of Connections

Bolted Connections: Types/grades of bolts, Behavior of bolted joints, Strength of joint/connection, efficiency of joint, Design of bolted connections subjected to tension, compression and moment.

Welded Connections: Types & properties of welds, Types of welds, codes for welded connections, Design of welded connections subjected to tension, compression and moment.

Unit III – Design of Tension members

Types of loads acting on industrial structures, Introduction to IS Codes & specifications: IS 875 (part –I, II & III) , assessment of dead load, live load and wind load for roof truss as per IS 875 (part –I, II & III), various design load combinations, analysis of truss.
Tension members: Behavior, Modes of failures, various cross sections such as solid threaded rod, cable and angle sections. Limit strength due to yielding, rupture and block shear. Design of tension member: using single and double angle sections, connections of member with gusset plate by bolts and welds (example of design of tension member of truss is preferred).

Unit IV – Design of Compression members

Compression members: Behavior, Modes of failures, Buckling classification as per geometry of cross section, buckling curves, design of struts in trusses using single and double angle section, connections of members with gusset plate by bolts and welds (example of design of compression member of truss is preferred).

Unit V – Design of Beams

Design of Beams - laterally supported, Simply supported beams using single rolled steel section with and without flange plate, curtailment of flange plates, strength in flexure, low and high shear, check for web buckling, web crippling and deflection, Design of purlin, Concept of plate girder.
Design of Beams - laterally unsupported, Simply supported beams using single rolled steel section with and without flange plate, curtailment of flange plates, strength in flexure, low and high shear, check for web buckling, web crippling and deflection, Concept of gantry girder.

Unit VI – Design of Columns and Footings

Design of columns subjected to axial load using rolled steel section. Design of eccentrically loaded column providing uniaxial and biaxial bending (check for section strength only), Design of built-up column with lacing and battening, connection of lacing/battening with main components by bolts and welds.
Design of column bases: Design of slab base, gusseted base and moment resistant base (axial load and uni-axial bending).

Text Books :

1. Limit state design in Structural Steel by M.R. Shiyekar, PHI, Delhi
2. Limit state design of steel structures by S K Duggal, Tata McGraw Hill Education, New Delhi.
3. Fundamentals of structural steel design M L Gambhir, Tata McGraw Hill Education Private limited, New Delhi.

Reference Books :

1. Design of Steel Structure by N Subramanian, Oxford University Press, New Delhi.
2. Structural Design in Steel—Sarwar Alam Raz—New Age International Publishers
3. Analysis and Design: Practice of Steel Structures—Karuna Ghosh-- PHI Learning Pvt. Ltd. Delhi
4. Design of Steel Structures by K S Sai Ram, Pearson, New Delhi.
5. Limit state design of Steel Structure by Ramchandra & Gehlot, Scientific Publishers, Pune.
6. Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti S. S. I K International Publishing House, New Delhi

Foundation Engineering (CVUA31174)

Teaching Scheme
Credits : 3
Lectures : 3 hrs./week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- To inculcate necessary geotechnical engineering skills to analyze and design shallow and deep foundation systems under different loading and soil conditions.

Course Outcomes: At the end of the course the students will be able to:

1. Describe field tests on soil and interpret the data
2. Determine bearing capacity of the soil for design of shallow foundation
3. Explain consolidation process in soil and calculate consolidation settlement by using data of consolidation test
4. Analyze and design pile foundation using field and laboratory data
5. Describe coffer dams and identify properties of problematic black cotton soil
6. Explain the mechanism of soil reinforcement and effect of ground motion on foundation design

Unit I - Subsurface investigations for foundation

Purpose, Objectives and planning of subsurface exploration. Methods of Investigation: Trial pits, borings, depth & number of exploration holes, core recovery, RQD, Core Log. Geophysical methods. Disturbed and undisturbed sampling, types of samplers, degree of disturbance of a sampler. Field tests - SPT, DCPT, SCPT and Pressure meter test. (Site Visit SPT)

Unit II - Bearing capacity of Shallow Foundation

Basic definitions, Modes of shear failure, Bearing capacity analysis- Terzaghi's, Hanson's, Meyerhof's, Skempton's and Vesics equations. IS code method - Rectangular and Circular Footings. Bearing Capacity evaluation- Plate Load Test and SPT, Housel's perimeter shear concept. Bearing capacity of layered soil. Effect of water table on bearing capacity. Effect of eccentricity. Presumptive bearingcapacity. (Site Visit - Plate Load Test)

Unit III – Settlement and Consolidation

Introduction to concept of settlement Causes of settlement. Contact pressure. Allowable settlement, Differential settlement - I.S. criteria, Types - Elastic settlement, consolidation settlement. Use of Plate load test and SPT in settlement analysis.
Introduction to concept of consolidation, spring analogy, Terzaghi's consolidation theory, Laboratory consolidation test, Determination of coefficient of consolidation- Square root of time fitting method and logarithm of time fitting method. Time factor. Introduction of Normal consolidation, Over consolidation and Pre-consolidation pressure.

Unit IV - Deep Foundations

Introduction, Pile classification, Pile installation techniques. Load carrying capacity of pile by static method, Dynamic methods-Engineering news formula and Modified ENR formula. Pile load test and Cyclic Pile load test. Group action-Field rule, Rigid block method. Negative skin friction. Settlement of pile group incohesive soil by approximate method. Piers and Caissons- Definition, Types and uses. Well foundation: components, sand island method.

Unit V - Cofferdams and Foundation on Black Cotton Soils.
Types of sheet Piles, Cofferdam uses and features. Characteristics of black cotton soil, swelling potential and its evaluation methods, Engineering problems, Swelling pressure measurement, Foundations on black cotton soil: design principles, Construction techniques in B.C soils, under reamed piles- Design principles and its construction Techniques. Stone columns, prefabricated vertical drains, preloading technique, and vibroflotation technique.
Unit VI - Soil Reinforcement and Earthquake Geotechnics.
Basic components and Mechanism of reinforced soil. Geosynthetics: type's, functional properties and requirements. Geosynthetics applications in Civil Engineering. Earthquake Terminology, Sources of earthquakes. Seismic waves, Location of earthquakes, Size of earthquake, Characteristics of Strong ground motion, Seismic hazards- liquefaction, Effect of liquefaction, Evaluation of liquefaction susceptibility, liquefaction hazard mitigation. (Site Visit Reinforced Earth Wall)
Text books: 1. Soil Mechanics and Foundation Engineering by Dr. B .C. Punmia, Laxmi Publications 2. Dr. B. J. Kasmalkar, "Foundation Engineering", Pune Vidyarthi Griha Prakashan, Pune 3. Principles of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, UBS Publishers
Reference books: 1. Soil Mechanics—T. William Lambe--Wiley 2. J. E. Bowels, "Foundation Analysis and Design", McGraw-Hill 3. Foundation Engineering—P. C. Varghese--- PHI Learning Pvt. Ltd. 4. Soil Mechanics and Foundation Engineering- V. N. S Murthy, Marcel Dekker, Inc. Newyork.. 5. Soil Mechanics & Foundation Engineering—Rao--Wiley 6. A. K. Arora, " Soil Mechanics and Foundation Engineering", Standard Publishers,2009. 7. Engineering in Rocks for Slopes. Foundations and Tunnels—T Ramamurthy—PHI Learning 8. Geotechnical Engineering by Conduto, PHI, New Delhi. 9. Foundation Design Manual: N V Nayak, Dhanpat Rai Publications. 10. International Steven Kramer, "Geotechnical Earthquake Engineering", Prentice Hall Publications. 11. Practical Handbook of Grouting : Soil-Rock and Structures---James Warner--Wiley

Interdisciplinary Elective - I

Optimization Techniques (CVUA31175A)

Teaching Scheme
Credits: 3
Lectures: 3 hrs./ week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Course Objectives:

- To introduce students to optimization techniques and applications of same in Civil Engineering.
- To impart the knowledge of different Stochastic Methods of optimization
- To equip the students with advance Linear Programming techniques.
- To impart the knowledge of Non-Linear Programming through unconstrained optimization techniques.
- To make students aware of dynamic programming.

Course Outcomes: At the end of the course the students will be able to:

1. **Understand** basics of optimization Techniques, perform graphical method for Linear programming and solve problems on convex and concave function.
2. **Solve** queuing problems using (M/M/1): (FCFS//) model, perform Monte Carlo simulation and sequencing of n jobs over 2,3 m machine
3. **Solve** transportation and assignments problems using linear programming techniques
4. **Utilize** simplex, Big M, two phase and duality methods to solve linear programming problems
5. **Implement** Dichotomous, Fibonacci, Golden section methods to solve unconstrained nonlinear univariate problems, gradient techniques for Multivariate problems and Lagrange Multiplier Techniques for constrained optimization problems.
6. **Use** dynamic programming to solve multistage decision processes, propose best strategy using Games theory and implement replacement models for items whose maintenance and repair cost increase with time

Unit I – Introduction of systems approach

Introduction to System approach, Operations Research and Optimization Techniques, Applications of systems approach in Civil Engineering.
Introduction to Linear and Nonlinear programming methods (with reference to objective function, constraints), Graphical solutions to LP problems.
Local & Global optima, unimodal function, convex and concave function.

Unit II – Stochastic Programming

Sequencing– n jobs through 2, 3 and M machines.
Queuing Theory: elements of Queuing system and it's operating characteristics, waiting time and ideal time costs, Kendall's notation, classification of Queuing models, single channel Queuing theory: Model I (Single channel Poisson Arrival with exponential services times, Infinite population (M/M/1): (FCFS/ /).
Simulation: Monte Carlo Simulation.

Unit III –Linear programming (A)

The Transportation Model and its variants.
Assignment Model, and its variants.

Unit IV– Linear programming (B)

Formulation of Linear optimization models for Civil engineering applications. The simplex method.

Method of Big M, Two phase method, duality.
Unit V– Nonlinear programming
Single variable unconstrained optimization: Sequential Search Techniques-Dichotomous, Fibonacci, Golden section. Multivariable optimization without constraints-The gradient vector and Hessian Matrix, Gradient techniques, steepest ascent/decent technique, Newton's Method. Multivariable optimization with equality constraints - Lagrange Multiplier Technique.
Unit VI – Dynamic programming, Games Theory & Replacement Model
Multi stage decision processes, Principle of optimality, recursive equation, Applications of D. P. Games Theory – 2 persons games theory, various definitions, application of games theory to construction Management. Replacement of items whose maintenance and repair cost increase with time, ignoring time value of money.
Text books: **1.** Operations Research by Premkumar Gupta and D.S.Hira, S. Chand Publications (2014). **2.** Engineering Optimization: Methods and Application-- A. Ravindran, K. M. Ragsdell— Wiley India. **3.** Engineering Optimization by S. S. Rao. **4.** Operations Research by Hamdy A. Taha. **5.** Quantitative Techniques in Management by N.D. Vohra (Mc Graw Hill) . **6.** Operations Research by Pannerselvam, PHI publications.
Reference books: 1. Topics in Management Science by Robert E. Markland(Wiley Publication). 2. An Approach to Teaching Civil Engineering System by Paul J. Ossenbruggen. 3. A System Approach to Civil Engineering Planning & Design by Thomas K. Jewell (Harper Row Publishers).
e – Resources: 1. Mathematical Model for Optimization (MMO Software). 2. nptel.iitm.ac.in/courses/webcourse-contents/IISc-Bang/OPTIMISATION METHODS/Newindex1. html.

Industrial Automation (ETUA31175A)

Teaching Scheme
Credits: 3
Lectures: 3 hrs./ week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Course Objectives:

- To give the students a comprehension of Industrial Instrumentation Design.
- To give the students a comprehension of the relation between Instrumentation and controller design in industrial applications.
- To make the students able to analyze the control loops and to achieve the control actions with different Controllers

Course Outcomes: At the end of the course the students will be able to:

- Select an appropriate sensor or transducer to meet requirements of an industrial application.
- Select and design a signal conditioning circuit for given application based on applied sensing method.
- Design a data acquisition system using various Bus standards and communication Protocols.
- Choose different final control elements and Actuators.
- Design Industrial solutions for complex engineering problems using Programmable Logic controllers.
- Understand Advanced systems in Industrial automations.

Unit I: Sensors and Transducers

Performance terminology - Displacement, Velocity and Motion sensors - Proximity sensors, Force, Pressure, Flow, Level and Temperature sensors – Humidity, pH and Conductivity sensors – Specifications and selection criteria – Inputting data by switches

Unit II: Transmitters, Signal conditioning and Converters

Analog signal conditioning for different sensors – Use of bridge circuits and Instrumentation amplifiers – Design guidelines – Signal converters V/I, I/V, V/F, F/V, I/P & P/I converters – Evolution of two wire transmitters – Isolated two wire transmitters – Smart and Intelligent transmitters

Unit III: Data Acquisition, Bus Standards and Protocols

Multichannel data logging and computer-based data acquisition system like LABVIEW, – RS 232C standard, IEEE 488 bus, I2C bus, HART protocols – Foundation Field bus and Profibus

Unit IV: Actuators and Final Control elements

Pneumatic and hydraulic actuators- Directional control valves, Pressure control valves, Cylinders, Process control valves - Electrical actuators- Mechanical switches, Solid state switches, Solenoids, DC motors, AC motors and Stepper motors.

Unit V: Programmable Logic Controllers, Applications and Interfacing

PLC Architecture – Input / Output processing – Interfacing of Input / Output devices with PLC – Analog Input / Output - Ladder logic programming – Selection of PLC – PLC based automated systems.

Unit VI: Advances in Industrial Automations

Direct digital control systems, Distributed control systems (DCS): Introduction, DCS flow sheet symbols, architecture of DCS controller, DCS communication, DCS supervisory computer tasks, Features and advantages of DCS. Supervisory control and Data acquisition (SCADA): SCADA introduction, elements of SCADA, Features of SCADA.

Text Books:

1. K. Krishna Swamy, "Process Control"; New Age International Publishers.
2. C.S. Rangan, G.R. Sarma, V.S.V. Mani; "Instrumentation Devices and Systems"; Tata McGraw Hill; 2nd Edition
3. W. Bolton; "Mechatronics, Electronic Control Systems in Mechanical and Electrical Engineering"; Pearson Education; 3rd Edition

Reference Books:

1. Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, Pearson Education.
2. Ernest O. Doebelin; "Measurement System Application and Design"; Mc-Graw Hill; 5th Edition
3. David G. Alciatore, Michael B Histand; "Introduction to Mechatronics and Measurement System"; Tata McGraw Hill

Internet of Things (CSUA31175)

Teaching Scheme
Credits: 3
Lectures: 3 hrs./ week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Course Objectives:

- To understand fundamentals of IoT
- To understand Building Blocks of Iot and apply the knowledge for implementing small IoT systems
- To gain knowledge of IoT proctools
- To understand fundamentals of security in IoT
- To learn how secure infrastructure for IoT is implemented
- To learn real world application scenarios of IoT along with its societal and economic impact using case studies

Course Outcomes: At the end of the course the students will be able to:

1. Understand the fundamental of IoT
2. Understand Building Blocks of IoT & Implement small IoT Systems
3. Learn the IoT protocols
4. Understand the security issues in IoT
5. Learn the concepts of Cloud & Fog Computing
6. Know the real-world applications of IoT

Unit I: Introduction to IoT

IoT: Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications.

Unit II: IoT & M2M

Machine to Machine, Difference between IoT and M2M, Software define Network, Software define Network for IoT, IoT Physical Devices and Endpoints: Basic building blocks of and IoT device, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino Introduction to Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Beagle board and Other IoT Devices.

Unit III: Protocols for IoT

Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE 802.15.4,BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer

Unit IV: Security in IoT

IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modeling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non-repudiation and availability, Security model for IoT.

Unit V: Cloud Computing and Fog Computing

Introduction to Cloud Computing, Cloud of Things: Grid/SOA and Cloud Computing, Cloud Middle ware, Cloud Standards – Cloud Providers and Systems, Mobile Cloud Computing, The Cloud of Things

Architecture. Challenges and issues in cloud Computing. Fog Computing, Need of Fog computing, Fog Computing Architecture.
Unit VI: IoT Case Studies
Case Studies: Home Intrusion Detection, Weather Monitoring, System, Air Pollution Monitoring, Smart Irrigation, Smart cities, Health Care.
Text Books: 1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515 2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012. ISBN : 9781439892992 3. Dieter Uckelmann, Mark Harrison, Florian Michahelles, "Architecting the Internet of Things", Springer, 2011. ISBN: 978-3-642-19156-5
Reference Books: 1. Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2012, 9781119958345 2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012, ISBN:978-1-119-99435-0 3. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010. ISBN: 978-0-470-90356-8 4. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014, ISBN: 978-1-118-43063-7

Product Design Engineering (IOEP21182A)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Course objectives:

- To understand basic techniques for particular phases of product development
- Make and manage design teams for product development in a company.

Course Outcomes:

Upon completion of this course, the student will be able to:

1. Describe an engineering design and development process
2. Employ engineering, scientific, and mathematical principles to execute a design from concept to finished product
3. Create 3D solid models of mechanical components from the perspective of aesthetic, ergonomic and functional requirement using CAD software
4. Work collaboratively on a team.
5. Create new product based on mechanical design engineering.
6. Investigate contemporary issues and their impact on provided solution.

Unit I – Introduction to Product Design

Characteristics of Successful Product Development, Innovative Thinking, Challenges to Product Development, Product Development Process, Concept Development, Economics – Cost Vs Performance, Design Considerations

Unit II – Product Development Process

Product development process- Identification of customer needs- customer requirements, product development process flows. Product specifications and concept generation, concept selection, concept screening, concept testing, reverse engineering, product architecture

Unit III –Product Design Tools

Creativity and Problem Solving –Creativity methods-Theory of Inventive Problem Solving (TRIZ), Product function tree, Life cycle analysis, Quality Function Deployment, Competing Product Analysis, SWOT analysis, Failure Mode Effect Analysis.

Unit IV – Design for Manufacture and Assembly

Design for assembly, design for disassembly, design for environment, design for graphics and packaging

Unit V– Rapid Prototyping

Understanding Prototypes, Principles of Prototyping, Prototyping Technologies, Planning for Prototypes

Unit-VI: Product Testing and Validation

Time value of Money, Analytical technique, Product and Process, Evaluation of component, subassembly,

assembly, Reliability Goals, Computer simulations and Bench test results, Comprehensive test plans and reports.

Text Books:

1. Product Design-Techniques in Reverse Engineering and New Product Development, Kevin Otto, Kristion Wood, Pearson Education, ISBN 978-81-7758-821-7.
2. Karl T.U. And Steven D.E., Product Design and Development, McGraw Hill, Ed 2000.

Reference Books :

1. Dieter GE, Engineering Design-Material and Processing Approach, McGraw Hill, Ed 2000

Lab Practice- III (CVUA31176)

Teaching Scheme
Credits: 3
Practical: 6 hrs./week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- To determine flow parameters like Reynold's number, drag, lift, velocity, discharge, coefficient of impact, efficiency of hydraulic machines.
- To analyze water quality.
- The practical sessions will help the students to develop the detailed drawing skills and to acquire practical knowledge of design and drafting of various structural components with the oral and written communication skills.

Course Outcomes: At the end of the course the students will be able to:

1. **Determine** the drag, lift around submerged bodies, impact of jet on flat plate and curved vane as well as efficiency of pump and turbine.
2. **Analyze** uniform flow, varied flow in an open channel
3. **Analyze** water sample.
4. **Design** water treatment plant units.
5. **Design** industrial building as a whole including truss, purlins, columns and footings
6. **Demonstrate** the ability to develop structural drawings for steel structure using modern engineering tools individually and / or through a teamwork.

Unit 1 - Fluid Mechanics II

List of Practicals to be performed: (any 8 + Virtual Lab)

1. Flow around a Circular Cylinder
2. Flow around an airfoil
3. Study of Uniform Flow Formulae of Open channel.
4. Velocity Distribution in Open Channel Flow.
5. Calibration of Standing Wave Flume / Venturi flume
6. Study of Hydraulic Jump as Energy Dissipater
7. Study of flow over hump
8. Graphical determination of loss of energy in hydraulic jump
9. Solving GVF problem using Excel
10. Flow over Broad Crested Weir
11. Calibration of V-Notch
12. Virtual lab

Unit II – Environmental Engineering I

List of Experiments- (Any 8 + Virtual Lab)

1. Determination of pH and alkanity from water.
2. Determination of Hardness from water.
3. Determination of chlorides from water.
4. Determination of optimum dose of alum.
5. Determination of chlorine dose and chlorine demand.

6. Determination of Iron or Manganese from water.
7. Determination of ambient PM10 and Noise level.
8. Determination of fluoride from water.
9 Design of 1MLD WTP in spread sheet or any software.

List of Assignments:

1. Study of Plumbing fixture and accessories.
2. SWM Rule 2016 technical note.
3. Types of intake structure.
4. Automation in water supply system.

Design of Structures – I

Term work will consists of the following.

A) Four full imperial size drawing sheet showing structural detailing of 16 sketches based on syllabus. (Any one sheet using suitable software and remaining three sheets Hand drawn)

B) Design of industrial building including roof truss, purlin, bracings, column, column base and connections.

Three full imperial size drawing sheets. (Any one sheet using suitable software and remaining t sheets Hand drawn)OR

B) Design of building including primary and secondary beams, column, column base and connections. One full imperial size drawing sheets. (Using suitable software)

C) Two site visits: Report should contain structural details with sketches.

Oral Examination shall be based on the above term work.

Note: 1. Maximum number of students in a group, if any, should not be more than three to five for the term work design assignments.
2. Draw any one sheet from (A) and (B) Using suitable software.

Text books:

1. Hydraulics and Fluid Mechanics by P. N. Modi and S. N. Seth Standard book house
2. Open Channel Flow by K Subranmanya, TMH, Third Ed
3. Open Channel Flow: K. G. RangaRaju - Tata McGraw Hill.
4. Water Supply Engg. Vol. -1 By S.K. Garg
5. Environmental Engg. Vol. 2 By S.K. Grag
6. Water Supply Engg. Vol. 1 By B.C.Punmia
7. Limit state design in Structural Steel by M.R. Shiyekar, PHI, Delhi
8. Limit state design of steel structures by S K Duggal, Tata McGraw Hill Education, New Delhi.
9. Fundamentals of structural steel design M L Gambhir, Tata McGraw Hill Education Private limited, New Delhi.

Reference books:

1. Engineering Fluid Mechanics by R.J.Garde and A.G.Mirajgaonkar, Scitech Publications, 2003
2. Fluid Mechanics and Machinary by C.S.P.Ojha, R. Berndtsson, P.N.Chandramouli, Oxford University Press, 2010
3. Flow through Open Channels by Rajesh Srivastava, Oxford University Press, 2015
4. Water Supply & Sanitary Engg. By G.S. Birdi-Laxmi publications (p) Ltd. New Delhi
5. Water & Waste Water Technology by Mark J.Hammer Prentice – Hall of India, New Delhi
6. Environmental Engineering – H.S. Paeavy& D.R. Rowe Mc Graw Hill Book Co. New Delhi

7.	Water & Waste Water Technology G.M. Fair & J.C. Geyer.
8.	Design of Steel Structure by N Subramanian, Oxford University Press, New Delhi.
9.	Structural Design in Steel—Sarwar Alam Raz—New Age International Publishers
10.	Analysis and Design: Practice of Steel Structures—Karuna Ghosh-- PHI Learning Pvt. Ltd. Delhi
11.	Design of Steel Structures by K S Sai Ram, Pearson, New Delhi.
12.	Limit state design of Steel Structure by Ramchandra & Gehlot, Scientific Publishers, Pune.
13.	Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti S. S. I K International Publishing House, New Delhi

Employability Skills (Building Design & Drawing) (CVUA31177)

Teaching Scheme
Credits: 3
Lectures: 2hrs./week
Practical: 2hrs./week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- As a Prerequisite to structural design and quantity surveying course.
- To impart knowledge about analyze and solve problems on network analysis, resource allocation and updating.

Course Outcomes: **At the end of the course the student will be able to,**

1. **Plan and design** different types of buildings,
2. **Apply** basic drawing skills, including the ability to perceive and express visual relationships
3. **Apply** different architectural drawing types to elementary design situations, for communication with clients.
4. **Apply** the basic concepts of project monitoring and control

Unit I – Building Drawing and Byelaws

Introduction to Architectural drawing: i) Line plan, ii) Developed Plan, iii) Elevation, iv) Section.
Necessity of bye-laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), TDR, Marginal distances, building line - control line, height regulations, room sizes, Area calculations (built-up area, carpet area), Rules for ventilation, lighting, Vertical Circulation, Sanitation and Parking of vehicles.
Commencement and Occupancy Certificate, Various NOCs, List of documents to be submitted to local authority.
Green buildings: salient features, benefits, Planning concepts, Rating systems (LEED, GRIHA etc.)

Unit II – Building Services

Noise and Acoustics: Sound insulation, Acoustical defects, Reverberation time, sound absorbents.
Ventilation – Necessity of Ventilation, Natural ventilation stack effect, wind effect, mechanical ventilation and its types, air conditioning systems.
Lighting – Principles of day lighting, design of windows, artificial illumination, solar energy systems for lighting (BIPV),
Plumbing – Water storage tanks at ground level and on terrace (capacity), Plumbing systems, Rain water harvesting etc.

Unit III – Planning of Residential and Public Buildings

Planning of Residential buildings – Load bearing / Framed Structure- Functional requirements of Bungalows, Row houses, Ownership flats, and Apartments.
Planning of Public buildings. Functional requirements and planning of Educational, Hostel, Restaurant /Hotel building, Primary Health center/ Hospital, Shopping complex, Auditorium, Sports complex, Vegetable market, Post office, Bank buildings etc.

Unit IV- Project planning and scheduling
WBS – Work Breakdown, Gantt/Bar chart, Network Analysis, C. P. M. - . Activity on Arrow (A.O.A.), Critical path and type of floats , Precedence network analysis (A.O.N.), P. E. R.T.
Practicals: Students will prepare working drawings of any type of building from the list given in Unit IV (Individual project to be planned as per green building norms and manually drafted to suitable scale): 1. Layout/ Site plan, (with area statement) 2. Plan/ Typical floor plan (with construction notes , schedule of openings) 3. Elevation, 4. Sectional Elevation, 5. Axonometric view (using CAD) 6. Water Supply and Drainage layout. (on tracing paper) 7. Report file: It shall consist of Data given for the project, Planning considerations and line plans, Design calculations and Analysis of the project. 8. The entire class will be divided in to a group of 5-6 students .They will be assigned one ongoing project site .The group will visit the site alternate week & will do presentation alternate week on progress of work on site on basis of unit IVASSESSMENT CRITERIA: Attendance, Line work, Punctuality, Presentation and Understanding
Text books: 1. Shah M.G., Kale C.M. and Patki S.Y., "Building drawing an Integrated approach to Built Environment", Tata McGraw Hill Publishing, 2. Building Science and Planning - Dr. S. V. Deodhar. Khanna Publication. 3. Projects – Planning, Analysis, Selection, Implementation and Review, Prasanna Chandra, Tata McGraw Hill Publications.
Reference books: 1. National Building Code of India 2005, Bureau of Indian Standard, 2. Building services – Prof. S. M. Patil, 3. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings, 4. Civil Engineering Drawing –by M. Chakraborty, 5. DC Rules of urban local body. 6. Construction Project Management-Planning, Scheduling and Controlling by K. K.Chitkara, Tata McGraw Hill Publishing Company, New Delhi.

Department of Civil Engineering

Mini Project (CVUA31178)

Teaching Scheme
Credits: 3
Lectures: 1 hr./week
Practical: 2 hrs./week

Examination Scheme
Formative Assessment : 50 Marks

Course Objectives:

- To train the students to apply their engineering knowledge to real life problem solving.
- To train the students to plan. implement and execute project work so as to satisfy the stated objectives of the project

Course Outcomes: **At the end of the course the student will be able to,**

1. **Formulate** a real world problem and develop its requirements
2. **Develop** a design solution for a set of requirements
3. **Test and validate** the conformance of the developed prototype against the original requirements of the problem
4. **Express** technical ideas, strategies and methodologies in oral and written form

Mini Project can be an individual or a group activity depending on the depth and scope of the topic. Mini Project shall be on any topic of students' own choice approved by the faculty. The continuous evaluation will be based on the continuous work of the student to achieve set objectives, technical contents of the topic to assess understanding of the student about the same. The student should submit duly certified spiral bound report having the following contents.

• Introduction
• Literature Survey
• Theoretical contents/fundamental topics
• Relevance to the present national and global scenario (if relevant)
• Merits and Demerits
• Field Applications / case studies / Experimental work / software application / Benefit cost/ feasibility studies
• Conclusions
• References

A. Report shall be typed on A4 size paper with line spacing 1.5 on one side of paper.
Left Margin : - 25 mm
Right Margin : - 25 mm
Top Margin : - 25 mm
Bottom Margin : - 25 mm
B. Size of Letters
Chapter Number: - 12 font size in Capital Bold Letters- Times New Roman
Chapter Name: - 12 Font size in Capital Bold Letters- Times New Roman
Main Titles (1.1, 3.4 etc):- 12 Font size in Bold Letters- Sentence case. Times New Roman
Sub Titles (1.1.4, 2.5.3 etc):- 12 Font size in Bold Letters-Sentence case. Times New Roman
All other matter: - 12 Font size sentence case. Times New Roman
C. No blank sheet be left in the report
D. Figure name: - 12 Font size in sentence case-Below the figure.
E. Table title -12 Font size in sentence case-Above the table

Continuous Evaluation: Will be monitored by the respective guides

Semester - II

Environmental Engineering II (CVUA32171)

Teaching Scheme
Credits : 3
Lectures: 3 hrs. / week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- Study of process used in waste water treatment
- To prepare students with an ability to understand designing of Waste water treatment system and apply same in future.
- To increase the awareness amongst the students for Importance of waste water & their management.

Course Outcomes: At the end of the course the students will be able to:

1. **Explain** the process used in waste water treatment
2. **Analyze** the Characteristics of sewage
3. **Design** of preliminary and primary treatment units for sewage treatment
4. **Design** of Secondary Biological treatment unit
5. **Develop** an ability to design STP plants.
6. **Develop** Low cost treatment & advance treatment methods of waste water

Unit I - Waste Water and Treatment Concept

Fundamentals of waste water, types of waste water , treatment methods, unit operation and process, treatment system such as preliminary, primary, secondary and tertiary, functions of treatment plant.
Basic consideration in design such as strength and characteristics of waste water, flow rate concept of mass flow rate, types of reaction and reactors.
Concept for HRT, SLR, WLR, OLR, F/M ratio, horizontal and settling velocity, generation rate of waste water, method of sampling.

Unit II – Characteristics of sewage, stream sanitation and bio-kinetics

Characteristics of sewage: physical, chemical and biological, effluent standards as per CPCB/MPCB norms.,
Stream sanitation: Self-purification of natural streams, Oxygen Sag Curve, Streeter -Phelps equation and terminology (without derivation and numerical).
Objective, classification of biological treatment, significance of bio-kinetic coefficient (growth constant) and calculations by graphical method.

Unit III – Design of preliminary and primary treatment units for sewage treatment

Design of pumping station, flow measurement equalization basin, screen chamber, grit chamber, oil and grease trap. Design of circular sanitary sewers pipe system.
Design of primary and secondary sedimentation tank.

Unit IV– Biological treatment of waste water

Design of Secondary Biological treatment unit: Suspended growth process.
Design consideration of HRT, MCRT,F/M ratio, OLR, Qty. of oxygen required, Power required, sludge production, sludge flow rate, recycling ratio
Design of Secondary Biological treatment unit: Attach growth process.
Design of tricking (NRC equation numericals), introduction to bio- towers, concept rotating

biological contactor
Unit V– Anaerobic biological treatment of waste water and sludge treatment
Design consideration in anaerobic treatment process, anaerobic reactor types. Principle of anaerobic digestion, stages of digestion, bio–gas production its characteristics & application, factors governing anaerobic digestion,. Dewatering of sludge by gravity thickener, sludge drying bed, decanters. Methods of sludge treatment and disposal, advantages & disadvantages. Up-flow Anaerobic Sludge Blanket (UASB) Reactor– Principle, advantages & disadvantages. Design of UASB.
Unit VI– Low cost treatment & advance treatment methods of waste water
Oxidation pond: Bacteria –algae symbiosis, design of oxidation pond as per the manual of CPHEEO, advantages & disadvantages of oxidation ponds. Aerated lagoons: Principle, aeration method, advantages & disadvantages of aerated Lagoons, design of aerated lagoon. Removal of nutrient process such as phosphate, nitrate from waste water.
Text books: 1. Environmental studies by Rajgopalan -Oxford University Press. 2. Waste Water Treatment & Disposal –Metcalf & Eddy -TMH publication. 3. Environmental Engg. -Peavy, Rowe-McGraw Hill Publication. 4. Waste Water Treatment -Rao & Dutta.
Reference books: 1. Waste Water Engg. –B.C. Punmia& Ashok Jain -Arihant Publications. 2. Water Supply & Waste Water Engg.-B.S.N. Raju –TMH publication. 3. Sewage Disposal & Air Pollution Engg. –S. K. Garg–Khanna Publication. 4. Environmental Engg. –Davis -McGraw Hill Publication 5. Manual on sewerage and sewage treatment –Public Health Dept., Govt. of India. 6. Standard Methods by APHA. I.S. Codes I.S. 3025 (all parts)
Suggested Reading (e –Resources) i) http://nptel.iitm.ac.in/courses -contents/IIT Kanpur and IIT Madras. ii) http://cpcb.nic .in iii) http://moef.nic .in iii) http://moef.nic .in

Water Resources Engineering (CVUA32172)

Teaching Scheme
Credits : 3
Lectures : 3 hrs./week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- To get exposure to science of hydrology
- To apply hydrological principles to calculate runoff
- To understand the concepts of irrigation and water requirement of crops
- To get exposure to groundwater hydrology
- To understand demand and supply of water resources from reservoir planning perspective

Course Outcomes: At the end of the course the students will be able to:

1. **Analyze** various components of hydrologic cycle including their measurement techniques
2. **Compare** various types and methods of irrigation and estimating water requirement of crops
3. **Explain** concepts of groundwater movement and storage, and estimating well yields
4. **Perform** runoff calculation and estimate design flood
5. **Planning** of reservoirs, and estimate useful life of a reservoir
6. **Explain** water management, water logging and drainage

Unit I – Hydrology

Introduction: Hydrologic cycle, application of hydrology.
Precipitation: forms and types of precipitation, measurement, analysis of precipitation data, mass rainfall curves, intensity-duration curves, concepts of depth-area-duration analysis, computation of mean rainfall.
Evaporation and Infiltration: elementary concepts, factors affecting, measurement of evaporation, transpiration, evapotranspiration (consumptive use) and infiltration (Horton's method and infiltration indices)
Stream Gauging: Selection of site, various methods of discharge measurement (velocity-area method, dilution method, slope-area method). Site visit is recommended to learn this topic.

Unit II – Irrigation

Introduction: definition, functions, advantages and necessity, methods of irrigation, surface irrigation, subsurface irrigation, micro-irrigation, lift irrigation
Water Requirements of Crops: Soil moisture and crop water relationship, factors governing consumptive use of water, principal Indian crops, their season and water requirement, crop planning, agricultural practices, calculations of canal and reservoir capacities – duty, delta, irrigation efficiency.
Assessment of Canal Revenue: Various methods (Area basis or crop rate basis, volumetric basis, seasonal basis, composite rate basis, permanent basis or betterment levy basis)

Unit III – Ground Water Hydrology

Occurrences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, safe yield of basin. Hydraulics of wells under steady flow condition inconfined and unconfined aquifers, specific capacity of well. Well Irrigation: Tube wells, Open wells and their construction

Unit IV– Runoff & Floods

Runoff: Factors affecting runoff, rainfall-runoff relationships, runoff hydrograph, unit hydrograph, theory, S-curve hydrograph, synthetic unit hydrograph, use of unit hydrograph.

Floods: Estimation of peak flow, rational formula and other methods, frequency of point rainfall and plotting position, flood frequency analysis Gumbel's method, design floods.

Unit V– Reservoir Planning

Introduction, related terms (Yield, Reservoir planning and operation curves, Reservoir storage, Reservoir clearance),Investigation for reservoir planning, Significance of mass curve and demand curves, Applicationsof mass curve and demand curves, Fixation of reservoir capacity from annual inflow and outflow, Fixation of reservoir capacity using elevation capacity curve and dependable yield, Reservoir regulation, Reservoir losses, Reservoir sedimentation- Phenomenon , Measures to control reservoir sedimentation, Useful life of reservoir, Costs of reservoir, Benefit-Cost ratio.

Unit VI –Water Management, Logging and Drainage

Water Management: Distribution, warabandi, rotational water supply system, Participatory Irrigation Management, Cooperative water distribution systems.

Water Logging and Drainage: The process of water logging Causes of water logging, Effects of water logging, preventive and curative measures, Land drainage, and reclamation of water logged areas, alkaline and saline lands.

Text books:

1. Engineering hydrology – K. Subramanyam Tata McGraw Hill.
2. Hydrology – Dr. P. Jaya Rami Reddy – University Science
3. Irrigation, Water Resources and water power engineering- P. N. Modi, Standard Book House.
4. Irrigation Engineering - S. K. Garg, Khanna Publishers

Reference books:

1. Irrigation Engineering - Bharat Singh
2. Theory & design of irrigation structures Vol.I, II, III Varshney Gupta and Gupta Nemchand and brothers publication
3. Groundwater Hydrology, 3ed—Todd--Wiley
4. Irrigation and water power Engineering.- Dr. Punmia and Dr. Pande, Standard Publisher
5. Elementary Engineering Hydrology-M.J.Deodhar-Pearson Education
6. Engineering Hydrology. –Ojha—Oxford University Press
7. Irrigation Engineering-Raghunath--Wiley
8. Water Management – Jasapal Singh, M.S.Achrya, Arun Sharma – Himanshu Publication.

Elective - II

Advanced Concrete Technology (CVUA32173A)

Teaching Scheme
Credits: 3
Lectures: 3hrs./ week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- To understand the material science of concrete.
- To develop an ability to link the behavior of concrete with the fundamental interactions between the ingredients.
- To develop fundamental understanding of the mechanism governing concrete performance

Course Outcomes: At the end of the course the students will be able to:

1. **Explain** the microstructure and properties of the concrete, properties of mineral admixtures and demonstrate the effect of admixtures on properties of concrete
2. **Understand** a suitable type of special concrete for appropriate application/s
3. **Analyze** characteristics of mix constituents and design a concrete mix for field applications using mix proportioning principles and explain the use of non-destructive techniques as a tool to assess the condition of reinforced concrete structures
4. **Describe and justify** properties and applications of Fibre Reinforced Concrete
5. **Determine** the properties of hardened concrete and interpret the quality of concrete in laboratory and field
6. **Understand** the properties and techniques to manufacture and erection of ferrocement and precast concrete.

Unit I - Additions to concrete and its Properties

Review of types, covering pulverised fuel ash, ground granulated blast furnace slag and silica fume; origins and manufacture; chemical composition; physical characteristics; chemical and physical processes of hydration and interaction; effects on properties of concretes, mortars and grouts; methods of test; applications; mixer blends and blended cements, modern methods of analysis.
properties of concrete, w/b ratio, gel space ratio, Problems on maturity concept, aggregate cement bond strength, Guidelines for Quality control & Quality assurance of concrete, Effect of admixtures.

Unit II - Special Types of Concrete

Structural Light weight concrete, ultra-light weight concrete, vacuum concrete, mass concrete, waste material based concrete, sulphur concrete and sulphur infiltrated concrete, Jet cement concrete (ultra- rapid hardening), gap graded concrete, high strength concrete, high performance concrete ,Self-curing concrete,
Pervious concrete, Geo polymer concrete, Green concrete .

Unit III - Concrete Mix Design and Non Destructive Tests on concrete

Design of high strength concrete mixes, design of light weight aggregate concrete mixes, design of fly ash cement concrete mixes, design of high density concrete mixes, Design of pumpable concrete mixes, Design of self-compacting concrete.
Advanced non-destructive testing methods: ground penetration radar, probe penetration, breakoff maturity method, stress wave propagation method, electrical/magnetic methods, nuclear methods and infrared thermographs.

Unit IV- Fibre Reinforced Concrete

Historical development of fibre reinforced concrete, properties of metallic fibre, polymeric fibres, carbon fibres, glass fibres, Basalt fibres and naturally occurring fibres. Interaction between fibres and matrix (uncracked and cracked matrix), basic concepts and mechanical properties: tension and bending.

Unit V- Hardened properties of Concrete

Properties of hardened frc, behavior under compression, tension and flexure of steel fibres and polymeric fibres, GFRC, SFRC, SIFCON,SIMCON -development, constituent materials, casting, quality control tests and physical properties.

Unit VI - Special Techniques on concrete

Ferrocement: Properties & specifications of ferrocement materials and techniques, Introduction to prefabricated concrete structural elements, manufacturing process of industrial concrete elements, precast construction, erection and assembly techniques.

Text books:

1. Concrete Technology --M.S. Shetty, S. Chand Publications.
2. Concrete Technology – A. R. Santhakumar, Oxford University Press.
3. Concrete technology -- M. L. Gambhir, Tata McGraw Hill Publications.
4. Fiber Reinforced Cement Composite- P. N. Balguru & P. N. Shah.
5. Concrete: Microstructure, Properties and Materials-- P. Kumar Mehta and P. S. M. Monteiro--
6. Tata Mc-Graw Hill Education Pvt. Ltd.

Reference Books:

1. Handbook on Advanced concrete Technology Edited by N. V. Nayak, A .K. Jain, Narosa
2. Publishing House.
3. Design of concrete mixes by Raju N Krishna, CBS Publisher.
4. Properties of concrete by A. M. Neville, Longman Publishers.
5. Concrete Technology by R.S. Varshney, Oxford and IBH.
6. Concrete technology by A M. Neville, J.J. Brooks, Pearson.
7. Ferrocement Construction Mannual-Dr. D.B.Divekar-1030, Shivaji Nagar,Model Colony,
8. Pune.
9. Concrete Mix Design-A. P. Remideos--Himalaya Publishing House (ISBN-978-81-8318-996-5
10. Concrete, by P. Kumar Metha, Gujrat Ambuja.
11. Learning from failures----- R. N. Raikar.
12. Structural Diagnosis ---- R. N. Raikar.
13. Concrete Mix Design -- Prof. Gajanan Sabnis.

Urban Planning (CVUA32173B)

Teaching Scheme
Credits: 3
Lectures: 3hrs./ week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- To prepare students with principles of urban planning,
- To prepare students with an ability to analyze and forecasting skills,
- To prepare students to pursue higher education in the field of urban & regional planning.

Course Outcomes: At the end of the course the students will be able to:

1. **Analyze** different types of plans,
2. **Perceive, communicate** ideas graphically and express visual relationships,
3. **Apply** planning concepts and tools to design layouts,
4. **Explain** different policies and legal framework in relation to planning.
5. **Explain** concept of Transportation System
6. **Apply** Legislative aspect in Urban Planning

Unit I – Introduction to Planning

Historical importance, Evolution of town planning in India, Planning efforts post-independence, Goals and objectives of planning; Multidisciplinary approach, Role of urban planner, Benefits of planning; Cityas an organism. Contribution of town planners, Growth patterns of towns. Hierarchy of Plans: Regional plan, sub-regional plan, Development Plan, Town Planning Scheme.

Unit II – Development Plan

Types of Development Plans(Master Plan, city development plan, structure plan, action area plan), Benefits and Components of DP, Various types of civic surveys (Physical – Social – Economic) Types of zoning (Land Use, Height, Density), Color code, Various maps. Necessity of DC Rules, Implications of violations of development control rules.

Unit III : Policy and Tools

Town Planning Scheme, Neighborhood planning, Developing New Towns as countermagnets. Quality of life and livability, Special Township policy of GoM.

Unit IV- Urban Governance

Urban Local Bodies, Metropolitan Planning Committees, Planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, Metropolitan RDA etc.) Concepts and parameters in sustainable city development, Urban renewal : AMRUT and Smart City Guidelines by GoI.

Unit V- Urban Transport systems

Urban road classification, concept of PCU and level of service; Traffic Surveys and their types, Road layouts, Traffic management, Intelligent Transport Systems, BRT, LRT, MRT. Application of GIS, Remote Sensing in planning.

Unit VI - Planning Legislation
Significance of law and its relationship to planning; UDPFI Guidelines, Proliferation of Laws (Municipal Acts, Urban Development Authority Acts, Housing Board Acts, Improvement Trust Acts, Slum ImprovementActs etc); Environmental & Pollution Control Acts. Land Acquisition Rehabilitation and Resettlement Act 2013. Legislative mechanism for preparation of DP: MRTP Act 1966.
Text books: 1. Town Planning by S. C. Rangwala, Charotar Publication. 2. Town Planning by G. K. Hiraskar 3. Town and country Planning- N.K. Gandhi
Reference books: 1. DC Rules of urban local body. 2. Planning Legislation By Koperdekar And Diwan 3. MRTP Act 1966 4. LARR Act 2013 5. The Urban Pattern: City planning and design by Gallion and Eisner. 6. UDPFI guidelines. 7. ITPI New Delhi, Publications

Construction Management (CVUA32173C)

Teaching Scheme
Credits : 3
Lecture:3hrs/ week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objectives:

- To understand role of construction industry in infrastructure development.
- To demonstrate the use of work study charts and conduct time studies.
- Use of mathematical models for risk assessment and materials management.
- To study the legal concepts within which construction contracts are establish, documents and contract administration
- To enhance knowledge about construction equipments this can be used effectively.
- To study the concepts of Information systems and their applications.

Course Outcomes: At the end of the course the students will be able to:

1. **Explain** the techniques BOT, BOLT and their importance.
2. **Develop** various charts and conduct time and motion study for effective management.
3. **Apply** various techniques for risk management and material management
4. **Explain** the features of contract documents and balance sheets.
5. **Apply** knowledge about efficient utilization of construction equipment
6. **Use** concepts of MIS for efficient management.

Unit I - Overview of construction sector

Introduction of construction management, necessity and applications, Role of construction industry in infrastructure development, BOT and BOLT techniques.
Project overruns and means to combat them, generation and identification of project investment opportunities, project management consultants – role, types, selection and appointment process.

Unit II - Work study and value engineering

Work Study: Definition, Objectives, basic procedure, method study and work measurement, work study applications in Civil Engineering. Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams. Work measurement, Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time-lapse photography technique, Analytical production studies. Meaning of value, value analysis, value engineering and value management, energy resources, consumption patterns, energy cost escalation and its impact.

Unit III - Financial aspects and Risk Management of construction projects.

Capital investments: importance and difficulties, means of finance, working capital requirements, project cash flow projections and statements, project balance sheet, profit loss account statements.
Introduction, principles, types, origin, risk control, use of mathematical models: sensitivity analysis, break even analysis, simulation analysis, decision tree analysis, risk identification, analysis and mitigation of project risks, role of insurance in risk management.

Unit IV Materials management and contracts

Materials flow system, role of materials management in construction management and its linkage with other functional areas, vendor networking, buyer-seller relationships, E material codification and

classification, concept of logistics and supply chain management. Inventory models- EQQ models with variations.

Introduction- Definition-Essential ingredients of tender- principles to be followed in the consideration and acceptance of tenders. bid cycle, tender and contract documents, contract conditions, study of contract documents of State PWD and CPWD. Standard agreements. Indian Contract Act 1872; Need, provisions, scope for modifications /improvement. Rules of interpretation of contracts. Introduction to legal terms used in construction contracts.

Unit V Equipment Management

Introduction to construction Equipments, Identification, Planning of equipment – Selection of Equipment - Equipment Management in Projects - Maintenance Management

Equipment cost – Operating cost – Cost Control of Equipment - Depreciation Analysis – Replacement of Equipment- Replacement Analysis.

Unit VI Management Information system

Introduction to Management Information systems (MIS) Overview, Definition. MIS and decisionsupport systems, Information resources, Management subsystems of MIS. Management information system structure based on management activity whether for Operational control, management control or strategic planning. role of ERP in materials management – material resource information systems

Text books:

1. Projects – Planning, Analysis, Selection, Implementation and Review, Prasanna Chandra, Tata McGraw Hill Publications.
2. Total Project Management – The Indian Context – P. K. Joy, MacMillian Publications
3. Materials Management–Gopalkrishnan & Sunderasan, Prentice Hall Publications.
4. Management –Principal, process and practices by Bhat – Oxford University Press.
5. Financial management by Shrivastava- Oxford University Press
6. Management Information Systems – Gordon B. Davis, Margrethe H. Olson – Tata McGraw Hill Publ. Co.
7. Construction Equipments & its Management: S.C Sharma, Khanna Publication

Reference books:

1. Project Management—Khatua—Oxford University
2. Construction Project Management-Planning, Scheduling and Controlling by K. K.Chitkara, Tata McGraw Hill Publishing Company, New Delhi.
3. Construction Management and Planning by B. Sengupta and H Guha, Tata McGraw Hill Publishing Company, New Delhi.
4. The Essentials of Project Management by Dennis Lock, Gower Publishing Ltd. UK.
5. Construction Planning Methods & Equipment: Puerifoy –Tata MC Graw Hill
6. Essentials for Decision Makers by Asok Mukherjee, Scitech Publication, New Delhi.
7. Total Quality Management - Dr. S. Rajaram and Dr. M. Sivakumar-- Biztantra
8. Total Engineering Quality Management – Sunil Sharma – Macmillan India Ltd.
9. Construction Management practice and contract management practice- Dr. V. K. Raina, 2nd Edition, SPD publications, New Delhi.

Lab Practice IV (CVUA32174)

Teaching Scheme
Credits: 3
Practical: 6 hrs./ week

Examination Scheme
Formative Assessment: 50 Marks
Summative Assessment: 50 Marks

Course Objectives:

- To impart the knowledge of Waste Water engineering.
- To impart the knowledge of hydrology & water resources engineering
- **Elective –II**
  - To review and apply the QAQC norms as per standards in constriction practices.
  - To design special concretes mixes using standards.
  - To understand relationship between legal aspect and planning.
  - To impart the knowledge of Construction Project Management and Economics.

Course Outcomes: At the end of the course the students will be able to:

1. **Analyse** Waste water sample.
2. **Design** Waste water treatment plant units.
3. **Analyse** components of hydrologic cycle (rainfall, infiltration, runoff, etc.); determine flood peaks
4. **Determine** storage capacity of reservoir; flood routing
5. **Elective –II**
   - **Advanced Concrete Technology :**
     a. **Perform** the test to find properties of high-performance concrete in fresh and hardened state
     b. **Design and prepare** the high-performance concrete mix as per the guidelines given in Indian standard code.
   - **Urban Planning:**
     a. **Explain** Projects under different planning schemes.
     b. **Apply** different types of survey for existing land-use.
   - **Construction Management:**
     a. **Explain** project cash flow, balance Sheet for construction project.
     b. **Use** different construction management techniques for material management and their control.

Environmental Engineering - II

1. List of Experiments (Any Eight)
2. Determination of dissolved oxygen.
3. Determination of B.O.D.
4. Determination of C.O.D.
5. Determination of solids TS, TDS,TSS,VS,FS
6. Sludge volume index for sludge characteristics
7. Determination of phosphate from waste water
8. Determination of nitrite from waste water.
9. Determination of conductivity of waste water.
10. Site visit to STP
11. Computerized excel spread sheet or any software for treatment unit design

Assignment
1. Sewer material and apprentuences
2. Septic tank design.

Water Resources Engineering

1. Analysis of rainfall data I (Double mass curve technique)
2. Analysis of rainfall data II (Double mass curve technique)
3. Compute average annual precipitation and determine yield by various methods I.
4. Compute average annual precipitation and determine yield by various methods II.
5. Compute average annual precipitation and determine yield by various methods III.
6. Analytical method of measurement of infiltration
7. Determination of peak flood discharge in a basin using unit hydrograph technique
8. Flood frequency studies using Gumbel's extreme value distribution
9. Determination of storage capacity of a reservoir using mass curve of inflow and outflow.
10. Application of HEC-RAS for Hydrologic routing
11. Site visit to Meteorological station/Water Research Center
12. Report on Irrigation Project (Case Study)

Elective –II

- **Advanced Concrete Technology :**

The Termwork / Labwork will be based on completion of assignments / practicals / reports of site visits, confined to the course in that semester.

1. Write a review on any recent research article from standard peer-reviewed journal.
2. Report on at least one patent (national/international)– on any topic related to concrete technology.
3. Concrete mix design and production in lab of any one – Self compacting concrete, Fiber reinforced concrete, light-weight concrete, high strength or ultra-high strength concrete .Comparison with traditional concrete mix is to be clearly stated in the report.
4. Cost analysis (material, labour, equipment, others) of any type of concrete for lab, in-situ and RMC production.
5. Perform any two Fresh (workability tests – Slump Flow Test, T-50, J-Ring, Visual Stability Index, Column Segregation, L-Box, U-box) and Hardened (Compressive, tensile, flexural) properties tests on any high performance concrete.
6. Any one experiment on any one of the topics – NDTs; Microscopic examination of cement/concrete; Performance study of any one admixture (Mineral/Chemical) in concrete.
7. Visit reports on minimum two site visits - exploring the field and practical aspects of concrete technology.

Note: Term Work should include a detailed analysis of practical interpretation, significance and application of test results including above contents and site visit report in form of journal.

- **Urban Planning:**

Students will undertake case studies, prepare drawings and reports based on following assignments:

1. Report on Contribution of Planners : Individual Seminar presentation
2. Study of salient features of urban renewal (JNNURM, AMRUT) schemes: Individual Seminar presentation
3. Study of existing Development Plan (Report with analysis w.r.t. civic surveys): Group work
4. Case Study of Special Townships or Smart City : (site visit, report with analysis): Group work
5. Neighborhood planning (design layout with report) : Group work

6. Report on any Existing New Town Like new Mumbai and Gandhinagar

ASSESSMENT CRITERIA: Attendance, Line work, Punctuality, Presentation and Understanding

- **Construction Management:**
  1. Site Visit to a Construction project to study following documents and preparing a report – (4)
     a. Project Cash Flow Analysis.
     b. Project Balance Sheet.
     c. Materials Flow System in the Project.
  2. Study of various contracts related to construction Industry (2)
  3. Assignment on sensitivity analysis, break even analysis, simulation analysis, decision tree analysis (4)
  4. Assignment on Work Study and work measurement on any two Construction Trades. (4)
  5. Assignment on EOQ Model and its variation. (2)
  6. Assignment on Equipment Management. (2)
  7. Assignment on MIS in construction industry. (2)

Industrial Training (CVUA32175A)

Teaching Scheme
Credits : 8
Practical : 16 Hrs/week

Examination Scheme
Formative Assessment : 50 Marks
Summative Assessment : 50 Marks

Course Objective:
1. Apply existing knowledge in similar or new situations
2. Acquire new engineering knowledge and skill
3. Understand importance of life learning processes through internship experiences.

Course Outcomes:
After completion of the course, student will be able to
1. Apply the existing engineering knowledge in similar or new situations
2. Have ability to identify when new engineering knowledge is required, and apply it
3. Understand the lifelong learning processes through critical reflection of internship experiences.

The preferred duration of an Engineering internship is 3 months, full-time placement with an related industry/organization/consultancy work etc.

Continuous Assessment of Performance During Internship:

During the internship semester, the organization with whom the student is undertaking the internship programme conducts periodic assessments of the intern's progress, performance and achievements.

Students are required to submit progress report of internship as per schedule and being in constant touch with the respective Guide. At least two presentations and report should be submitted to VIIT, Pune.

In order to ensure that the internship remains meaningful, Guide of the respective student from VIIT, Pune will maintains close contact with organizations/ Industry/Consultancy etc.

Summative Assessment :

After completion of the program, the student submits a detailed report of his internship experience and makes a presentation of the same at VIIT, Pune.

Guidelines for Internship report are mentioned in Annexure I.

In house value added training

Green and Energy Efficient Building Technology (CVUA32175B1)

Teaching Scheme
Credits : 8
Lectures : 4 Hrs/week
Practical- 8Hrs/week
Tutorial:--

Examination Scheme
Formative assessment:50 marks
Summative assessment: 50 marks

Prerequisite:

Course Objectives:

- To increase awareness of students about preservation of natural resources as well as design, construction and advantages of green buildings including an overview of economic aspects and finance.

Course Outcomes:

Upon completion of this course, students will be able to:

1. **Recognize** and describe eco-friendly materials and need for the use of recycled materials.
2. **Outline** need of sustainable site planning and management using the nature's gifts/ resources.
3. **Compare** different rating systems, their advantages for buildings and evaluate the ratings.
4. **Explain** various smart service systems relevant to green buildings.
5. **Explain** different ways and means of conserving electrical energy and related aspects.
6. **Describe** economical and financial aspects related to green and energy efficient building.

Unit I: Materials and its applicability, Indoor Environmental Quality, Reuse and Recycle of Construction Waste

Eco Friendly/ Green Building Materials: To understand Environmental impact of building materials. Eco Friendly building materials, their composition, availability, production, physical properties etc. Application of the Eco Friendly/ Green Building materials for different components of the buildings at different level, both internally and externally.
Indoor environmental quality, Low VOC materials: Adhesives - Sealants, Paints- Coatings etc. Construction Waste as a Resource- Resource Economics, Disposable Materials, Recovery, Recycling, Collection, Processing, Governmental Role in Waste Management, Potential for Reuse.

Unit II: Site / Building Planning

Sustainable Site planning: wind / sun path, water management , material use, landscape, topography. Climate Responsive Architecture: orientation, solar- wind, Building envelope
Thermal comfort indices. Heat flow through building materials. Thermal properties of common building materials available in India. Thermal performance of building envelope. Air movement and buildings. Ventilation and buildings. Wind an Stack effect. Mechanical ventilation. HVAC System, Day lighting. Passive and sustainable architecture. Passive and active systems.

Unit III: Building Rating Systems

National Association for Home Builders (**NAHB**) – For Homes, Building Research Establishment Environmental Assessment Method (**BREEAM**), Green Star by Green Building Council Australia (**GBCA**), **LEED India,** Comprehensive Assessment System for Built Environment Efficiency (**CASBEE**), **Estimada -**Abu Dhabi Urban Planning Council (UPC) etc.

Unit IV: Smart Services System in Green Building

Water efficiency, Water Efficient Landscaping- Rain water harvesting, potable water and bore well recharging, minimization of water use, dual flush, Waterless urinals, Smart controlled water tabs, Recycling of treated waste water for different non potable use, Domestic solid waste –segregation, green materials.
Lift system, lighting system, security system, fire system, gas detector system, solar system , plumbing system, vent system etc.

Unit V: Electrical Energy Management and Lighting

Electricity billing, Electrical load management and maximum demand control, Power factorimprovement and its benefit, Selection and location of capacitors, Distribution and transformer losses. Electrical motors -types, efficiency and selection. Speed control, Energy efficient motors. ElectricityAct 2003. Lighting-Lamp types and their features, recommended illumination levels, lighting system energy efficiency

Unit VI: Energy Economics and Finance Analysis

Costing of Utilities -Determination of cost of lifting system, steam generation, solar heating system, solid waste disposal system, rain water harvesting system, smart electrical system. Energy balance sheet of small house or building.
Simple payback, Time value of money, Net Present Value (NPV), Return on Investment (ROI), Internal Rate of Return (IRR), Risk and Sensitivity analysis, balance sheet, account entry, cash flow analysis, payback period, B/C ratio. Estimation of maintenance cost of services in green building.

Assignments on (17 Nos Total)

Appropriate Technologies / Approaches for: Water conservation / efficiency
Appropriate Technologies / Approaches for: Sanitation (Grey water, black water management, SWM)
Appropriate Technologies / Approaches for: Biogas
Appropriate Technologies / Approaches for: Composting
Appropriate Technologies / Approaches for: Solar energy and its applicability through panels, photovoltaic cells etc
Appropriate Technologies / Approaches for: Use of " LED, CFL, Fresnel Lens" etc
Appropriate Technologies / Approaches for: Wind energy and its use.
Appropriate Technologies / Approaches for: Solar energy and its use.
Appropriate Technologies / Approaches for: Orientation aspects in site planning to achieve maximum daylight and natural ventilation
Appropriate Technologies / Approaches for: Any two smart system in green building.
Measurement of electrical power by watt meter.
Electrical devices, electrical symbols, line dig arm for green building.
Estimation and costing of services in green building.
Cost balance sheet for construction of green building (economic balance sheet)
Energy balance sheet and electrical load calculations.
Study of Innovative Materials Developed by CBRI, SERC,
Study of Environmental Audit of any existing building and prepare a report

Reading Material
Manual of Tropical housing and climate by Koenisberger • Climate responsive architecture by Arvind Krishnan • Manual of solar passive architecture - by Nayak J.K. R. Hazra J. Prajapati. • Energy Efficient Buildings in India by Milli Mujumdar • Green Building Materials by Ross Spiegel and Dru Meadows • Publications from - CBRI – Roorkee, - IDC – Mumbai, NID - Ahmedabad • Solar Energy in Architecture and Urban Planning by Herzog Thomas • Solar Heating, Design Process by Kreider Jan F • Energy - Manual for college teachers (CEE publications) • Renewable Energy & Environment - A policy analysis for India (CEE publications) • Sustainable Building Design Manual-Volume I and II –TERI Publication • Mechanical and Electrical Systems in Construction and Architecture-by Frank R Dagostino
Reference Books
1. Green building By Michael Bauer, Peter Mösle and Michael Schwarz. 2. Green Building – Guidebook for Sustainable Architecture, Springer Publication. 3. Sustainable construction: Green building design and delivery, Kibert, C. J., Wiley, Hoboken, NJ.

In house value added training

Mechanical Electrical and Plumbing Engineering system (CVUA32175B2)

Teaching Scheme
Credits : 8
Lectures : 4 Hrs/week
Practical- 8Hrs/week
Tutorial:--

Examination Scheme
Formative assessment:50 marks
Summative assessment: 50 marks

Prerequisite:

Course Objectives:

- To expose the students to various building services, facilities and utilities such as air conditioning, water supply and sewage systems, plumbing, etc.; along with instrumentation, installation and safety aspects.

Course Outcomes:

Upon completion of this course, students will be able:

1. To describe fundamentals of thermodynamics, ventilation and air-conditioning.
2. To explain air handling unit including fans, filters, sensors and ducts.
3. To recognize and describe components of water supply and sewage conveyance systems including basics of plumbing, fixtures, accessories, water conservation aspects and treatment.
4. To differentiate between various types of plumbing systems, pipes, vents, traps, etc.
5. To estimate the cost of electrification and electrical installations.
6. To recognize the need of safety with reference to electrification, describe first aid and other measures related to electrical safety as well as legal aspects of safety.

Unit I: Fundamental of Psychometric and Air conditioning

Reverse Carnot cycle, block diagram of refrigerator & heat pump (numerical), modified reverse Carnot cycle (Bell Coleman cycle). Introduction to air conditioning, psychometric, psychometric properties and terms, Psychometric relations, Psychometric processes and its representation on Psychometric chart. Thermodynamics of human body, comfort and comfort chart, factors affecting human comfort, concept of infiltration and ventilation, indoor air quality requirements, factors contributing to cooling load.

Unit II: Air Distribution Systems

Air handling unit, Classification of ducts, duct material, pressure in ducts, flow through duct, pressure losses in duct (friction losses, dynamic losses), air flow through simple duct system, equivalent diameter, methods of duct system design: equal friction, velocity reduction, static regain method (numerical on duct system design). Fan coil unit, types of fans used air conditioning applications, fan laws, filters, supply and return grills, sensors, HVAC system.(humidity, temperature, smoke).

Unit III : Water supply and sewage collection system.

Water Supply**:** Types of water supply pipes Fittings and joints, Galvanized iron, Copper, Stainless steel, HDPE, MDPE, Rigid PVC, CPVC, PPR, Composite pipes, (PE-AL-PE),PEX, Joints, Jointing methods and materials. Plumbing fixtures, Water conserving fixtures, Rating system for water efficient products,(WEP-I), Water closets, Bidets, Urinals, Flushing devices, Lavatory and bath units, Kitchen

sinks, Water coolers, Purifiers, Drinking water fountain, Cloth washers, Mop sinks, Dish washers, Receptors Overflows, Strainers, Standard heights. Prohibited fixtures, Floor slopes.
Sanitary system: Fixtures, Appliances and appurtenance, Classification of fixtures, Soil and waste and grey water, Soil fixtures, Bathroom fixtures, Accessories, Indirect waste connections, Food handling establishments, Fixtures below invert level.

Unit IV : Building Drains ,traps and vents :

Introduction, Four systems of plumbing, One pipe and two pipe system, Air admittance valves and solvents, Comparison of systems, Vent pipe, Symphonic action, Antisyphon and vent pipes, Loop, Circuits, Types of building drainage pipes, Fittings and jointing methods, Clean outs, Drainage fixture units (DFU), Sizing, Testing, Case study
Traps-Purpose, Fixture traps and floor traps, Prohibited traps, Trap arm, Developed length, Trap seal, Trap seal protection, Venting of traps, Trap primers, Building traps, Clarifiers, Grease interceptors, Sizing, oil and sand interceptors.
Vents: Vent requirement, Parts of vent system. Parts of vent system, Materials, Sizing, Vent connections, Flood rim level, Island sink venting, Venting of interceptors, Water curtain and hydraulic jump, Termination of vent stacks, Stack venting, Yoke vent, Wet venting.

Unit V :Estimation and Costing-Electrical Engineering

Introduction, HT, LT overhead lines and underground cables, cable sizing, price catalogue, labour rates, schedule of rates and estimating data (only theory), Estimation and conductor size calculations of internal wiring for Residential and Commercial (Numerical) installations and estimate for underground LT service lines.

Unit VI :Electrical Safety

Causes of Accidents, Prevention of Accidents & precautions to be taken. Dangers arising as a result of faulty equipments and tools, chemicals, water, poor joints and insulation strains and moving machines. Contents of first aid box, treatment for cuts, burns and electrical shock.
Procedures for first aid (e.g. removing casualty from contact with live wire and administering artificial respiration). Various statutory regulations (Electricity supply regulations, factory acts and Indian electricity rules of Central Electricity Authority (CEA), Classification of hazardous area.

Assignments

1.Estimation of cooling load of simple air conditioning system (case study)
2.Study of installation and servicing of split air conditioner
3.Assignment Construction, working and troubleshooting of any two household Electrical equipment's (Fan, Mixer, Electric Iron, Washing Machines, Electric Oven, Microwave -Limited to electrical faults)
4.Study the various types of earthling for electrical appliances/systems, Practice of earthling and Measurement of Earth resistance of Campus premises.
6.Design, Estimation and costing of ear thing pit and earthling connection for any lab
7.Project design and estimation of power circuit of labs/industry.
8. Introduction of available codes in plumbing
9. Introduction of associations in plumbing in India and outside India
10. Detailed hydraulic design for High rise structure OR G+1 Bungalow by using software.
11. Compilation of rules and regulations of local governing bodies.
12. Roles of plumbing contractor and plumbing consultants.
13. Report on Plumbing fixtures and fittings and explain any ten.
14. Report on materials for water supply and drainage.
15. Report on necessity of traps, intercepts and vents

Text Books
1.Plumbing, Sanitation and Domestic Engineering‖ Volume – 1to 4 by G. S. Williams, Mc Graw Hill. 2. Plumbing, Sanitation and Domestic Engineering, Data Sheets & Wall Charts‖ by G. S. Williams, Mc Graw Hill 3. Plumbing Engineering, Theory and Practice‖ by Subhsh Patil. SEEMA Publishers Mumbai 4. National Plumbing Codes Handbook‖, by R. Dodge Woodson. 5. Central Public Health and Environmental Engineering Organisation Manual (CPHEEO)
Reference Books
1.P.S. Pabla –Electric Power Distribution, 5thedition, Tata McGraw Hill. 2.S. L.Uppal, Electrical Wiring and Costing Estimation,Khanna Publishers, New Delhi. 3.Surjit Singh,Electrical wiring, Estimation and Costing,Dhanpat Rai and company, New Delhi. 4.B.D. Arora-Electrical Wiring, Estimation and Costing,-New Heights, New Delhi.

In- house value added training

General Studies for Indian Services and National Service Scheme (IE32175B1)

Teaching Scheme
Credits : 8
Lectures : 4 Hrs/week
Practical- 8Hrs/week
Tutorial:--

Examination Scheme
Formative assessment:50 marks
Summative assessment: 50 marks

Prerequisite:

Course Objectives :

1. To inculcate & improve the understanding about general studies knowledge and analytical qualities which required for various technical & non-technical competitive exams.
2. To foster the student's social work identity including professional use of supervision and consultation, self-awareness.
3. To prepare students with critical thinking skills in various areas of practice, research, and aware them about various social work programs.

Course Outcomes:

Upon learning the course, the student will be able to

1. Able to develop better understanding about importance of ongoing Current events and general studies knowledge required for various competitive exams.
2. Comprehensive understanding of various concepts of economy, history, our country's constitutional system & its significance.
3. Understand for environmental issues relevant to engineering industry and its impact on society through engineering prospect as future technocrat.
4. Understand the community in which they live & work to gain skills in mobilizing community participation for the purpose of finding practical solutions to individual and community problems.
5. Understanding and awareness about various health habits and importance of fitness for successful life style through yoga technique.

Unit I : Indian History & Geography

History of India (with special reference to Maharashtra) and Indian National Movement.

Maharashtra, India and World Geography- Physical, Social, Economic Geography of Maharashtra, India and the World.

Unit II : Indian Political System & Governance

Constitution, Political System, Panchayati Raj Institutions, Urban Governance, Public Policy, Rights issues, various constitutional and non-constitutional agencies etc

Unit III : Indian Economy

Economic and Social Development - Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, etc., Banking system and financial transaction techniques.(Including Digital)

Unit IV: Environmental Studies & Current Affairs

Current events of state, national and international importance. General issues on Environmental

Ecology, Bio-diversity and Climate Change.

Unit V: Introduction To NSS & Village Adoption Program

Orientation and structure of NSS: The history of NSS, Objectives, Symbol and meaning, NSS hierarchy from national to college level, Roles and responsibility of various NSS functionaries.
Definition and importance of Life Competencies: Four aspects of development – Physical, Mental, Social, and Moral, Qualities of constructive leadership, Rapport building with community and role of leadership. Degeneration of value system, family system, Gender issues ,Regional imbalance, Problems of Rural areas,
Approaches and strategies in adopting a village with special reference to involving people participation in N.S.S. Activities, Govt. and Non-Government agencies (NGO), political and village leadership for effective implementation of N.S.S. program and activities in adopted villages.

Unit VI : Health, Hygiene, Sanitation & Yoga

Definition, need and scope of health education, Food and nutrition, Safe Drinking water ,water Borne Diseases and sanitation (**Swachh Bharat Abhiyan**),National health program, Reproductive Health, HIV Different Yoga Traditions and Their impact, Yoga as a tool for healthy Lifestyle

Practical Sessions Contain: (Any 8 practical's has to be performed out of 11 suggested but minimum any 2 field visits are mandatory)

1. Practice of Easy writing on current & contemporary issues.
2. Reading Comprehension, Translation practice and precise writing.
3. Visit & report writing on any local government administrative institution / PRI.
4. Report on government scheme of various ministries & Scholarship programs for higher studies.
5. Plantation of trees, their preservation & Watershed management with waste land development program.
6. Village Visit: Construction & maintenance of village streets, drains, etc. so as to keep the environment clean; Construction of sanitary latrines & Cleaning of village ponds and wells;
7. Popularization and construction of Gobar Gas Plants, use of non-conventional energy sources;
8. Study of Environmental sanitation and disposal of garbage & composting with solid waste management technique;
9. Study of Prevention of soil erosion, and work for soil conservation technique.
10. Preservation and upkeep of monuments, and creation of consciousness about the preservation of cultural heritage among the community.(Field visit recommended if possible)
11. Visit & case study of any one Non-governmental origination (NGO) work.

Text Books :

1. Modern Indian History by Rjiv Ahir, Spectrum Publication
2. Indian Polity by M. Laxmikant
3. Indian Geogrphy Majjid Husain
4. Rural Housing: Policies and Practices by Bhaskar Majumder

TISS : Training Programme on National Programme Scheme.

Reference Books

1. Imagining India : Nandan Nilkani
2. I do What I do : Dr. Raghuram Rajan

3. An Uncertain Glory: India and its contradictions: Dr. Amratya Sen.
4. Indian Economy by D.D.Basu
5. Rural Sociology: Dr. Desai A.R. , Ellis Horowitz,
6. Fundamentals of Data Structures: Sartaj Sahni ,Computer Science Press.

Introduction to Social work: Chowdhry Paul

In house value added training
Social Enterprise and Entrepreneurship (IE32175B2)

Teaching Scheme
Credits : 8
Lectures : 4 Hrs/week
Practical- 8Hrs/week
Tutorial:--

Examination Scheme
Formative assessment:50 marks
Summative assessment: 50 marks

Prerequisite:

Course Objectives:
This course will lead to the learning of

- Acquiring Entrepreneurial spirit and resourcefulness
- Familiarization with various uses of human resource for earning dignified means of living
- Understanding the concept and process of entrepreneurship -its contribution in and role in the growth and development of individual and the nation
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture

Course Outcomes:
On completion of the course, student will be able to :

1. Understand the concept of Entrepreneurship
2. Assess how entrepreneurship can help shape one's career
3. Differentiate between various types of entrepreneurs
4. Identify different and your own personality type to become an entrepreneur
5. Appreciate the role of global and Indian innovations in entrepreneurial ventures

Unit I - Entrepreneurship -What, Why and How

Entrepreneurship –Concept, Functions, Need and Importance, Why Entrepreneurship For You, Myths about Entrepreneurship, Pros and Cons of Entrepreneurship, Process of Entrepreneurship, Startup and its stages, Entrepreneurship –The Indian Why be an Entrepreneur, Types of Entrepreneurs ,Competencies and characteristics: Ethical Entrepreneurship ,Entrepreneurial Values, Attitudes and Motivation ,Mindset of an employee and an entrepreneur difference , Intrapreneur: Importance in any organization Scenario

Unit II - Entrepreneurship Journey

Self-Assessment of Qualities, Skills, Resources and Dreams., Generation of Ideas., Business Ideas vs. Business Opportunities, Opportunity Assessment –Factors, Micro and Macro Market Environment, Feasibility Study , Business Plan Preparation, Execution of Business Plan ,Role of networking in entrepreneurship

Unit III – Entrepreneurship as Innovation and Problem Solving

Entrepreneurs -as problem solvers., Innovations and Entrepreneurial Ventures –Global and Indian, New Industries of New Age Economy, Role of Technology –E-commerce and Social Media, Social Entrepreneurship as Problem Solving-Concept and Importance,Risk Taking-Concept; types of business risks

Unit IV - Understanding the Market

Business Idea and Concept, Types of Business: Manufacturing, Trading and Services,Stakeholders: sellers, vendors and consumers and Competitors. Market Research -Concept, Importance and Process, Market Sensing and Testing, Business Model, Proof of Concept, Pricing and Factors affecting pricing. , Launch Strategies after pricing and proof of concept

Unit V – Introduction to Social Entrepreneurship

Profile of social entrepreneurs, Create your own profile of a social entrepreneur, Grounding in social entrepreneurship, Typology of ventures, Definitional disputes.Creating social change: The social value proposition and identifying a social business opportunity, Seizing social business opportunities, Social entrepreneurship profiles, Community asset mapping, Profile of a social entrepreneur: Dr. Venkataswamy, Aravind Eye Institute, India. Understanding poverty: The Sustainable Development Goals, The critical need to alleviate poverty, Ecosystem approach, The role of cooperatives in addressing poverty, Profile of a social organization: Grameen Bank. Profile of a social organization: IDEO, The role of mind mapping in creating solutions, Empowerment model: Partnering with targeted community.

Unit VI – The Business model: Creating a social business model

The role of the business model in starting a social venture, Equitable distribution of value, The role of the business model: The business model canvas, Social business model framework, Profile of a social entrepreneur: Husk Power Systems, Business model canvas exercise, Business model execution failure. Sustainable funding sources: Earned income, Profile of a social entrepreneur: Furniture Resource Centre, Traditional funding sources, Social investment funding sources, Investing in a social venture, Relationship building with donors and investors

Project Work

1. Identify a social problem and its impact
2. Visit and report of Industry or Case Study of the startup associated with the problem identify
3. Identifying possible solutions and analyzing them
4. Business Plan design

Text Books :

1. Udyamita (in Hindi) by Dr. MMP. Akhouri and S.P Mishra, pub. By National Institute for Entrepreneurship and Small Business Development (NIESBUD), NSIC-PATC Campus, Okhla
2. Everyday Entrepreneurs - The harbingers of Prosperity and creators of Jobs - Dr. Aruna Bhargava.
3. Bornstein, D. and Davis, S., *Social Entrepreneurship: What Everyone Needs to Know* (Oxford, Oxford University Press, 2010)
4. Social Entrepreneurship: The Art of Mission-Based Venture Development, by Peter C. Brinckerhoff.

Reference books:

1. Udyamita Samachar Patra (Monthly, Hindi), Pub. By centre for Entrepreneurship Development, M.P. (CEDMAP), 60 Jail Road, Jhangerbad, Bhopal-462008.
2. Science Tec. Entrepreneur (A Bi Monthly Publication), centre for Enterprenurship Development, M.P (CEDMAP), 60 Jail Road, Jhangerbad, Bhopal – 462008

In house value added training

National Service Scheme and Social Entrepreneurship (IE32175B3)

Teaching Scheme
Credits : 8
Lectures : 4 Hrs/week
Practical- 8Hrs/week
Tutorial:--

Examination Scheme
Formative assessment:50 marks
Summative assessment: 50 marks

Prerequisite:

Course Objectives:

- To equip social workers with generalist knowledge, values, and skills and to prepare competent professionals for entry level social work practice.
- To prepare social workers who understand and values social and economic justice while also respecting and appreciating diversity.
- To foster the student's social work identity including professional use of supervision and consultation, self-awareness.
- To prepare students with critical thinking skills in areas of practice, research, and ethics to help ensure success in graduate social work programs.
- Developing creative solutions to address social problems.
- Learning the process and skills of creation and management of social entrepreneurial venture.

Course Outcomes:

On completion of the course, students will be able to

1. understand the community in which they work to gain skills in mobilising community participation
2. identify the needs and problems of the community and involve them in problem-solving
3. develop among themselves a sense of social and civic responsibility
4. utilise their knowledge in finding practical solutions to individual and community problems
5. Identify innovative solution for identified problems
6. Appreciate the role of global and Indian innovations in social entrepreneurial ventures.

Unit 1: Introduction to NSS and development of Life competencies

Orientation and structure of NSS, The history of NSS, Objectives, Symbol and meaning, NSS hierarchy from national to college level, Roles and responsibility of various NSS functionaries. Definition and importance of Life Competencies, Four aspects of development – Physical, Mental, Social, and Moral, Qualities of constructive leadership, Rapport building with community and role of leadership.

Unit 2: Basic social issues in India and Benefits of Village adoption programme

Degeneration of value system, family system, Gender issues ,Regional imbalance, Problems of Rural areas, Approaches and strategies in adopting a village with special reference to involving people participation in N.S.S. Activities, Govt. and Non Government agencies, political and village leadership for effective implementation of N.S.S. programme and activities in adopted villages

Unit 3: Health, Hygiene and Sanitation

Definition, need and scope of health education, Food and nutrition, Safe Drinking water ,water Borne Diseases and sanitation(Swachh Bharat Abhiyan),national health programme, Reproductive Health

Unit 4: Youth Health and Yoga

Healthy Lifestyles, Aids, HIV, Drugs, Substance abuse, Home Nursing, First aid, Different Yoga Traditions and Their impact, Yoga as a tool for healthy Lifestyle

Unit 5: The Business model: Creating a social business model

Profile of social entrepreneurs, Create your own profile of a social entrepreneur, The role of the business model in starting a social venture, Equitable distribution of value, The role of the business model: The business model canvas, Social business model framework, Profile of a social entrepreneur: Husk Power Systems, Business model canvas exercise, Business model execution failure.

Unit 6 : Funding social ventures: Strategies for success

Sustainable funding sources: Earned income, Profile of a social entrepreneur: Furniture Resource Centre, Traditional funding sources, Social investment funding sources, Investing in a social venture, Relationship building with donors and investors.

Students will work on a particular problem at the respective area.

i) Plantation of trees, their preservation and upkeep
(ii) Creation of NSS parks/gardens.
(iii) Construction & maintenance of village streets, drains, etc. so as to keep the environment clean;
(iv) Construction of sanitary latrines etc.
(v) Cleaning of village ponds and wells;
(vi) Popularization and construction of Gobar Gas Plants, use of non-conventional energy;
(vii) Environmental sanitation and disposal of garbage & composting;
(viii) Prevention of soil erosion, and work for soil conservation,
(ix) Watershed management and wasteland development
(x) Organic farming

SOCIAL ENTREPRENEURSHIP

(i) Visit and report of Industry or Case Study of the startup associated with the problem identify
(ii) Identifying possible solutions and analyzing them
(iii)Design a business Plan

Text Books :

1. Rural Housing: Policies and Practices by Bhaskar Majumder | 1 December 2007
2. Singh Surendra and Srivastava S. P. (ed) 2005), Social Work Education in India, Challenge and opportunities, New Royal Book Publications, Lucknow
3. Bornstein, D. and Davis, S., *Social Entrepreneurship: What Everyone Needs to Know* (Oxford, Oxford University Press, 2010)

Reference Books :

1. Dr. Desai A.R. : Rural Sociology in India
2. Siddiqui, H.Y.2015, Social Work and Human Relations,Rawat Publications, Jaipur.
3. Raising the Bar : Integrity and Passion in Life and Business: The Story of Clif Bar, Inc., By Gary Erickson

ANNEXURE I

Department of Civil Engineering

(Value Added Courses/ / Industrial Training) Report on

(Title)

By:

(Name)----------

(Roll No)----------

Semester I/II

For the partial fulfillment of B. Tech. degree in (Civil Engineering)

of

Under guidance of

(Name of Guide/ Company)

20 - 20

CERTIFICATE

This is to certify that the In House Value Added Training/ Industrial Training Report entitled "_____ _____" is submitted by_____bearing Roll No_____for the partial fulfillment of B.Tech. degree in (Civil Engineering) of Savitribai Phule Pune University, Pune.

Guide **Guide**

Head of Department **Director**

External Examiner