SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)
SreeSainath Nagar, Tirupati

Department of Civil Engineering

Supporting Document for 1.1.2

Syllabus Revision carried out in 2019

Program: B.Tech.-Civil Engineering

Regulations: SVEC-19

This document details the following:

1. Courses where syllabus has been changed 20% and more.
2. Course-wise revised syllabus with changes highlighted.

Note: *For SVEC-19 revised syllabus, SVEC-16 (previous syllabus) is the reference.*

List of Courses where syllabus has been changed (20% and more)

S.No.	Course Code	Name of the course	Percentage of Syllabus changed	Page Number in which Details are Highlighted
1.	19BT20102	Engineering Mechanics	40	4
2.	19BT30101	Construction, Planning and Project Management	38	8
3.	19BT30102	Fluid Mechanics	42	13
4.	19BT30103	Mechanics of Solids	40	17
5.	19BT40101	Engineering Hydrology	30	22
6.	19BT40102	Environmental Engineering	34	27
7.	19BT40103	Hydraulic Engineering	50	32
8.	19BT40107	Sustainable Engineering	100	36
9.	19BT40131	Environmental Engineering Lab	26	38
10.	19BT1AC01	Spoken English	100	40
11.	19BT1BS02	Biology for Engineers	100	42
12.	19BT1HS01	Communicative English	20	44
13.	19BT1BS04	Engineering Chemistry	50	48
14.	19BT1BS32	Engineering Chemistry Lab	25	54
15.	19BT2BS02	Applied Physics	100	58
16.	19BT2BS31	Applied Physics lab	100	60
17.	19BT2BS01	Transformation Techniques and Linear Algebra	20	62
18.	19BT4BS01	Material Science	100	67
19.	19BT4HS05	Gender & Environment	100	69
20.	19BT4HS09	Life Skills	100	72
21.	19BT4HS11	Professional Ethics	100	74
22.	19BT4HS12	Women Empowerment	100	76
23.	19BT10201	Basic Electrical and Electronics Engineering	100	78
24.	19BT10231	Basic Electrical and Electronics Engineering Lab	100	80
25.	19BT10501	Programming for Problem Solving	100	82
26.	19BT10531	Programming for Problem Solving Lab	100	84
27.	19BT315AC	Design Thinking	100	86
28.	19BT50409	Green Technologies	35	88
29.	19BT50104	Transportation Engineering	20	91
30.	19BT50105	Construction Equipment and Automation	100	96
31.	19BT50106	Pipeline Engineering	100	99

S.No.	Course Code	Name of the course	Percentage of Syllabus changed	Page Number in which Details are Highlighted
32.	19BT50133	Socially Relevant Project-1	100	101
33.	19BT503AC	Foundations of Entrepreneurship	100	102
34.	19BT6HS02	Organizational Behavior	100	103
35.	19BT60102	Advanced Structural Analysis	40	103
36.	19BT60103	Advanced Surveying	25	106
37.	19BT60107	Urban Stormwater Management	100	111
38.	19BT60108	Railway Engineering	100	114
39.	19BT60114	Solid and Hazardous Waste Management	20	116
40.	19BT60115	Transportation Planning and Management	20	120
41.	19BT60120	Land Survey and Real Estate Development	100	126
42.	19BT60122	Sustainable Water Resources Development	100	128
43.	19BT60343	Thermodynamics and Heat Transfer	100	128
44.	19BT60124	Intelligent Transportation Systems	100	129
45.	19BT60125	Smart Materials and Structures	100	131
46.	19BT61531	Internet of Things (IoT) Lab	100	133
47.	19BT60132	Socially Relevant Project-2	100	134
48.	19BT5MC01	Universal Human Values	100	135
49.	19BT70105	Environmental Hydraulics	100	137
50.	19BT70108	River Engineering and River Basin Management	100	139
51.	19BT70110	Analysis and Design of Composite Structures	100	142
52.	19BT70112	Civil Infrastructure for Smart City Development	100	143
53.	19BT70114	Geotechnics for Underground Structures	100	145
54.	19BT70115	Traffic Engineering and Management	100	150
55.	19BT701AC	Spread Sheet Applications in Civil Engineering	100	152
		Average%(A)	77.72	
		Total No. of Courses in the Program**(T)**	136	
		No. of Courses where syllabus (more than 20%) has beenchanged**(N)**	55	-
		Percentage of syllabus content change in the courses **(C)=(A x N)/100**	42.76	
		Percentage of Syllabus changed in the Program(P)=C/T x 100	**31.43**	

DEAN (Academics)

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SREE VIDYANIKETHAN ENGINEERING COLLEGE
Sree Sainath Nagar, A. RANGAMPET
CHITTOOR (DT.)-517 102, A.P.

PRINCIPAL

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(AUTONOMOUS)
Sree Sainath Nagar, A. RANGAMPET
Chittoor (Dist.) - 517 102, A.P., INDIA.

I B. Tech. – II Semester

(19BT20102) **ENGINEERING MECHANICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: -

COURSE DESCRIPTION: Statics of Particles and Rigid Bodies; Support Reactions; Analysis of Perfect Frames; Friction; Centroid, Centre of Gravity and Moment of Inertia; Simple Stresses and Strains; Thin and Thick Cylinders.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze engineering problems related to statics of particles and rigid bodies; friction; sectional properties; simple stresses and strains, for effective solutions.

CO2. Design cylinders for different engineering applications ensuring safety.

DETAILED SYLLABUS:

UNIT – I: STATICS (10 Periods)

Statics of Particles: Basic concepts, System of units, System of concurrent coplanar forces in plane, Resultant of forces, Laws of mechanics, Equilibrium of forces, Lami's theorem, Vectorial representation of forces.

Statics of Rigid Bodies: Moment of a force, Varignon's theorem, Moment of a couple, Vectorial representation of moments and couples, Coplanar non-concurrent forces, Equilibrium of rigid bodies, Types of supports and loads, Types of frames, Perfect frame analysis, Method of joints, Method of sections, Principle of virtual work.

UNIT – II: FRICTION (8 Periods)

Frictional force, Types of friction, Laws of friction, Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Applications: Body on horizontal/inclined plane, Two bodies in contact, Ladder friction, Wedge friction.

UNIT – III: CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA (09 Periods)

Centroids of simple and composite areas, Centre of gravity of bodies, Theorems of Pappus and Guldinus, Parallel axis and perpendicular axis theorems, Moment of Inertia of Composite areas, Radius of gyration – Section modulus, Mass Moment of Inertia of simple and composite masses.

UNIT – IV: SIMPLE STRESSES AND STRAINS (10 Periods)

Elasticity and plasticity, Types of stresses and strains, Hooke's law, Stress-strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio, Volumetric strain, Types of elastic moduli and relations, Bars of varying section, Composite bars, Temperature stresses, Strain energy - Gradual, sudden and impact loadings, Simple applications.

UNIT – V: THIN AND THICK CYLINDERS (8 Periods)

Thin Cylinders: Thin cylindrical shells, Longitudinal and circumferential stresses; Hoop, Longitudinal and volumetric strains; Changes in dimensions of thin cylinders.

Thick Cylinders: Lame's theory, Distribution of hoop and radial stresses across thickness, Design of thick cylinders, Compound cylinders, Difference of radii for shrinkage.

Total Periods: 45

TEXT BOOKS:

1. S. S. Bhavikatti and K. G. Rajashekarappa, *Engineering Mechanics*, **New Age International (P) Ltd., 3rd edition, 2009.**
2. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *Mechanics of Materials*, Laxmi Publications Pvt. Ltd., 2001.

REFERENCE BOOKS:

1. *J. L. Meriam and L. G. Kraige, Engineering Mechanics: Statics (Vol. 1), Dynamics (Vol. 2), John Wiley & Sons Ltd., 5th edition, 2008.*
2. S. Rajasekaran and G. Sankarasubramanian, *Engineering Mechanics – Statics and Dynamics*, Vikas Publishing House Pvt. Ltd., 3rd edition, 2009.
3. Bhavikatti, S. S., *Strength of Materials*, Vikas Publishing House, 3rd edition, 2010.
4. Junnarkar, S. B. and Shah, H. J., *Mechanics of Structures – Vol. I (Strength of Materials)*, Charotar Publishing House Pvt. Ltd., 27th Revised and enlarged edition, 2008.

ADDITIONAL LEARNING RESOURCES:

1. Arthur P. Boresi and Richard J. Schmidt, *Engineering Mechanics - Statics and Dynamics,* Cengage Learning, 1st edition, Indian edition, 2008.
2. K. Vijaya Kumar Reddy and J. Suresh Kumar, *Singer's Engineering Mechanics - Statics and Dynamics*, BS Publications, 3rd edition, 2010.
3. S. Timoshenko, D. H. Young and J. V. Rao, *Engineering Mechanics*, Tata McGraw-Hill Education Pvt. Ltd., Revised 4th edition, Special Indian edition, 2007.
4. Rajput, R. K., *Strength of Materials (Mechanics of Solids)*, S. Chand & Company LTD, 5th edition, 2006.
5. Ramamrutham, S. and Narayanan, R., *Theory of Structures,* 9th edition, Dhanpat Rai Publishing Co. Ltd., 2014.
6. Basu, A. R., *Strength of Materials,*Dhanpat Rai & Co. (P) LTD., 2nd Revised edition, 2015.

I B. Tech. - II Semester
(16BT20102) **ENGINEERING MECHANICS**

(Common to CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	4	1	-	4

PRE-REQUISITES: Intermediate Mathematics and Physics.

COURSEDESCRIPTIONS:staticsofparticlesandrigidbodies;support reactions;analysisofperfectframes;friction;centroid,centreofgravity and moment of inertia; kinematics andkinetics.

COURSE OUTCOMES:

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

CO1: Apply the knowledge of engineering mechanics fundamentalstothesolutionsofbasicengineeringproblems.

CO2: AnalyzeMulti-body systems under equilibrium and dynamic conditions.

- Systems involving dry friction and computing the efficiency of the system of forces in frames under suitableassumptions.
- Sectional properties of surfaces andsolids.

CO3: Design sustainable solutions to complex engineering problems using first principles of engineering mechanics.

CO4: Exercise awareness to assess the safety of system related to engineeringmechanics.

CO5: Communicate effectively engineering and allied information through free body diagram.

CO6: Sustain interest in engineering mechanics to upgrade knowledge and skills through self learning concepts in mechanics.

Detailed Syllabus:

UNIT–I: STATICSOFPARTICLES (10Periods)

Basicconcepts,Systemofunits,Systemofconcurrentcoplanarforcesin plane,Resultantofforces,Lawsofmechanics,Equilibriumofforces,Lami'stheorem, Vectorial representation offorces.

UNIT–II:STATICSOFRIGIDBODIES (14Periods)

Moment of a force, Varignon'stheorem, Moment of a couple, Vectorial representationofmomentsandcouples,Coplanarnon-concurrentforces, Equilibriumofrigidbodies,Typesofsupportsandloads,Typesofframes, Perfectframeanalysis,Methodofjoints,Methodofsections,Principleof virtualwork.

UNIT–III:FRICTION (10Periods)

Frictionalforce,Typesoffriction,Lawsoffriction,Co-efficientoffriction, Angleoffriction,Angleofrepose,Coneoffriction,Applications:Bodyon horizontal/inclined plane, Two bodies in contact, Ladder friction, Wedge friction.

UNIT–IV:CENTROID,CENTREOFGRAVITYANDMOMENTOFINERTIA

(12Periods)

Centroids of simple and composite areas, centreof gravity of bodies, Theorems of Pappus and Guldinus, Parallel axis and perpendicular axis theorems, Moment of Inertia of Composite areas, Radius of gyration – Sectionmodulus,MassMomentofInertiaofsimpleandcompositemasses.

UNIT–V:KINEMATICSANDKINETICS (**14Periods)**

Kinematics of Particles

Rectilinear and Curvilinear motion, Velocity, Acceleration, Motion of a projectile, Relative motion.

Kinetics of Particles and Rigid Bodies

Kinetics of rectilinear motion, Newton's laws of motion, D'Alembert's principle,Work-energymethod,Impulse-momentumequation,Kineticsof circular motion,Rotation.

Total Periods: 60

TEXT BOOKS:

1. S.S.BhavikattiandK.G.Rajashekarappa,**EngineeringMechanics**, New Age International (P) Ltd., 3rdEdition,2009.
2. J. L. Meriam and L. G. Kraige**, Engineering Mechanics:Statics** (Vol. 1), **Dynamics** (Vol. 2), John Wiley & Sons Ltd., 5thEdition, 2008.

REFERENCE BOOKS:

1. Arthur P. Boresi and Richard J. Schmidt, **Engineering Mechanics - StaticsandDynamics**,CengageLearning,1stedition,IndianEdition, 2008.
2. S. Rajasekaranand G. Sankarasubramanian, **Engineering Mechanics – Statics and Dynamics**, Vikas Publishing House Pvt. Ltd., 3rdedition,2009.
3. K. Vijaya Kumar Reddy and J. Suresh Kumar, **Singer'sEngineering Mechanics - Statics and Dynamics**, BS Publications, 3rdedition,2010.
4. S.Timoshenko,D.H.YoungandJ.V. Rao,**EngineeringMechanics,** TataMcGraw-HillEducationPvt.Ltd.,Revised4thedition,SpecialIndian Edition,2007.

II B. Tech. – I Semester

(19BT30101)CONSTRUCTION, PLANNING AND PROJECT MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Course onCivil Engineering Materials and Concrete Technology

COURSE DESCRIPTION: Masonry and Foundations; Building Components; Finishings; Shoring; Scaffolding; Form Work; Organization and Resource Management; Project Management; Network Development; PERT and CPM.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Characterize masonry, foundations and building components using various tools and techniques besides communicating effectively in graphical form.

CO2 Analyze finishings, shoring, scaffolding and form work using various tools and techniques and through continuous learning considering safety, environment and sustainability.

CO3 Analyze organization and resource management through various tools and techniques in accordance with legislative laws and amendments in construction practice ensuring safety and sustainability.

CO4 Develop charts and event networks using appropriate tools and techniques for solving complex construction project management problems besides communicating effectively in graphical form.

CO5 Develop event networks for analyzing critical path by using CPM and PERT techniques and interpret various parameters for effective project management besides communicating effectively in graphical form.

DETAILED SYLLABUS

UNIT – I: MASONRY, FOUNDATIONSANDBUILDING COMPONENTS

(08 Periods)

Masonry and Foundations: Types of masonry, English and Flemish bonds, Rubble and ashlar masonry, Cavity walls, Partition walls, Foundations, Shallow foundations, Spread, Combined, Strap and mat footings.

Building Components: Lintels, Arches, Vaults, Stair cases, Different types of floors, Concrete, Mosaic, Terrazzo floors, Pitched, Flat and curved roofs, Lean–to–Roof, Coupled roofs, Trussed roofs, King and Queen post trusses, RCC Roofs, Madras Terrace/Shell Roofs.

UNIT - II: FINISHINGS, SHORING, SCAFFOLDING AND FORM WORK

(07 Periods)

Finishings: Damp proofing , Water proofing, Termite proofing, Fire proof materials used, Plastering, Pointing, White washing and distempering, Painting, Constituents of a paint, Types of paints, Painting of new/old wood, Varnish.

Shoring, Scaffolding and Form Work: Types, Erection methodology, Latest equipment, Safety precautions.

UNIT - III: ORGANIZATION AND RESOURCE MANAGEMENT (10 Periods)

Organization:Types, Merits and demerits of different types of organization, Labour legislation in India, Workmen's compensation act of 1923 and minimum wages act of 1948, and subsequent amendments, Safety in construction.

Resource Management:Manpower: Resource smoothing, Resource leveling, establishing workers productivity.***Materials:*** Objectives of material management, Costs, Functions of material management departments, ABC classification of materials, Inventory of materials, Material procurement, Stores management. ***Machinery:*** (Basics only) Classification of construction equipment, Earth moving Equipment, Excavation equipment, Hauling equipment, Earth compaction equipment, Hoisting equipment, Concreting plant and equipment, Selection of equipment, Task consideration, Cost consideration, Factors affecting the selection, Factors affecting cost owning and operating the equipment, Equipment maintenance.

UNIT - IV: PROJECT MANAGEMENTAND NETWORKDEVELOPMENT

(11 Periods)

Project Management:Project planning, Scheduling, Controlling, Role of decision in project management, Techniques for analyzing alternatives,Operation research, Methods of planning and programming problems, Development of bar chart-Illustrative examples, Shortcomings of bar charts and remedial measures; Milestone charts, Development of PERT network problems.

Network Development:Introduction, Event, Activity, Dummy, Graphical guidelines for network, Common partial situations in network, Numbering the events, Cycles problems, Planning for network construction, Modes of network construction, Steps in development ofnetwork, Work breakdown structure, Hierarchies, Illustrativeexamples.

UNIT – V: PERT AND CPM **(09 Periods)**

Network analyses, PERT, Slack, Critical path, Illustrative examples, Probability of meeting scheduled date problems, CPM process, CPM networks, Activity time estimate, Earliest event time, Latest allowable occurrence time, Combined tabular computations for T_E and T_L, Start and finish times of activity, Float, Critical activities and critical path, Resource allocation, leveling, Crashing, Illustrative examples.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. K. K. Chitkara, *Construction Project Management: Planning, Scheduling and Controlling*,3rd Edition, Tata McGraw Hill Education Pvt. Ltd.,2014.
2. B.C.Punmia, K.K. Khandelwal, *Project Planning and Control withPERT and CPM,*4thEdition, Lakshmi Publications (P). Ltd., 2010.

REFERENCE BOOKS:

1. Jha, *Construction Project Management,* 1st Edition, Pearson Publications, 2011.
2. R. Chudly, Roger Greno, Mike Hurst and Simon Topliss, *Construction Technology – Vol. I and Vol. II,* 5th Edition, Longman, 2011.
3. S. Seetharaman, *Construction Engineering and Management,* 3rd Edition, UmeshPublications, 2010.
4. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Building Construction,* 10thEdition, Laxmi Publications (P) Ltd., 2010.

ADDITIONAL LEARNING RESOURCES:

1. Srinath L. S., *PERT and CPM –Principles and Applications*, 3rd Edition, Affiliated East- West Press Pvt Ltd., New Delhi, 2001.
2. Chris Hendrickson and Tung Au, *Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders*, Prentice Hall, Pitsburgh, 2008.

II B.Tech. – I Semester

(16BT30101) **CONSTRUCTION PLANNING AND PROJECT MANAGEMENT**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Building Materials and Construction Technology.

COURSE DESCRIPTION: Construction planning and organization; Resource management - Manpower, Materials, Machinery; Project management; Elements and development of network; PERT and CPM.

COURSEOUTCOMES: Onsuccessfulcompletionofthiscourse, the students will be ableto:

CO1. Demonstrate the knowledge on construction planning and projectmanagement.

CO2. Identify critical activities and critical paths in a construction project and analyzenetworks.

CO3. Developthenetworkforanalyzingcriticalpathbyusing programmeevaluationtechniques.

CO4. Solve complex construction planning andmanagement problemsthroughproperinterpretationofdata.

CO5. Use appropriate tools and techniques for better constructionplanningandmanagement.

CO6. Planandmanageconstructionensuringsafety.

CO7. Useenvironmentallysustainableapproachinconstruction planning andmanagement.

CO8. Maintainethicsinconstructionplanningandmanagement followingrulesandregulations.

CO9. Plan,monitorandcontrolthefinanceincivilengineering construction.

DETAILED SYLLABUS

UNIT – I: CONSTRUCTION PLANNING AND ORGANIZATION(08 Periods) Basic concepts in the development of construction plans, Choice of technology and construction method, Planning for construction projects, Steps involved in planning, Types of plans, Stages of planning by different agencies, Types of organization, Labour legislation in India, Workmen's Compensation Act of 1923 and Minimum Wages Act of 1948, Subsequent amendments, Safety inconstruction.

UNIT–II:RESOURCEMANAGEMENT (10Periods)

Manpower: Resource smoothing, Resource leveling, Establishing labour productivity. **Materials:** Objectives of material management, Costs, Functions of material management departments, ABC classification of materials, Inventory of materials, Materialprocurement,Storesmanagement.

Machinery: Classification of construction equipment, Earth movingequipment,Excavation equipment, Hauling equipment, Earth compaction equipment, Hoisting equipment, Concretingplant and equipment, Selection of equipment, Task consideration, Cost consideration, Factors affecting the selection, Factors affecting cost owning and operating the equipment,Equipmentmaintenance.

UNIT–III:PROJECTMANAGEMENT (09Periods)

Projectplanning,Scheduling,Controlling,Roleofdecisioninproject management,Techniquesforanalyzingalternatives,Operationresearch, Methodsofplanningandprogrammingproblems,Developmentofbar chart,Illustrativeexamples,Shortcomingsofbarchartsandremedial measures,Milestonecharts,DevelopmentofPERTnetworkproblems.

UNIT– IV: ELEMENTS AND DEVELOPMENTOF NETWORK (09 Periods)

Introduction,Event,Activity,Dummy,Graphicalguidelinesfornetwork, Commonpartialsituationsinnetwork,Numberingtheevents,Cycles problems, Planning for network construction,Modes of network construction, Steps in development of network, Work breakdown structure,Hierarchies,Illustrativeexamples.

UNIT–V:PERTANDCPM **(09Periods)**

Networkanalyses,PERT,Slack,Criticalpath,Illustrativeexamples, Probabilityofmeetingscheduleddateproblems,CPMProcess,CPM Networks,Activitytimeestimate,Earliesteventtime,Latestallowable occurrencetime,CombinedtabularcomputationsforTEandTL,Start andfinishtimesofactivity,Float,Criticalactivitiesandcriticalpath, Resourceallocation,Leveling,Crashing,Illustrativeexamples.

Total Periods: *45*

TEXTBOOKS:

1. K. K. Chitkara, *Construction Project Management:Planning, SchedulingandControlling*,TataMcGraw-HillEducationPvt.Ltd., 3rd Edition,2014.
2. B.C.PunmiaandK.K.Khandelwal,*ProjectPlanningandControlwithPERTandCPM,*LakshmiPublications(P).Ltd.,4thEdition, 2010.

REFERENCEBOOKS:

1. ChrisHendricksonandTungAu,*ProjectManagementfor Construction – Fundamentals Concepts for Owners,Engineers,ArchitectsandBuilders*,PrenticeHall, Pitsburgh,2008.
2. Jha,*ConstructionProjectManagement,*PearsonPubilications, 2011.
3. S.Seetharaman,*ConstructionEngineeringandManagement,* Umesh Publications, 3rd Edition, 2010.
4. R.Chudly,RogerGreno,MikeHurstandSimonTopliss, *ConstructionTechnology,*Vol.IandVol.II,Longman,5thEdition, 2011.

II B. Tech. – I Semester

(19BT30102) **FLUID MECHANICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE - REQUISITES: Applied Physics

COURSE DESCRIPTION: Fluid properties and fluid statics; Fluid kinematics; Fluiddynamics; Closed conduit flow and flow measurement; Laminar and turbulent flows; Hydraulic similitude and model analysis.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze fluid properties and fluid statics to solve complex problems using appropriate techniques.
CO2 Analyze fluid flows and forces in fluid kinematics and dynamics using appropriate techniques for solving complex fluid flow problems
CO3 Analyze conduit flow and its measurement to solve complex fluid flow problems using appropriate tools and techniques following latest developments.
CO4 Design pipes and piping systems to solve complex conduit flow problems suing appropriate techniques.
CO5 Analyze laminar and turbulent flows to solve complex fluid flow problems using appropriate techniques.
CO6 Analyze problems associated with hydraulic similitude and model studies to solve complex fluid mechanics problems using appropriate techniques.

DETAILED SYLLABUS:

UNIT –I:**FLUID PROPERTIES AND FLUID STATICS (09 periods)**

Dimensions and units, Physical properties of fluids, Pressure at a point, Pascal's law, Hydrostatic law;Atmospheric, gauge and absolute pressures; Measurement of pressure, Manometers, Hydrostatic forces on submerged plane and curvedsurfaces – Centre of pressure on plane and curved surfaces, Buoyancy, Centre of Buoyancy, Stability of floating bodies.

UNIT-II: FLUID KINEMATICS AND DYNAMICS (09 periods)

Fluid Kinematics*:*Description of fluid flow, Stream line, Path line and streak line, Stream tube, Classification of flows, Equation of continuity, Stream and velocity potential functions, Flownet and its uses.

Fluid Dynamics*:*Surface and body forces, Euler's Equation, Bernoulli's equation for flow along a stream line and its applications,Vortex flows, Momentum equation and its application, Forces on pipe bend, Moment of momentum equation and its application, Torque on Sprinklers.

UNIT- III:CLOSED CONDUIT FLOW AND FLOW MEASUREMENT (08 periods)

Laws of fluid friction,Major loss,Darcy–Weisbach equation, Minor losses, Pipes in series, Pipes in parallel, Total energy line and hydraulic gradient line, Venturimeter, Orificemeter, Pitot tube, Orifices and mouthpieces, Notches and weirs, Latest flow measuring devices.

UNIT- IV:LAMINAR AND TURBULENT FLOW (09 periods)

Reynolds's experiment, Characteristics of laminar and turbulent flows, Laminar flow through circular pipes, Hagen Poiseuille equation, Flow between parallel plates, Hydro dynamically smooth and rough boundaries, Moody's chart.

UNIT- V:HYDRAULIC SIMILITUDEAND MODEL ANALYSIS (10 periods)

Dimensional analysis,Rayleigh's method and Buckingham's pi theorem, Model studies, Similarities - Geometric, kinematic and dynamic similarities; Dimensionless numbers, Model laws,Types of model, Distorted and undistorted model, Resistance on floating and submerged bodies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. R. K. Rajput, *A Textbook of Fluid Mechanics*, S. Chand Publishers, 5th Edition, 2013.
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publishers, 9th Edition, 2011.

REFERENCE BOOKS

1. P. N. Modi and S. M. Seth, *Hydraulics and Fluid Mechanics Including Hydraulic Machines*, Standard Book House, 20th Edition, 2011.
2. J. F. Douglas, J.M. Gaserek and J.A. Swaffirld, *Fluid Mechanics,* 5th Edition, Longman, 2010.
3. S. K. Som and G. Biswas, *Introduction to Fluid Machines*, Tata McGraw–Hill Publishers Pvt. Ltd, 2nd Edition, 2010.
4. Domkundwar and Domkundwar, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Dhanpat Rai and Co, 6th Edition, 2014.

ADDITIONAL LEARNING RESOURCES

1. Streeter, V. L., Wylie, E. B. and Bedford, K. W., *Fluid Mechanics*, McGraw Hill Book Company, New York, 9th Edition, Indian Edition, 2017.
2. Frank M White, *Fluid Mechanics,* McGraw Hill, 8thEdition, 2016.
3. S. Mukhopadhyay, *Textbook of Fluid Mechanics,*CBS Publishers, 1stEdition, 2014.

II B.Tech. – I Semester

(16BT30102) FLUID MECHANICS AND HYDRAULIC MACHINERY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Mechanics, Multi–Variable Calculus and Differential Equations.

COURSE DESCRIPTION: Properties of fluids and pressure measurement; Hydrostatic forces; Fluid kinematics; Fluid dynamics;Closedconduitflow;Measurementofflow;Laminar and Turbulent flow; Hydraulic similitude and Model testing; Boundary layer theory; Open channel flow; Impact of jets; Hydraulic turbines;Centrifugal pumps.

COURSEOUTCOMES: Onsuccessfulcompletionofthiscourse, the students will ableto:

CO1 Demonstrate the knowledge on basic properties of fluids, classification of flows and hydraulic machinery.

CO2Analyze fluids, flows and forces in hydraulics.

CO3Design piping systems, open channels and hydraulic machinery.

CO4 Address the problems and faults in the prototype preparationusingthemodelanalysisandprovidesuitable solutions.

CO5 Use of flow and pressure measurement devices in channels and hydraulic machinery.

CO6 Consider safety issues in the analysis and design of channels, pipes and hydraulic machinery.

DETAILED SYLLABUS:

UNIT - I: PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS

(09Periods)

Dimensionsandunits,Physicalpropertiesoffluids,Pressureat apoint,Pascal'slaw,Hydrostaticlaw,Atmospheric,gaugeand absolute pressures, Measurement of pressure, Manometers andmechanicalgauges,Hydrostaticforcesonsubmergedplane surfaces, Total pressure and centre of pressure on plane and curved surfaces, Buoyancy, Centre ofbuoyancy.

UNIT - II: FLUID KINEMATICS AND DYNAMICS (08Periods)

Descriptionoffluidflow,Streamline,Pathlineandstreakline, Stream tube, Classification of flows, Equation of continuity, StreamandVelocitypotentialfunctions,Flownetanditsuses, Surface and body forces, Euler's and Bernoulli's equations, derivation, Practical applications, Momentum equation anditsapplication,OrificesandMouthpieces,NotchesandWeirs,Latest velocity measuring devices, Introduction to boundary layer, Separation andprevention.

UNIT - III: CLOSED CONDUIT FLOW AND HYDRAULIC SIMILITUDE

(09Periods)

Laws of fluid friction, Darcy–Weisbach equation, Minor losses, Pipesinseries,Pipesinparallel,TotalenergylineandHydraulic gradient line, Moody's chart, Dimensional analysis, Rayleigh's methodandBuckingham's□theorem,Modelstudies,Geometric, kinematicanddynamicsimilarities,Dimensionlessnumbers,Model laws, Scale effects, Flow around submerged bodies, Drag and lift.

UNIT-IV:OPENCHANNELFLOW (09Periods)

Typesofflows,Typesofchannels,Velocitydistribution,Chezy's, Manning'sandBazin'sformulaeforuniformflow,MostEconomical sections, Critical flow, Specific Energy, Critical depth, Computation of critical depth, Critical, subcritical and supercritical flows, Non uniform flow, Dynamic equation for

graduallyvariedflow,Typesofslopes,Surfaceprofiles,Rapidly variedflow,Hydraulicjumpanditsapplications.

UNIT-V:TURBINESANDPUMPS (10Periods)

Jet on plane and curved surfaces, Classification of turbines, Pelton wheel, Francis turbine, Kaplan turbine, Working proportions, Velocity diagrams, Work done and efficiency, Hydraulic design, Draft tube theory, Governing of turbines, Specificspeed,Performancecharacteristics,Geometricsimilarity, Cavitation, causes, effects, Pump, Classification of centrifugal pumps, Work done, Minimum starting speed, Specific speed, Multistagepumps,Pumpsinparallelandseries,Performanceof pumps, Characteristic curves, Net positive suctionhead(NPSH).

Total Periods:45

TEXT BOOKS:

1. R. K. Rajput, *A Textbook of Fluid Mechanics*, S. Chand Publishers,5thEdition,2013.
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publishers, 9th Edition,2011.

REFERENCEBOOKS:

1. P.N.ModiandS.M.Seth,*HydraulicsandFluidMechanics IncludingHydraulicMachines*,StandardBookHouse,20th Edition,2011.
2. J. F. Douglas, J.M. Gaserek and J.A. Swaffirld, *Fluid Mechanics,*5thEdition,Longman,2010.
3. S.K.SomandG.Biswas,*IntroductiontoFluidMachines*, TataMcGraw–HillPublishersPvt.Ltd,2ndEdition,2010.
4. Domkundwar and Domkundwar, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Dhanpat Rai and Co, 6th Edition,2014.

II B.Tech. – I Semester

(19BT30103) MECHANICS OF SOLIDS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: Course onEngineering Mechanics

COURSE DESCRIPTION: Shear force and bending moment; Stresses in beams; Combined direct and bending stresses; Torsion; Springs; Principalstresses and strains; Theories of failures; Columns and struts.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Analyze shear force and bending moment distributions for determinate beams with different loadings to solve complex structural analysis problems besides communicating effectively in graphical form.

CO2. Design beams considering bending stresses, shear stress, strain energyand theories of failurestosolve complex problems ensuring safety besides communicating effectively in graphical form.

CO3. Analyze direct and bending stresses for columns and chimneys ensuring safety besides communicating effectively in graphical form.
CO4. Design shafts and springs tosolve complex problems ensuring safety.
CO5. Analyze principal stresses and strains for bars and beams ensuring safety besides communicating effectively in graphical form.
CO6. Analyze columns and struts for critical loads using appropriate methods ensuring safety.

DETAILED SYLLABUS:

UNIT – I: SHEAR FORCE AND BENDING MOMENT (09Periods)

Types of beams, Supports andloads, Concept of shear force and bending moment, SF and BM diagrams - Cantilever, Simply supported, Overhanging beams subjected to point loads, Uniformly distributed load, Uniformly varying load and its combination, Point of contraflexure, Relation between SF and BM, Rate of loading at a section of beam.

UNIT–II: STRESSES IN BEAMS, DIRECT AND BENDING STRESSES

(09 Periods)

Stresses in Beams: Theory of simple bending, Basic bendingequation, Neutral axis, Bending stresses, Section modulus of different cross sections, Design of simple beam sections, Strain energy due to bending, Basic shear stress equation, Shear stress distribution for different cross sections, Strain energy due to shear.

***Direct and Bending Stresses*:**Stresses under the combined action of direct loading and bending moment, Core of a section, Stresses in chimneys, Conditions for stability, Stresses due to direct loading and bending moment about both axes.

UNIT – III: TORSION AND SPRINGS (09 Periods)

***Torsion*:** Theory of pure torsion, Torsional equation, Torsional moment of resistance, Polar section modulus, Power transmitted by shafts;combined bending, torsion and end thrust; Design of shafts.

***Springs*:** Deflection of close and open coiled helical springs under axial load and axial twist, Springs in series and parallel.

UNIT – IV: PRINCIPAL STRESSES AND STRAINS & THEORIES OF FAILURE

(10 Periods)

Principal Stresses and Strains: Stresses on an inclined planeunder axial loading, Compound stresses, Normal and tangential stresses on an inclined plane for biaxial stresses, Two perpendicular normal stresses accompanied by a state of simple shear, Mohr's circle of stresses, Triaxial state of stresses, Principal stresses and strains.

Theories of Failure: Maximum principal stress theory, Maximum principal strain theory, Maximum shear stress theory, Maximum strain energy theory, Maximum shear strain energy theory.

UNIT – V: COLUMNS AND STRUTS (08 Periods)

Short, medium and longcolumns, Axially loaded compression members, Euler's theorem for long columns, Euler's critical load, Equivalent length of a column, Slenderness ratio, Limitations of Euler's theory, Rankine–Gordon formula, Long columns subjected to eccentric loading.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *Mechanics of Materials*, Laxmi Publications Pvt. Ltd.,2001.
2. Bhavikatti, S. S., *Strength of Materials*, Vikas Publishing House,3rd Edition, 2010.

REFERENCES:

1. Rajput, R.K., *Strength of Materials(Mechanics of Solids),* S. Chand & Company LTD,5th Edition, 2006.
2. Basu, A. R., *Strength of Materials,* Dhanpat Rai & Co. (P) Ltd., 2nd Revised Edition, 2015.
3. Junnarkar, S. B. and Shah, H. J., Mechanics of Structures– Vol. I (Strength of Materials), Charotar Publishing House Pvt. Ltd.,27th Revised and Enlarged Edition, 2008.
4. Khurmi, R. S., Strength of Materials, S. Chand & Company Ltd.,23rd Edition, 2005.

ADDITIONAL LEARNING RESOURCES:

1. T. D. Gunneswara Rao and Mudimby Andal, *"Strength of Materials: Fundamentals and Applications*, Cambridge University Press, 1stEdition, 2018.
2. Bansal, R. L., *Strength of Materials*, Laxmi Publications (P) Ltd., 4th Revised Edition, 2010.
3. Stephen H. Crandall, Norman C. Dahi, Thomas J. Lardner and Sivakumar M. S., *An Introduction to the Mechanics of Solids*, Tata McGraw-Hill Education Pvt. Ltd., 2nd Revised Edition, 2012.
4. S. Timoshenko.,*Strength of Materials*, CBS Publishers & Distributors Pvt. Ltd., Revised 3rdEdition, Special Indian Edition, 2004.
5. Ryder, G. H., *Strength of Materials,* Macmillan Publishers India Limited, 3rd Edition, Special Indian Edition, 2002.
6. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, DhanpatRai Publishing Co. Ltd., 9thEdition, 2014.

II B.Tech. – I Semester

(16BT30103) **MECHANICS OF SOLIDS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Course on Engineering Mechanics

COURSE DESCRIPTION: Simple stresses and strains;Strain energy;Shearforceandbendingmoment;Stressesinbeams; Combined direct and bending stresses; Torsion; Springs;Thin cylinders; Thickcylinders.

COURSEOUTCOMES: Onsuccessfulcompletionofthiscourse, the students will be ableto

CO1. Acquire the knowledge on simple stresses and strains, shear force, bending moment, stresses in beams, torsion, springs, thin cylinders and thick cylinders.

CO2. Analyze bars, beams, shafts, springs and cylinders for stresses,strains,strainenergy,shearforceandbending momentdistributions.

CO3. Design beams, shafts, springs and cylinders for various loading conditions.

CO4. Solve complex engineering problems associated with beams, shafts, springs and cylinders through proper investigation and interpretation of stresses, strains, shear force and bending moment.

CO5. Use appropriate methods in analyzing bars, beams, shafts and cylinders.

CO6. Consider safety and stability issues in analyzing bars, beams, shafts, springs and cylinders.

DETAILED SYLLABUS:

UNIT–I:SIMPLESTRESSESANDSTRAINS (09Periods)

Elasticityandplasticity,Typesofstressesandstrains,Hooke's law,Stress-straindiagramformildsteel,Workingstress,Factor ofsafety,Lateralstrain,Poisson'sratio,Volumetricstrain,Types of elastic moduli and relations, Bars of varying section, Compositebars,Temperaturestresses,Strainenergy-Gradual, suddenandimpactloadings,Simpleapplications.

UNIT – II: SHEAR FORCE AND BENDING MOMENT (09 Periods)

Types of beams, Supports and loads, Concept of shear force andbendingmoment,SFandBMdiagrams-Cantilever,Simplysupported, Overhanging beams subjected to point loads, Uniformly distributed load, Uniformly varying load and its combination,Pointofcontra–flexure,RelationbetweenSFand BM, Rate of loading at a section ofbeam.

UNIT – III: STRESSES IN BEAMS, DIRECT AND BENDINGSTRESSES

(10Periods)

StressesinBeams:Theoryofsimplebending,Basicbending equation, Neutral axis, Bending stresses, Section modulus of differentcrosssections,Designofsimplebeamsections,Strain energy due to bending, Basic shear stress equation, Shear stress distribution for different cross sections, Strain energy due toshear.

Direct and Bending Stresses: Stresses under thecombined actionofdirectloadingandbendingmoment,Coreofasection, Stresses in chimneys, Conditions for stability, Stresses due to directloadingandbendingmomentaboutbothaxes.

UNIT–IV:TORSIONANDSPRINGS (09Periods)

Torsion: Theory of pure torsion, Torsional equation, Torsional momentofresistance,Polarsectionmodulus,Powertransmitted by shafts; Combined bending, torsion and end thrust; Design ofshafts.

Springs: Deflection of close and open coiled helical springs underaxialloadandaxialtwist,Springsinseriesandparallel.

UNIT–V:THINANDTHICKCYLINDERS (08Periods)

Thin Cylinders: Thin cylindrical shells, Longitudinal and circumferential stresses; Hoop, Longitudinal and volumetric strains; Changes in dimensions of thin cylinders.

ThickCylinders: Lame'stheory,Distributionofhoopandradial stressesacrossthickness,Designofthickcylinders,Compound cylinders,Differenceofradiiforshrinkage.

Total Periods: 45

TEXT BOOKS:

1. Punmia,B.C.,AshokKumarJainandArunKumarJain, *Mechanics of Materials*, Laxmi Publications Pvt.Ltd., 2001.
2. Bhavikatti,S.S.,*StrengthofMaterials*,VikasPublishing House,3rdEdition,2010.

REFERENCE BOOKS:

1. Rajput,R.K.,*StrengthofMaterials(MechanicsofSolids),*S. Chand & Company LTD, 5th Edition, 2006.
2. Basu, A. R., *Strength of Materials,* Dhanpat Rai &Co.(P) LTD., 2nd Revised Edition, 2015.
3. Junnarkar,S.B.andShah,H.J.,MechanicsofStructures– Vol.I(StrengthofMaterials),CharotarPublishingHouse Pvt.Ltd.,27thRevisedandEnlargedEdition,2008.
4. Khurmi,R.S.,StrengthofMaterials,S.Chand&Company Ltd., 23rd Edition,2005.

II B.Tech.– II Semester

(19BT40101) ENGINEERING HYDROLOGY

Internal Marks	External Marks	Total Marks	L	T	P	C
40	60	100	3	-	–	3

PRE-REQUISITES: Course on Fluid Mechanics

COURSE DESCRIPTION: Hydrologic cycle; Applications and history; Weather and seasons in India; Precipitation; Evaporation; Evapotranspiration; Runoff; Streamflow; Groundwater hydrology; Hydrograph analysis; Design flood; Erosion; Reservoir sedimentation.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze hydrologic cycle and precipitation to solve complex hydrology problems using appropriate techniques considering environment and sustainability besides communicating effectively in graphical form.

CO2 Analyze abstractions from Precipitation and runoff using appropriate tools and techniques for solving complex hydrology problems considering safety, environment and sustainability besides communicating effectively in graphical form.

CO3 Analyze groundwater hydrology to solve complex problems using appropriate tools and techniques following latest developments and considering safety, environment and sustainability besides communicating effectively in graphical form.

CO4 Analyze hydrographs using appropriate techniques to solve complex hydrology problems considering environment and sustainability besides communicating effectively in graphical form.

CO5 Design floods using appropriate techniques to solve flood routing problems following ethics and considering safety, environment and sustainability besides communicating effectively in graphical form.

CO6 Analyze erosion and reservoir sedimentation to solve complex problems using appropriate techniques and considering safety, environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT- I: HYDROLOGY AND PRECIPITATION (09Periods)

Scope of hydrology, Hydrologic cycle, Practical applications and historical development; *Precipitation*-Types and forms, Weather and seasonsin India, Measurement of rainfall; Recording and non-recording rain gauges, Errors, Analysis

and interpretation of rainfall data, Methods of calculation of mean precipitation over an area.

UNIT -II: ABSTRACTIONS FROM PRECIPITATION AND RUNOFF (09Periods)

***Abstractions from Precipitation*:** Process, Factors, Estimation, Methods of reduction of evaporation**,** Evapotranspiration - Factors, Measurement, Estimation, Penman Monteith method;Infiltration – Process, Factors, Double ring infiltrometer, Infiltration equation and indices, Interception, Horton's equation and Green Ampt method.

Runoff: Components, Factors, Rainfall–runoff relationships, Flow mass curve, Flow duration curve, Mass curve of rainfall, Hyetograph, Double mass curve; Streamflow - Concept, Measurement, Stage, Discharge - Area velocity method, Moving boat method.

UNIT - III: GROUNDWATER HYDROLOGY (09Periods)

Occurrence and movement of groundwater, Darcy's law and its application, Types and properties of aquifers, Conjunctive use and it's necessity; Confined and unconfined flow equations; Well hydraulics - Steady and unsteady flow, Well losses, Specific capacity, Pumping and recuperation test; Pollution of groundwater - Sources, Seawater intrusion; Artificial recharge techniques, Groundwater exploration – Methods, Latest developments.

UNIT - IV: HYDROGRAPH ANALYSIS AND DESIGN FLOOD(10 Periods)

Components of hydrograph, Unit hydrograph, Derivation, Use and limitation of unit hydrograph, Design flood – Estimation of peak discharge, Methods - Envelope curves, Empirical formulae, Rational method, Unit hydrograph method, S-Curve unit hydrograph, Frequency analysis, Gumbel's and log Pearson Type III methods; Flood routing–Concepts of flow routing, hydraulic and hydrologic routing, Reservoir routing, Channel routing, Muskingum's method.

UNIT - V: EROSION AND RESERVOIR SEDIMENTATION(08 Periods)

Erosion process, Estimation of sheet erosion, Channel erosion, Movement of sediment from watersheds, Sediment yield from watersheds, Trap efficiency, Density of sediment deposits, Distribution of sediment in reservoir, Life of a reservoir, Reservoir sedimentation control, Erosion and reservoir sedimentation problems in India.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. K. Subramanya, *Engineering Hydrology*, Tata McGraw–Hill Education Pvt. Ltd., 4th Edition, 2013.
2. P. Jaya Rami Reddy, *A Text Book of Hydrology,*University Science Press, An Imprint of Laxmi Publications Pvt. Ltd., 3rd Edition, 2011.

REFERENCE BOOKS:

1. H. M. Raghunath, *Ground Water,* Wiley Eastern Ltd., 3rd Edition, 2009.
2. David Keith Todd, *Groundwater Hydrology,* Wiley India Pvt. Ltd., 2nd Edition, 2010.
3. V. T. Chow., *Hand Book of Applied Hydrology,* Mc Graw–Hill Education Pvt. Ltd., 2nd Edition, 2000.
4. C. S. P. Ojah, R. Berndtsson, P. Bhunya, *Engineering Hydrology,* Oxford Higher Education, 5th Edition, 2008.

ADDITIONAL LEARNING RESOURCES

1. V.P. Singh, *Handbook of Applied Hydrology*, McGraw Hill Education, 2nd Edition, 2016.
2. Santosh Kumar Garg, *Water Resources Engineering (Vol. I): Hydrology, Flood Control and Groundwater Engineering,* Khanna Publishers, Delhi, 25th Revised Edition, 1973.
3. Murthy, V.V.N. and Madan Kumar Jha, *Land and Water Management Engineering*, Khalyani Publishers, New Delhi,5th Edition, 2013.
4. **Ray K. Linsley, Max Adam Kohler and Joseph L. H.,** *Hydrology for Engineers*, McGraw-Hill Series in Water Resources and Environmental Engineering, McGraw-Hill Education, 3rd Edition, SI Metric Edition, 1988.

II B.Tech.– II Semester
(16BT40103) **ENGINEERING HYDROLOGY**

Internal Marks	External Marks	TotalMarks	L	T	P	C
30	70	100	3	1	–	3

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery

COURSE DESCRIPTION: Hydrologic cycle; Applications and history; Wea ther and seasons in Ind ia; P recipitat ion; Evaporati on; Evapotranspiration; Runoff; Groundwater hydrology; Hydrograph analysis; Design flood; Erosion; Reservoir sedimentation.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Acquirethebasicknowledgeonsurfaceandgroundwater hydrology.

CO2. Analyze problems associated with surface and groundwater hydrology.

CO3. Design of floods using Muskingum'smethod.

CO4. Provide solutions for complex engineering problems in hydrology through proper interpretationdata.

CO5. Use appropriate techniques for solving issues related to hydrology

CO6.Addressthesafetyissuesinfloodrouting,erosionandreservoir sedimentation.

CO7.Understandtheeffectoferosionandreservoirsedimentation on the e nvironmentand prov ide solutionst oensure environmentalsustainability.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO HYDROLOGY AND PRECIPITATION (09Periods)

Scopeofhydrology,Hydrologiccycle,Practicalapplicationsandhistorical development,Precipitation-Typesandforms,Weatherandseasonsin India,Measurementofrainfall,Recordingandnonrecordingtypeof raingauges,Errorsinmeasurement,Analysisandinterpretationof rainfalldata,Methodsofcalculationofmeanprecipitationoveranarea.

UNIT-II:EVAPORATIONANDINFILTRATION (09Periods)

Process of evaporation, Factors affecting evaporation, Estimation, Methods of reduction, Factors affecting infiltration, Infiltrationequationand indices, Interception, Evapotranspiration - Factors affecting, Measurement.

UNIT - III: RUNOFF AND GROUNDWATER HYDROLOG (09 Periods)

Components,Factorsaffectingrunoff,Rainfall–runoffrelationships,Flow masscurve,Flowdurationcurve,Masscurveofrainfall,Hyetograph, Doublemasscurve,Streamflowmeasurement–Stage,Discharge-Areavelocitymethod,Movingboatmethod,Currentmeter,Floatmethod; Groundwater hydrology - Steady state well hydraulics and aquifers, Application of Darcy'slaw.

UNIT - IV: HYDROGRAPH ANALYSIS AND DESIGN FLOOD (09 Periods)

Components of hydrograph, Unit hydrograph, Derivation, Use and limitationofunithydrograph,Flood–Methods,Envelopecurves,Empirical formulae, Rational method, Unit hydrograph method, S-Curve unit hydrograph,Frequencyanalysis,Floodrouting–Muskingum'smethod.

UNIT-V:EROSIONANDRESERVOIRSEDIMENTATION (09Periods)

Erosionprocess,Estimationofsheeterosion,Channelerosion,Movement of sediment from watersheds, Sediment yield from watersheds, Trap efficiency,Densityofsedimentdeposits,Distributionofsedimentin reservoir, Life of a reservoir, Reservoir sedimentation control, Erosion and reservoir sedimentation problems inIndia.

Total Periods: 45

TEXT BOOKS:

1 K. Subramanya, *Engineering Hydrology*,Tata McGraw–Hill Education Pvt. Ltd., 4th Edition,2013.

2 P. Jaya Rami Reddy, *A Text Book of Hydrology,* University SciencePress,AnImprintofLaxmiPublicationsPvt.Ltd.,3rd Edition,2011.

REFERENCE BOOKS:

1 H.M.Raghunath,*GroundWater,*WileyEasternLtd.,3rd Edition, 2009.

2 David Keith Todd, *Groundwater Hydrology,* Wiley India Pvt.Ltd., 2nd Edition,2010.

3 V.T.Chow.,*HandBookofAppliedHydrology,*McGraw–Hill Education Pvt.Ltd., 2nd Edition,2000.

4 C. S. P. Ojah, R. Berndtsson, P. Bhunya, *EngineeringHydrology,*Oxford Higher Education, 5th Edition, 2008.

II B.Tech. – II Semester

(19BT40102) **ENVIRONMENTAL ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PREREQUISITES: Environmental Science

COURSE DESCRIPTION: Water Sources, Quality and Quantity, Intakes; Water Treatment and Distribution Systems; Sewage Characteristics, Collection and Quantity; Sewage Treatment; Sewage Effluent, Sludge Treatment and Disposal.

COURSE OUTCOMES: On successful completion of the course, the students will be able to:

CO1 Analyze water sources, quality and quantity using different tools and techniques for solving water supply problems considering codes of practice, public health and safety, environment and sustainability.

CO2 Design water treatment and distribution systemsusing different methods to solve water supply problemsby following current developments and considering codes of practice, public health and safety, environment and sustainability besides communicating graphically.

CO3 Design sewage collection systems for treatment and disposal to solve complex problems considering appropriate methods, code of practices, public health and safety, environment and sustainability.

CO4 Design sewage treatment and sludge digestion units to solve complex problemsby following latest developments and considering code of practices, public health and safety, environment and sustainability besides communicating graphically.

CO5 Analyze sewage effluent, sludge treatment and disposal,house drainage plumbing systems in buildings using different tools and techniques considering codes of practice, health and safety, environment and sustainabilitybesides communicating graphically.

DETAILED SYLLABUS:

UNIT - I: WATER SOURCES, QUALITY AND QUANTITY, INTAKES(06 Periods)

Water Sources – Types,Quality, Quantity, Drinking water quality analysis and standards; Protected water supply – Need, Objectives; Population forecasting – Methods, Design period; Water demand – Types, Per capita demand, Factors affecting, Fluctuations; Intakes – Types, Factors influencing site selection.

UNIT- II: WATER TREATMENT AND SUPPLY (12 Periods)

Water Treatment:Units, Functions,Processes – Aeration, Coagulation, Flocculation, Optimum Coagulant Dosage; Sedimentation – Types, Factors affecting, Design of sedimentation tank; Filtration – Types; Slow and Rapid Gravity Sand Filters - Design, Operation and Maintenance; Disinfection –Methods, Chlorination, Chlorine demand, Break point chlorination; Latest techniques in water treatment.

Water Supply: Systems and methods; Distribution systems – Layouts, Design by Hardy Cross and equivalent pipe methods; Water supply arrangements in buildings - Flow meters, Pipe appurtenances, Laying and testing of pipe lines, Leakage prevention, Repair and maintenance.

UNIT – III: SEWAGE CHARACTERISTICS, COLLECTION AND QUANTITY

(06 Periods)

Sewage characteristics - Physical, Chemical and Biological; Sewage collection systems – Types, Comparison; Estimation of sanitary sewage and storm water runoff, Hydraulic design of sewers, Sewer appurtenances, BODEquations andSelf purification of streams.

UNIT – IV: SEWAGE TREATMENT **(12 Periods)**

Layout of sewage treatment plant; Design of primary treatment units - Screen chamber, Grit chamber, Sedimentation tank; Design of secondary treatment units – Attached growth systems - Trickling filters,Rotating Biological Contactors, Bio-towers; Suspended growth systems - Activated Sludge process, Oxidation ditch, Stabilisation pond; Design of sludge digestion tank – Aerobic and anaerobic, Factors influencing the digestion process; Latest techniques in sewage treatment.

UNIT – V: SEWAGE EFFLUENT, SLUDGE TREATMENT AND DISPOSAL

(9 Periods)

Disposal of sewage effluent – Dilution, Sewage farming, ISI Effluent disposal standards; Design of septic tank, Soak pit, Dispersion trench; Sludge treatment and disposal,House drainage plumbing systems in buildings.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. G. S. Birdie and J. S. Birdie, *Water Supply and Sanitary Engineering*, Dhanpat Rai and Sons Publishers, 9th Edition, 2011.
2. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Inc., 1985.

REFERENCE BOOKS:

1. S. K. Garg, *Environmental Engineering, (Vol. I): Water Supply Engineering*, Khanna Publishers, 20th Edition, 2011.
2. S. K. Garg, *Environmental Engineering (Vol. II): Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, 27th Edition, 2013.
3. Met Calf and Eddy, *Wastewater Engineering*, TMH Education Pvt. Ltd., 4th Edition, 2010.
4. R. Elangovan and M.K Saseetharan, *Unit Operations in Environmental Engineering*, New Age International (P) Limited, 1st Edition, 2008.

ADDITIONAL LEARNING RESOURCES:

1. S. K. Duggal, *Elements of Environmental Engineering,* S. Chand Publishing, 3rd Edition, 2013.
2. P. N. Modi, *Water Supply Engineering(Environmental Engineering-I)*, Standard Book House, 6th Edition, 2018.
3. P.N. Modi, *Sewage Treatment Disposal and Wastewater Engineering (Environmental Engineering-II)*, Standard Publishers Distributors, 17th Edition, 2019.
4. B.C. Punmia, Ashok K. Jain and Arun K. Jain, *Environmental Engineering-II: Wastewater Engineering (Including Air Pollution),* Laxmi Publications, 2nd Edition, 2019.

II B.Tech. II Semester

(16BT40105) **WATERSUPPLY ENGINEERING**

Int. Marks	Ext. Marks	Total	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES: Courses on Environmental Studies, Fluid Mechanics and Hydraulic Machinery.

COURSEDESCRIPTION: Watersources;Quality;Quantity;Demand; Collection; Conveyance and distribution; Water treatment; Distribution; Water supply arrangements inbuildings.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Acquirethebasicknowledgeonsources,quality,quantity, demand, conveyance, treatment systems, storage and distribution of water; and water supply arrangements in buildings.

CO2. Analyse problems associated with water supplyengineering.

CO3. Designwaterconveyance,treatment,storageanddistribution systems.

CO4. Solvewatersupplyengineeringproblemsthroughproper investigations andinterpretation.

CO5. Useappropriatetechniquesinsolvingwatersupplyengineering problems.

CO6. Providesolutionstowatersupplyengineeringproblemsensuring health andsafety.

CO7. Maintainqualitystandardsinanalysis,treatmentanddistribution of water in water supplyschemes.

DETAILED SYLLABUS:

UNIT–I:WATERSOURCESANDQUALITY (08Periods)

Importanceofwatersupplyengineering,Needforprotectedwatersupply, Objectivesofwatersupplysystems,Flowdiagramofwatersupply systems, Different sources of water, Quantity and quality of different sources– Physical,chemicalandbiologicalimpuritiesandtheirtesting parameters.

UNIT – II: QUANTITY, DEMAND, COLLECTION AND CONVEYANCE (10Periods)

Typesandvariationinwaterdemand,Factors affectingwaterdemand, Designperiod,Forecastingofpopulation,differentmethodsandtheir suitability,Waterqualitystandards–Drinking,Construction;Intake worksforcollectionofsurfacewater,Conveyanceofwater–Gravity andpumpingmethods;Differentmaterialsusedforconveyingconduits and theirsuitability.

UNIT–III:WATERTREATMENT (09Periods)

Conventional water treatment processes – Units and theirfunctions; Aeration,Coagulation,Flocculation,Clarification,Determinationof optimumdoseofalumforcoagulationofwater,Theoryoffiltration, Differenttypesoffiltersandtheirdesign,Disinfection–Disinfectants, Mechanism of disinfection, Different methods of disinfection, Break point chlorination, Types of chlorination, Dose ofdisinfectant.

UNIT – IV: ADVANCED TREATMENT METHODS AND DISTRIBUTION

(09Periods)

AdvancedTreatmentMethods: Removaloffluorides,arsenic,hardness, iron and manganese, salinity, colour, organic chemical and biological residues;Adsorptionwithactivatedcarbon,ion–exchangeresins; Membrane processes, Chemicaloxidation.

Distribution: Distribution**-**Systemsofdistribution,Distribution reservoirs,Distributionnetworks,Designofsimplenetworks,Pipe accessories,Valvesandtheirlocationandsuitability,EPANETsoftware.

UNIT – V: WATER SUPPLY ARRANGEMENTS IN BUILDINGS (09 Periods)

Definitionoftechnicaltermsusedinwatersupplyarrangements,House water connection, Water storage, Water piping systems inbuildings, Connectionfromwatermaintobuilding,Watersupplyfittings,Principles andprecautionsinlayingpipelinesinthepremisesofbuildings,Detection and prevention ofleakages.

Total Periods: 45

TEXT BOOKS:

1. S. K. Garg*, Environmental Engineering, Vol. I: Water Supply Engineering,* Khanna Publishers, 20th Edition,2011.
2. G.S.BirdieandJ.S.Birdie,*WaterSupplyandSanitary Engineering*, Dhanpat Rai and Sons Publishers, 9th Edition,2011.

REFERENCE BOOKS:

1. K.N.Duggal,*ElementsofEnvironmentalEngineering*,S.Chand Publishers,2010.
2. H.S.PeavyandD.R.Rowe,*EnvironmentalEngineering*, McGraw–HillPublishingCompany,2nd Edition,1984.
3. P.N.Modi,*WaterSupplyEngineering*,StandardBookHouse, 3rd Edition,2010.
4. S.K.Duggal,*ElementsofWaterSupplyEngineering,*S.Chand & Co,2010.

II B. Tech. – II Semester

(19BT40103) **HYDRAULIC ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Course on Fluid Mechanics

COURSE DESCRIPTION: Boundary layer theory; Open channel flow; Impact of jet on vanes; Hydraulic turbines; Pumps.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze boundary layer problems to solve complex hydraulic engineering problems using appropriate techniquesbesides communicating effectively in graphical form..

CO2 Design open channels using appropriate tools and techniques for solving complex open channel problems considering safety, environment and sustainabilitybesides communicating effectively in graphical form.

CO3 Analyze impact of jet on vanes to solve complex fluid flow problems using appropriate techniques considering safetybesides communicating effectively in graphical form.

CO4 Design hydraulic turbines using appropriate techniques to solve hydraulic engineering problems considering safety, environment and sustainability besides communicating effectively in graphical form.

CO5 Design pumps to solve hydraulic engineering problems using appropriate techniques following latest developments and considering safety, environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT - I: BOUNDARY LAYER THEORY (10 Periods)

Boundary layer concepts, Thickness of boundary layer, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, Laminar and turbulent boundary layers, Laminar sub–layer, Separation of boundary layer, Control of boundary layer, Flow around submerged bodies, Drag and lift.

UNIT – II: OPEN CHANNEL FLOW (09 Periods)

Types of flows, Types of channels, Velocity distribution, Chezy's, Manning's and Bazin's formulae for uniform flow, Most Economical sections, Critical flow, Specific Energy, Critical depth, Computation of critical depth, Critical, subcritical and supercritical flows, Non-uniform flow, Dynamic equation for gradually varied flow, Types of slopes, Surface profiles, Rapidly varied flow, Hydraulic jump and its applications, Surges.

UNIT-III: IMPACT OF JET ON VANES (08 Periods) Hydrodynamic force of jets on stationary and moving, vertical, inclined and curved vanes, Series of vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, Expressions for work done and efficiency.

UNIT-IV: HYDRAULIC TURBINES (10 Periods)

Layout of a typical hydropower installation, Heads and efficiencies, Classification of turbines, Pelton wheel, Francis turbine, Kaplan turbine, Working and working proportions, Velocity diagrams, Work done and efficiency, Hydraulic design,Runaway speed, Draft tube theory, Function and efficiency, Governing of turbines, Surge tanks, Unit quantities and specific speed, Performance of turbines, Characteristic curves, Cavitation, Causes, Effects, Classification of hydropower plants, Load factor, Utilization factor, Capacity factor, Estimation of hydropower potential.

UNIT-V: PUMPS **(08 Periods)**

Pumps-Components, Classification; Centrifugal pumps-Classification, Heads, Losses and efficiencies, Limitation of suction lift, Work done, Minimum starting speed, Specific speed; Multistage pumps, Pumps in parallel and series, Performance of pumps, Characteristic curves, Net positive suction head, Priming, Cavitation, Reciprocating pumps- Classification, Work done, Slip, Limitations; Special pumps – Self priming pump, Gear pump, Jet pump, Airlift pump; Latest developments in pumps.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. R. K. Rajput, *A Textbook of Fluid Mechanics*, S. Chand Publishers, 5th Edition, 2013.
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publishers, 9th Edition, 2011.

REFERENCE BOOKS:

1. P. N. Modi and S. M. Seth, *Hydraulics and Fluid Mechanics Including Hydraulic Machines*, Standard Book House, 20th Edition, 2011
2. Domkundwar and Domkundwar, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Dhanpat Rai and Co, 6th Edition, 2014.
3. V.T .Chow, *Open Channel Flow,* 3rdEdition, McGraw–Hill Publishers, 2009.
4. K. Subramanya, Flow in Open Channels, 3rd Edition, Tata McGraw Hill Publishers, 2010.

ADDITIONAL LEARNING RESOURCES:

1. John A. Roberson, John J. Cassidy, and M. Hanif Chaudhry, *Hydraulic Engineering,*2nd Edition, ISBN-13: 978-0471124665, Wiley, 2 Edition, 1998.
2. L. Hamill, *Understanding Hydraulics*, MacMillan Education UK,3rd Edition, 2011.

II B.Tech. – I Semester

(16BT30102) FLUID MECHANICS AND HYDRAULIC MACHINERY

Int. Marks	Ext. Marks	TotalMarks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Engineering Mechanics, Multi–Variable Calculus and Differential Equations.

COURSE DESCRIPTION: Properties of fluids and pressure measurement; Hydrostatic forces; Fluid kinematics; Fluid dynamics;Closedconduitflow;Measurementofflow;Laminar and Turbulent flow; Hydraulic similitude and Model testing; Boundary layer theory; Open channel flow; Impact of jets; Hydraulic turbines;Centrifugal pumps.

COURSEOUTCOMES: Onsuccessfulcompletionofthiscourse, the students will ableto:

CO1 Demonstrate the knowledge on basic properties of fluids, classification of flows and hydraulic machinery.

CO2Analyze fluids, flows and forces in hydraulics.

CO3Design piping systems, open channels and hydraulic machinery.

CO4 Address the problems and faults in the prototype preparationusingthemodelanalysisandprovidesuitable solutions.

CO5 Use of flow and pressure measurement devices in channels and hydraulic machinery.

CO6 Consider safety issues in the analysis and design of channels, pipes and hydraulic machinery.

DETAILED SYLLABUS:

UNIT - I: PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS

(09Periods)

Dimensionsandunits,Physicalpropertiesoffluids,Pressureat apoint,Pascal'slaw,Hydrostaticlaw,Atmospheric,gaugeand absolute pressures, Measurement of pressure, Manometers andmechanicalgauges,Hydrostaticforcesonsubmergedplane surfaces, Total pressure and centre of pressure on plane and curved surfaces, Buoyancy, Centre ofbuoyancy.

UNIT - II: FLUID KINEMATICS AND DYNAMICS (08Periods)

Descriptionoffluidflow,Streamline,Pathlineandstreakline, Stream tube, Classification of flows, Equation of continuity, StreamandVelocitypotentialfunctions,Flownetanditsuses, Surface and body forces, Euler's and Bernoulli's equations, derivation, Practical applications, Momentum equation anditsapplication,OrificesandMouthpieces,NotchesandWeirs,Latest velocity measuring devices, Introduction to boundary layer, Separation andprevention.

UNIT - III: CLOSED CONDUIT FLOW AND HYDRAULICSIMILITUDE(09Periods)

Laws of fluid friction, Darcy–Weisbach equation, Minor losses, Pipesinseries,Pipesinparallel,TotalenergylineandHydraulic gradient line, Moody's chart, Dimensional analysis, Rayleigh's methodandBuckingham's□theorem,Modelstudies,Geometric, kinematicanddynamicsimilarities,Dimensionlessnumbers,Model laws, Scale effects, Flow around submerged bodies, Drag and lift.

UNIT-IV:OPENCHANNELFLOW (09Periods)

Typesofflows,Typesofchannels,Velocitydistribution,Chezy's, Manning'sandBazin'sformulaeforuniformflow,MostEconomical sections, Critical flow, Specific Energy, Critical depth, Computation of critical depth, Critical, subcritical and supercritical flows, Non uniform flow, Dynamic equation for graduallyvariedflow,Typesofslopes,Surfaceprofiles,Rapidly variedflow,Hydraulicjumpanditsapplications.

UNIT-V:TURBINESANDPUMPS (10Periods)

Jet on plane and curved surfaces, Classification of turbines, Pelton wheel, Francis turbine, Kaplan turbine, Working proportions, Velocity diagrams, Work done and efficiency, Hydraulic design, Draft tube theory, Governing of turbines, Specificspeed,Performancecharacteristics,Geometricsimilarity, Cavitation, causes, effects, Pump, Classification of centrifugal pumps, Work done, Minimum starting speed, Specific speed, Multistagepumps,Pumpsinparallelandseries,Performanceof pumps, Characteristic curves, Net positive suctionhead(NPSH).

Total Periods:45

TEXT BOOKS:

1. R. K. Rajput, *A Textbook of Fluid Mechanics*, S. Chand Publishers,5thEdition,2013.
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publishers, 9th Edition,2011.

REFERENCEBOOKS:

1. P.N.ModiandS.M.Seth,*HydraulicsandFluidMechanics IncludingHydraulicMachines*,StandardBookHouse,20th Edition,2011.
2. J. F. Douglas, J.M. Gaserek and J.A. Swaffirld, *Fluid Mechanics,*5thEdition,Longman,2010.
3. S.K.SomandG.Biswas,*IntroductiontoFluidMachines*, TataMcGraw–HillPublishersPvt.Ltd,2ndEdition,2010.
4. Domkundwar and Domkundwar, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Dhanpat Rai and Co, 6th Edition,2014.

II B. Tech. - II Semester

(19BT40107) SUSTAINABLE ENGINEERING

(Open Elective-2)

(Common to CE, ME, CSE, CSSE, IT, CSE(AI), CSE(DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of sustainability; Sustainability metrics and assessment tools; Sustainable engineering practices; Sustainable engineering applications; Sustainable urbanization and industrialization.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze the principles of sustainability to solve complex environmental problems following relevant standards/protocols considering society, health, safety and environment.

CO2. Analyze sustainability metrics and assessment tools to solve complex environmental problems following relevant standards and emerging trends considering society, health, safety, environment and economics besides communicating effectively in graphical form.

CO3. Analyze sustainable engineering practices to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO4. Design sustainable engineering applications to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO5. Analyze sustainable urbanization and industrialization principles to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT I–PRINCIPLES OF SUSTAINABILITY (9 periods)

Emerging challenges, Sustainability and sustainable engineering; Environmental concerns; Social, economic and legal issues; Availability and depletion of natural resources, Disaster resiliency; Multilateral environmental agreements – Basel convention, Clean development mechanism (CDM), Montreal and Kyoto protocols.

UNIT II–SUSTAINABILITY METRICS AND ASSESSMENT TOOLS (9 periods)

Sustainability indicators, metrics and assessment tools, Material flow analysis and material budget, Carbon footprint analysis, Life cycle assessment, Streamlined life-cycle assessment (SLCA), Economic input output-life cycle analysis, Environmental health risk assessment, Other emerging assessment tools.

UNIT III–SUSTAINABLE ENGINEERING PRACTICES (9 periods)

Sustainable energy engineering, Sustainable waste management, Green and sustainable buildings and infrastructure, Sustainable civil infrastructure, Sustainable remediation of contaminated sites, Climate geoengineering.

UNIT IV–SUSTAINABLE ENGINEERING APPLICATIONS (9 periods)

Environmental and chemical engineering projects, Materials engineering projects, Infrastructure engineering projects – Background, Methodology, Goal and Scope, Study area, Technical design, Environmental sustainability, Life cycle assessment, Economic sustainability, Social sustainability, Rating systems – ENVISION, LEED, GRIHA, IGBC; Conclusions.

UNIT V–SUSTAINABLE URBANIZATION AND INDUSTRIALIZATION (9 periods)

Sustainable urbanization and industrialization, United Nations sustainable development goals – Right to education, Poverty eradication, Social and technological changes; Industrial Processes - Material selection, Energy efficiency, Pollution prevention and control techniques, Industrial Ecology, Industrial symbiosis.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Reddy, K.R., Cameselle, C., and Adams, J.A., *Sustainable Engineering: Drivers, Metrics, Tools, and Applications*, John Wiley &Sons, Inc., Hoboken, New Jersey, 2019, 544p (ISBN: 978-1-119-49393-8).
2. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Bradley. A.S; Adebayo,A.O., Maria, P.,*EngineeringApplications in Sustainable Design and Developmen*t, Cengage Learning, 1st Edition, 2016.
2. Purohit, S. S., *Green Technology: An Approach for Sustainable Environment*, Agrobios Publication, 1st Edition, 2016.
3. *Energy Conservation Building Code (ECBC) 2007*, Bureau of Energy Efficiency, Govt. of India, New Delhi.
4. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, Routledge, Taylor & Francis Group, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.
2. Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers, https://doi.org/10.1061/9780784407509, 2004.
3. Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.
4. *Environment Impact Assessment Guidelines*, Notification of Government of India, 2006.

II B.Tech. - II Semester

(19BT40131)ENVIRONMENTAL ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PREREQUISITES: Course onEnvironmental Engineering.

COURSE DESCRIPTION: Experimentalanalysis ofphysical, chemical and biological parametersof water and wastewater; Analysis of an ambient air quality.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Evaluate water using various tools and techniques to solve complex water problems by following the standard procedures/norms and latest developments ensuring safety, environment and sustainability.

CO2. Evaluate wastewater using various tools and techniques to solve complex wastewater problems by following the standard procedures/norms and latest developments ensuring safety, environment and sustainability.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on water supply and wastewater engineering.

LIST OF EXPERIMENTS:

1. Determination of pH, electrical conductivity and TDSof a given water sample
2. Determination of alkalinity and acidity of a given water sample
3. Determination of total solids, volatile and fixed solids of a given water sample
4. Determination of chlorides of a given water sample
5. Determination of iron and fluoride content of a given water sample
6. Determination of residual chlorine of a given chlorinated water sample
7. Determination of turbidity and optimum coagulant dose of a given water sample
8. Determination of dissolved oxygen and BOD of a given wastewater sample
9. Determination of COD of a given wastewater sample
10. Determination of nitrate nitrogen as $NO_3$of a given wastewater sample
11. Determination of sulphates as SO_4 of a given wastewater sample
12. Determination of phosphates as PO_4 of a given wastewater sample
13. Determination of color of a given water or wastewater sample
14. Bacterial examination of a given water or wastewater sample (not for examination)
15. Determination of air pollutants of an ambient air (not for examination)

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Environmental Engineering Lab Manual (SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

III B.Tech. – I Semester
(16BT50132) **ENVIRONMENTAL ENGINEERING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Water Supply Engineering, Wastewater Technology.

COURSE DESCRIPTION: Experimental analysis of physical, chemical and biological parameters of water and wastewater.

COURSEOUTCOMES: Onsuccessfulcompletionofthiscourse,the studentswillbeableto:

CO1. Demonstratetheknowledgeonexperimentalanalysisofwater andwastewater.

CO2. Analysewaterandwastewater.

CO3. Solvecomplexproblemsassociatedwithwaterandwastewater throughproperinvestigationsandinterpretationofdata.

CO4. Useappropriatetechniquesintheanalysisofwaterand wastewater.

CO5. Providesolutionstotheproblemsofwaterandwastewater ensuringhealthandsafety.

CO6. Considerenvironmentalsustainabilityinsolvingwaterand wastewaterproblems.

CO7. Followstandardsinwaterandwastewateranalysis.

CO8. Functioneffectivelyasanindividual,andasamemberorleader inteamstosolvethewaterandwastewaterproblems.

CO9. Communicateeffectivelyonwaterandwastewateranalysisin written,oralandgraphicalforms.

LISTOFEXPERIMENTS:

1. DeterminationofpH,turbidityandelectricalconductivity
2. Determination ofcolour
3. Determinationofalkalinityandacidity
4. Determinationoftotalsuspendedsolidsandtotaldissolvedsolids
5. Determinationoftotalsolids,volatileandfixedsolids.
6. Determination ofchlorides
7. Determinationofironandfluorides
8. Determinationofoptimumcoagulantdose
9. Determinationofresidualchlorine
10. DeterminationofDissolvedOxygen
11. DeterminationofB.O.D
12. DeterminationofC.O.D
13. Determination ofnitrogen
14. Determinationoftotalphosphorus
15. Determination ofsulphates
16. Bacterialexamination

I B. Tech. - I Semester (ECE, EEE & EIE) /
I B. Tech. - II Semester (CSE,CSSE,IT,CE&ME)

(19BT1AC01) SPOKEN ENGLISH

(Audit Course)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE OBJECTIVES:

- To impart the knowledge of day to day conversational expressions.
- To enhance contextual vocabulary and technical jargon for effective usage of language.
- To improve functional grammar for speaking and writing without errors.
- To acquaint with appropriate conversational and narrating techniques for effective communication.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the techniques of listening, speaking, reading, writing and apply through functional English to communicate effectively with the engineering community and society.

DETAILED SYLLABUS:

UNIT I - FUNCTIONAL ENGLISH: (6 periods)

Introduction - Functional Spoken English;Just a Minute; **Listening – Speaking:** Do's and Don'ts; **Expressing:** Ability/ Admiration/ Agreement/ Anger/ Annoyance/ Appreciation/ Pleasure/ Sarcasm/ Satisfaction/ Surprise/ Approval/ Capability/ Certainty/ Condolences/ Doubt/ Fear/ Gratitude/ Possibility/ Worry; **Asking for:** Advice/ Clarification/ Direction/ Information/ Permission/ Predictions/ a recommendation

UNIT II -VOCABULARY BUILDING: (6 periods)

Vocabulary for day-to-day conversations; Introduction: Vegetables/ Groceries/ Fruits/ Weather; Parts of a Human body/ Dresses/ Furniture/ Relations; Birds/ Cries of Animals; Food/ Hospitality/ Houses/ Rooms/ Tools; Airport/ News Paper/ Books/ Gems; Corporate Vocabulary/ Jobs/ Occupations/ Diseases; British/ American spelling; Slang Words and Technical Jargon

UNIT III -FUNCTIONAL GRAMMAR - I: (6 periods)

English Grammar and the Indian Student; Introduction: Parts of Speech, Verb forms; Tenses; Voice; Speech

UNIT IV -FUNCTIONAL GRAMMAR - II: (6 periods)

Universal Auxiliaries; Sentence making for an effective communication; Sentence Structure -WH- Questions - How to frame Questions and give answers; Question Tags; Subject and verb agreement; Spotting Errors

UNIT V –COMMUNICATION SKILLS: (6 periods)

Polite, Courteous and diplomatic terms; Useful daily expressions; Courtesy, Good manners and Etiquette; Conversation Techniques; Narrating/ Reading/ Listening to stories; Telling Stories

Total Periods: 30

TEXT BOOKS:

1. L. Adinarayana and V. Prakasam, *Spoken English*, Neelkamal Publications Pvt. Ltd., New Delhi, 2008
2. Ram Bhasker Raju, *The Complete Book on Spoken English*, Goutham Buddha Publications, Hyderabad, 2002.

REFERENCE BOOKS :

1. Sabina Pillai, *Spoken English for my World,* Oxford University Press, New Delhi, 2016.

2.K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009.

ADDITIONAL LEARNING RESOURCES

- https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills.
- https://www.fluentu.com/blog/english/websites-to-learn-english/

I- B. Tech - I/II Semester

(19BT1BS02) BIOLOGY FOR ENGINEERS

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	2	-	-	2

PRE REQUISITE: --

COURSE OBJECTIVES:

- Tointroduce the molecular basis of life and provide the basis for classification of living organisms
- To describe about biomolecules, enzymes, genes and the transfer of genetic information**.**
- To introducethetechniquesused for modification of living organisms and applications of biology**.**

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the basic knowledge of biology to understand the significance of various biological techniques.

CO2. Identify the role of DNA in the molecular basis of information transfer and understand single gene disorders related to the health perspective.

CO3. Apply the basic knowledge of bio-analytical devices and methods to address societal, health and legal issues.

DETAILED SYLLABUS:

UNIT I – LIVING ORGANISMS (6 Periods)

Comparison of biological organisms with manmade systems, Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources, molecular taxonomy

UNIT II – PROTEINS, NUCLEIC ACIDS AND ENZYMES (6 Periods)

Biomolecules, structure and functions of proteins and nucleic acids, Industrial applications of enzymes, Fermentation and its industrial applications

UNIT III – GENETICS AND MOLECULAR BIOLOGY (6 Periods)

Mendel's laws, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation.

UNIT IV – RECOMBINANT DNA TECHNOLOGY (6 Periods)

Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips

UNIT V –HUMAN PHYSIOLOGY AND APPLIED BIOLOGY (6 Periods)

Fundamentals of Human physiology, neurons, synaptic and neuromuscular junctions, Introduction to EEG, DNA fingerprinting, DNA Micro array and Genomics.

Total Periods: 30

TEXT BOOKS:

1. N. A. Campbell, J. B. Reece, et al., *Biology: A global approach*, Pearson Education Ltd, 2018.
2. S. Sing and T. Allen, *Biology for Engineers*, Vayu Education of India, 2014.

REFERENCE BOOKS:

1. B. Alberts, A. Johnson et al., *The molecular biology of the cell*, Garland Science, 6th edition, 2014.

2. A. T. Johnson, *Biology for Engineers*, CRC press, 2011.

I B. Tech – I Semester (CSE, CSSE, IT, CE & ME)
I B. Tech – II Semester (ECE, EEE & EIE)
(19BT1HS01) COMMUNICATIVE ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	--	3

PRE-REQUISITES: -

COURSE OBJECTIVES:

1. To acquaint with the nuances of effective communication correlating with academic content.
2. To understand and interpret the importance of listening techniques for effective communication.
3. To develop reading and writing techniques for effective technical communication.
4. To make use of speaking techniques to communicate effectively in formal and informal situations.

COURSE OUTCOMES: After successful completion of this course, students will be able to:

CO1. Analyze the modes and techniques of listening, speaking, reading, writing and apply appropriately to communicate effectively with the engineering community and society.

DETAILED SYLLABUS:

UNIT I - **INTRODUCTION TO COMMUNICATION** **(9 periods)**

Introduction – Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication – Barriers to Communication (classification) - Case study

UNIT II - **ACTIVE LISTENING** **(9 periods)**

Introduction –Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information - Case study

UNIT III - **EFFECTIVE SPEAKING** **(9 periods)**

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Conferences; significance, planning and preparation and procedure – Symposia and Seminars - Persuasive Speaking - Case study

UNIT IV - **READING** **(9 periods)**

Introduction – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading ––Techniques for Good Comprehension- SQ3R Reading Technique –Study Skills - Case study

UNIT V – **TECHNICAL WRITING** **(9 periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Paragraphs Construction – Essays: types, Steps to Essay Writing and Checklist – Précis Writing - Case study

Total Periods: 45

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

2. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.

2. Rajendra Pal and J. S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

ADDITIONAL LEARNING RESOURCES

1. https://www.skillsyouneed.com/ips/active-listening.html: A useful summary of what active listening skills are.
2. https://en.wikipedia.org/wiki/Active_listening: Wikipedia entry about active listening.
3. https://www.forbes.com/sites/womensmedia/2012/11/09/10-steps-to-effective-listening/#4b27a2503891: Ten steps to Active Listening (by Forbes magazine).
4. https://goo.gl/t1Uqrt: 20 tips for organizing a conference.
5. https://goo.gl/kPMr9u: 10 important issues for speakers at a conference.
6. https://goo/gl/C5bDvv: Wikihow guide to organizing a conference.

I B. Tech. – I Semester (CSE, CSSE, IT, CE & ME)

I B. Tech. – II Semester (ECE, EEE & EIE)

(16BT1HS01) TECHNICAL ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES: English at Intermediate level

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OBJECTIVES:

CEO1. To impart knowledge of the nuances of communication.
CEO2. To develop Listening, Speaking, Reading and Writing skills in order to use language effectively in distinct situations.
CEO3. To imbibe an attitude of assimilating language skills in the sequence of locating, retrieving, reporting, evaluating, integrating, and accurately citing in the required context.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

CO1: Demonstrate knowledge in

- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2: Analyze the possibilities and limitations of language, understanding

- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3: Design and develop functional skills for professional practice**.**

CO4: Apply writingskills in preparing and presenting documents

CO5: Function effectively as an individual and as a member in diverse teams.

CO6*:*Communicate effectively with the engineering community and society in formal and informal situations**.**

DETAILED SYLLABUS:

UNIT I - **INTRODUCTION TO COMMUNICATION: (9 periods)**

Introduction –Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication – Barriers to Communication (classification)

UNIT II - **ACTIVE LISTENING: (9 periods)**

Introduction – Reasons for poor Listening – Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information

UNIT III - **EFFECTIVE SPEAKING: (9 periods)**

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Persuasive Speaking

UNIT IV - **READING**: **(9 periods)**

Introduction and Reading Rates – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading – Reading for Different Purposes – SQ3R Reading Technique – Study Skills

UNIT V – **WRITING**: **(9 periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Referencing and Styling – Right Words and Phrases – Sentences

Total Periods: *45*

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt.Ltd., New Delhi, 2015.

2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.

3. Teri Kwal Gamble and Michael Gamble, *Communication Works*, Tata Mc Graw-Hill, New Delhi, 2010.

4. Rajendra Pal and J.S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

I B. Tech. - I/II Semester
(19BT1BS04**) ENGINEERING CHEMISTRY**
(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE REQUISITE: -

COURSE OBJECTIVES:

1 To provide basic knowledge in quantum-mechanical model of atom, bonding theories, water treatment, electrochemistry, corrosion, instrumental methods, fuels and lubricants.

2 To develop skills in identification of molecular shapes, measurement of hardness of water, calculation of cell potential, calorific value of fuels.

3 To impart basic knowledge pertains to various instrumental methods, their applications and characterization of molecular structures using instrumental methods.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the basic knowledge of quantum mechanical approach to atomic structure and bonding theories to identify shapes of different orbitals and molecules.

CO2. Analyze and solve problems associated with hardness of water, boiler troubles and address the societal, health and safety issues related to quality of water.

CO3. Apply the basic knowledge of corrosion phenomenon to identify solutions for control of corrosion and demonstrate competency in the basic concepts of electrochemical cells.

CO4. Demonstrate the basic knowledge of instrumental methods and their applications in the structural analysis of materials.

CO5. Apply the basic knowledge of fuel chemistry and lubricants to identify the quality of fuels and lubricants.

DETAILED SYLLABUS:

Unit I: Atomic Structure and Bonding Theories (9 periods)

Quantum-mechanical model of atom, Schrodinger wave equation, significance of Ψ and Ψ^2 , applications to particle in a box and hydrogen atom; Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules – energy level diagrams of N_2, O_2, NO and CO; Π-molecular orbitals of butadiene and benzene; VSEPR theory and molecular shapes.

Unit II: Water Treatment (9 periods)

Introduction, types of water, Impurities in water and their consequences. Hardness of water, units of hardness, disadvantages of hardness, measurement of hardness by EDTA method, numerical problems on measurement of hardness of water, boiler troubles-priming & foaming, scales & sludge, caustic embrittlement, boiler corrosion, softening of water– Ion exchange process, zeolite process, desalination of brackish water by reverse osmosis, Drinking water treatment- Ozonisation & chlorination, specifications of potable water as per WHO and BIS standards. Fluoride in ground water: Effects on human health, defluoridation method – Nalgonda method; merits and demerits of various defluoridation methods.

Unit III: Electrochemistry and Applications (10 periods)

Electrode potential, Nernst equation, reference electrodes (Calomel electrode and glass electrode), electrochemical cell, cell potential calculations. Primary cells – dry cell, alkali metal sulphide batteries, Secondary cells – lead acid, lithium ion batteries, Fuel cells - Hydrogen-oxygen fuel cell, Methanol-oxygen fuel cell, Solid-oxide fuel cell.

Corrosion: Introduction, Definition, types of corrosion- wet (galvanic corrosion, concentration cell corrosion) and dry corrosion, Factors influencing corrosion, control of corrosion- sacrificial anodic protection, Impressed current cathodic protection, electroplating method (Nickel).

Unit IV: Instrumental Methods and Applications(9 periods)

Introduction to spectroscopy–types of energy present in molecules, types of spectra, UV-Vis spectroscopy – principle, types of electronic transitions, chromophore, auxochrome, Bathochromic shift, Hypsochromic shift, Instrumentation of UV-Vis spectrophotometer, applications; Infrared spectroscopy – principle, types of vibrational modes, group frequencies, Instrumentation of IR spectrophotometer, applications. principle and applications of physicochemical methods (SEM, TEM, X-ray diffraction).

Unit V: Fuel chemistry and Lubricants(8 Periods)

Fuel chemistry: Types of fuels, calorific value, numerical problems based on calorific value; Liquid fuels, cracking of oils (Thermal and Fixed-bed catalytic cracking), knocking and anti-knock agents, Octane and Cetane values, Synthetic petrol: Fischer-Tropsch method and Bergius process.

Lubricants:Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity and viscosity index , flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total Periods: 45

TEXT BOOKS:

1. P. C. Jain & Monika Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy and C. Ramachandriah, *Engineering Chemistry,* Mc.Graw Hill Publishers, New Delhi.

REFERENCE BOOKS:

1. J. D. Lee, *Concise Inorganic Chemistry*, Oxford University Press, 5th edition 2010.

2. Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6th edition, 2007.
3. Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University Press, 10th edition, 2010.

I-B. Tech - I/II Semester
(16BT1BS01): ENGINEERING CHEMISTRY
(Common to All Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nano Chemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OBJECTIVES:

1. To impart basic and applied knowledge in water technology, Chemistry of Engineering materials, Nano Chemistry, Green Chemistry, bio-diesel, electro chemical cells, sensors, corrosion and lubricants.

2. To develop skills in analysis of materials and design of systems for engineering applications.

3. To imbibe an attitude among students to practice Engineering in compliance with principles of Green Chemistry.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

1. Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
2. Develop analytical skills in:
   a. Determination of hardness of water.
   b. Determination of viscosity, flame and fire points, cloud and pour points.
3. Develop designing skills in:
   a. Synthesis of engineering plastics.
   b. Chemical methods for the synthesis of Nano materials.
4. Develop skills for providing solutions through:
   a. Mitigation of hardness of water.
   b. Newer Nanomaterials and engineering plastics for specific applications
5. Acquire awareness to practice engineering in compliance to modern techniques such as:
   a. Nalgonda technique for defluoridation of water
   b. Electroplating technique for control of corrosion.
6. Acquire awareness to societal issues on:
   a. Quality of water.
   b. Bio-diesel
   c. Chemical materials utility and their impact.

DETAILED SYLLABUS:

UNIT–I: WATER TECHNOLOGY [9 periods]

Introduction, types of water, impurities in water and their consequences, types of hardness of water, units of hardness of water, disadvantages of hardness of water, estimation of hardness of water by EDTA method, Boiler troubles: Scales and Sludges, Caustic embrittlement, Boiler corrosion and Priming and Foaming. Softening of water: Zeolite process and Ion exchange process, advantages and disadvantages. Desalination of brackish water by Reverse Osmosis, Numerical problems on estimation of hardness of water.

Fluorides in water: effects on human health, defluoridation method-Nalgonda method;comparison of merits and demerits of various defluoridation methods (Nalgonda, Bone Charcoal, Activated Alumina, Contact precipitation, Brick, Reverse osmosis).

UNIT – II: CHEMISTRY OF ENGINEERING MATERIALS [9 periods]

Engineering Plastics: Definition, general properties, synthesis, properties and applications of PC, PTFE, and PMMA.

Conducting polymers: Definition, types of conducting polymers: Intrinsic and extrinsic conducting polymers with examples, engineering applications of conducting polymers.

Biodegradable polymers: Definition, properties, classification, mechanism of degradation of biodegradable polymers and their applications.

Composites – Introduction, types of composites: fiber reinforced particulate and layered composites with examples, advantages of composites and applications.

UNIT– III: NANO CHEMISTRY AND GREEN CHEMISTRY [9 periods]

Nano Chemistry: Introduction, classification, properties and applications of Nano materials (nano particles, nano tubes, nano wires, nano composites, dendrimers);synthesis of Nano materials – Sol-gel process.

Green Chemistry: Introduction, principles of green chemistry, Tools of Green Chemistry with Examples, Applications of Green Chemistry in science and technology.

Biodiesel: Introduction, Synthesis (Trans esterification method), advantages, disadvantages and applications.

UNIT–IV: ELECTROCHEMICAL CELLS AND SENSORS [9 periods]

Electrochemical cell: Introduction, EMF of an electrochemical cell.

Batteries: Introduction, types of Batteries: primary and secondary batteries with examples, Ni-Cd batteries, Lithium-ion batteries, Lithium- Polymer batteries, Applications of batteries.

Fuel Cells: Definition, examples: $H_2 – O_2$ Fuel cell, solid oxide fuel cell, Bio-fuel cell and applications of fuel cells.

Sensors - Introduction, Types of Sensors, electrochemical sensor: construction and working principle of potentiometric sensor, and applications of electrochemical sensors.

UNIT–V: CORROSION AND LUBRICANTS [9 periods]

Corrosion: Introduction, Definition, types of corrosion (dry and wet corrosion), galvanic corrosion, concentration cell corrosion, Factors influencing corrosion, Corrosion control: cathodic protection; sacrificial anodic protection and impressed current cathodic protection; protective coatings: Galvanizing and Electroplating (Nickel).
Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity, flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total periods: 45

TEXT BOOKS:

1. P.C.Jain & Monika Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy & C. Ramachandraiah **Engineering Chemistry**, Mc. Graw-Hill Higher Education, Hyderabad, 1st edition, 2015.

REFERENCE BOOKS:

1. A.K. Bandyopadhyay, **Nano Materials,**New Age international publishers, 2nd edition, 2014.
2. Paul T. Anastas, John C Warner, **Green Chemistry: Theory and practice,**Oxford University Press, 2000

I B.Tech. - I/II Semester

(19BT1BS32**) ENGINEERING CHEMISTRY LABORATORY**

(Common to All Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE REQUISITE: -

COURSE OBJECTIVES:

- To impart knowledge in basic principles of volumetric and instrumental methods of analysis.
- To develop practical skills encompassing quantitative analysis of materials by volumetric methods.
- To develop practical skills to analyze the materials by instrumental methods.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply analytical skills for the quantitative estimation of materials through volumetric methods of analysis and address the societal, health issues related to quality of water.

CO2. Develop analytical skills for the quantitative estimation of materials through instrumental methods of analysis.

CO3. Work independently and in teams to solve problems with effective communication.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS :

1. Estimation of Hardness of water by EDTA method
2. Determination of alkalinity of Water sample
3. Estimation of Dissolved Oxygen in water by Winkler's method.
4. Estimation Fe (II) by Dichrometry
5. Conductometric titration of strong acid Vs strong base
6. Estimation of Ferrous ion by Potentiometry
7. Determination of strength of acid by P^H metric method
8. Determination of Strength of an acid in Pb-Acid battery
9. Determination of Viscosity by Ostwald's viscometer
10. Determination of percentage of Iron in Cement sample by colorimetry
11. Estimation of residual chlorine in drinking water.
12. Identification of simple organic compounds by UV-Vis and IR spectroscopy

TEXT BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.

2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M. Enterprises Limited, 2013.

I-B. Tech- I/II Semester

(16BT1BS31): ENGINEERING CHEMISTRY LABORATORY

(Common to All Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OBJECTIVES: This course enables the students to:

1. Develop practical skills encompassing quantitative analysis of materials by volumetric methods, instrumental methods and acquire designing skills for the synthesis of Nano materials and Engineering plastics.

COURSE OUTCOMES: After completion of the course, a successful student is able to:

1. Acquire basic knowledge about the volumetric analysis and synthesis of materials used for engineering applications**.**
2. Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
3. Develop designing skills for the synthesis of polymers and Nanomaterials.
4. Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, P^H of a solution, determination of viscosity of lubricants and estimation of iron in cement.
5. Provide solutions for environmental issues through determination of quality of water.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS:

1. Estimation of Hardness of water by EDTA method.
2. Estimation of alkalinity of Water.
3. Estimation of Dissolved Oxygen in water.

4. Estimation of Ferrous Iron by Dichrometry.
5. Preparation of Novalac Resin.

6. Synthesis of Nano metal-oxide using sol– gel process.
7. Conductometric titration of strong acid Vs strong base
8. Estimation of Ferrous ion by Potentiometry.
9. Determination of amount of corrosion of metals in different medium
10. Measurement of viscosity of lubricants by Ostwald viscometer.
11. Determination of P^H of a given solution by P^H metry.
12. Estimation of Ferric iron in cement by Colorimetric method.

Duration: 3 Periods for each experiment

Total periods: 36

TEXT BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.
2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M. Enterprises Limited, 2013.

I B. Tech. – II Semester
(19BT2BS02) APPLIED PHYSICS
(Common to Civil and Mechanical Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	--	3

PREREQUISITES: --

COURSE OBJECTIVES:

- To impart fundamental knowledge in the area of mechanics, acoustics, ultrasonics, dynamic motion of a particle, heat energy and modern materials.
- To familiarize the application of modern materials and sensors to civil and mechanical engineering.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the basic knowledge of fiber optics, acoustics and ultrasonics to provide solutions for various engineering problems.

CO2. Analyze and solve the problems associated with kinetics, kinematics and thermal physics.

CO3. Demonstrate the knowledge on characteristics and applications of modern engineering materials.

DETAILED SYLLABUS:

Unit-I: FIBER OPTICS (8 periods)

Introduction, structure of an optical fiber, total internal reflection, acceptance angle, acceptance cone and numerical aperture, modes of propagation, classification of optical fibers, V-number (qualitative), fabrication of optical fiber by double crucible technique, applications of optical fibers, sensors (temperature, displacement, liquid level detector).

UNIT-II: ACOUSTICS AND ULTRASONICS (9 periods)

Acoustics - Introduction, classification of sound, sound intensity level (decibel), reverberation, reverberation time,absorption coefficient and its determination, Sabine's formula (qualitative), factors affecting acoustics and their remedies, basic requirements of an acoustically good hall.

Ultrasonics - Introduction to ultrasonic waves, production of ultrasonic waves by piezoelectric method, magnetostriction method, detection of ultrasonics (qualitative), industrial applications (ultrasonic welding, ultrasonic soldering and ultrasonic drilling).

UNIT-III: KINEMATICS AND KINETICS (10 periods)

Kinematics of particles - Rectilinear motion (displacement-time curve, velocity-time curve, acceleration-time curve), curvilinear motion (velocity and angle of projection,

equation of trajectory path, horizontal range) - inclined projection (equation of trajectory, maximum height, time of flight of projectile, horizontal range, angle of projection).

Kinetics - Bodies in rectilinear translation, kinetics of bodies rotating about fixed axis, work, energy, power, work-energy equation for translation.

UNIT-IV: THERMAL PHYSICS (8 periods)

Introduction, modes of heat transfer (conduction, convection and radiation), coefficient of thermal conductivity, rectilinear flow of heat along a uniform bar, thermal conductivity of bad conductor (Lee's disc method), heat conduction through compound media (materials in series and parallel).

UNIT V:MODERN ENGINEERING MATERIALS (10 periods)

Metallic glasses - Introduction, preparation of metallic glasses by RF sputtering technique, properties (structural, thermodynamic, mechanical, electrical, chemical and optical), applications of metallic glasses.

Shape memory alloys (SMA) – Introduction, shape memory effect and its types, characteristics of SMA, properties of NiTi alloy, applications of SMA.

Composites - Introduction, types and applications.

Total periods: 45

TEXT BOOKS:

1. M. N. Avadhanulu, P. G. Kshirsagar, T. V. S. Arun Murthy, *A Textbook of Engineering Physics* - S. Chand Publications, 11th edition, 2019.
2. S. S. Bhavikatti and K. G. Rajashekarappa, *Engineering Mechanics*, New Age International Publishers, 2nd edition, 2015.

REFERENCE BOOKS:

1. B. K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Learning, 2012.
2. Brij Lal and N. Subrahmanyam, *Heat and Thermodynamics,* S. Chand and Company Ltd., 1995.

I B. Tech. – II Semester

(19BT2BS31) **APPLIED PHYSICS LAB**

(Common to Civil and Mechanical Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE REQUISITE: --

Course Objectives:

- To gain practical knowledge in all experiments by correlating with the theoretical concepts in Physics.
- To analyze and interpret experimental data along with graphical analysis.
- To discuss the basic principles of scientific concepts in various engineering branches.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the experimental procedures to compute the frequency of a tuning fork, hall coefficient, energy gap, moment of inertia, rigidity modulus and thermal conductivity of materials.

CO2. Apply skills to plot various characteristic curves of an optical Fiber and also determine thermal conductivity, thermo emf and energy gap.

CO3. Work independently and in teams to solve problems with effective communication.

A minimum of **Ten** experiments are to be conducted among the following:

LIST OF APPLIED PHYSICS EXPERIMENTS:

1. Determination of moment of inertia of a bar and acceleration due to gravity - Compound Pendulum.
2. Moment of inertia of a Flywheel.
3. Bifilar Pendulum - Moment of inertia of a rectangular body.
4. Melde's Experiment – Determine the frequency of electrically driven tuning fork.
5. Determination of thermal conductivity of a good conductor (Forbe's Apparatus).
6. Determination of thermal conductivity of a bad conductor (Lee's disc method).
7. Thermal Expansion of Solids - Bimetallic Strip.
8. Study of characteristics of an optical sensor.
9. Verification of Newton's Law of Cooling for any two liquids.

10. Determination of number of charge carriers per unit volume and hall coefficients of a given material using Hall Effect.

11. Rigidity Modulus of a material of a wire - Torsional Pendulum

12. Thermocouple - Seebeck Effect.

13. Determine the energy gap of a material by varying temperatures.

REFERENCES:

1. Balasubramanian S, Srinivasan M.N and Ranganathan, *A Text book of Practical Physics,* R, Sultan Chand & Sons, 2017.

2. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=354&cnt=1

I B. Tech. - II semester

(19BT2BS01) **TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA**

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	--	4

PRE-REQUISITE: -

COURSE OBJECTIVES:

- To familiarize with Fourier series of a periodic function, the Fourier integral of a function and the Fourier transformation.
- To introduce Laplace transform techniques for solving differential equations.
- To acquaint the students with concepts of matrices and linear transformations useful in engineering contexts.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Apply the knowledge of Fourier and Laplace transform techniques to solve differential equations.

CO2: Analyze linear transformations and associated matrices to solve engineering problems by applying the knowledge of linear algebra.

DETAILED SYLLABUS:

UNIT- I: Fourier Series and Fourier Transforms (9 Periods)

Fourier series:Determination of Fourier coefficients, Euler's formulae, convergence of Fourier series (Dirichlet's conditions), Fourier series in $(0,2l),(-l,l)$; Fourier series of even and odd functions; Half-range Fourier sine and cosine expansions in $(0,l)$; Fourier integral theorem (statement only), Fourier sine and cosine integrals; Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

UNIT-II: Laplace Transforms (9 Periods)

Definition of Laplace transform, existence conditions, Laplace transform of standard functions, Properties of Laplace transforms, Laplace Transforms of derivatives, Laplace Transforms of integrals, multiplication by t^n, division by t, Laplace transform of periodic functions, Laplace transforms of unit step function and unit impulse function.

UNIT- III: Inverse Laplace Transforms (9 Periods)

Inverse Laplace transform by different methods; Convolution theorem (without proof), inverse Laplace transforms by convolution theorem; Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT- IV: Linear Algebra-I (Matrices) (9 Periods)

Rank of a matrix: echelon form; Linear systems of equations: solving system of Homogeneous and Non-Homogeneous equations; Eigen values and Eigen vectors of a matrix and properties (without proofs), Diagonalization of matrix by orthogonal transformation; Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

UNIT- V: Linear Algebra-II (Vector Spaces) (9 Periods)

Vector spaces, Linear dependence and independence of vectors, basis, dimension, Linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem (without proof), matrix associated with a linear map.

Total Periods: 45

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, *Engineering Mathematics-II*, S. Chand & Company, 10th edition, 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
3. David Poole, *Linear Algebra: A Modern Introduction*, Brooks/Cole, 2nd edition, 2005.

REFERENCE BOOKS:

1. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw hill, 1st edition, 2017.
2. V.Krishna Murthy, Mainra and Arora: *An Introduction to Linear Algebra*, Affiliated East-West Press, 1993.

I B. Tech. – II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OBJECTIVES:

CEO 1 :To impart basic knowledge on Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations.

CEO 2 :To develop skills in analyzing the problems ,designing mathematical models, Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations for the problems in engineering.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO 1 :Acquire basic knowledge in
(a) Fourier series and Fourier transforms
(b) Fourier integrals
(c) Laplace transforms and their applications
(d) z- transforms and their applications
(e) solving partial differential equations
(f) Heat transfer and wave motion

CO 2 : Develop skills in analyzing the
(a) Properties of Fourier series for a given function
(b) Partial differential equations through different evaluation methods
(c) Difference equations through z – transforms
(d) Engineering systems and processes involving wave forms and heat transfer

CO 3 :Develop skills in designing mathematical models for
(a) Problems involving heat transfer and wave forms
(b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO 4 :Develop analytical skills in solving the problems involving
(a) Fourier series and Fourier transforms
(b) Laplace transforms
(c) Z-transforms and difference equations
(d) Heat transfer and wave motion

CO 5 : Use relevant transformation techniques for
(a) Obtaining Fourier transforms for different types of functions

(b) Laplace transforms
(c) Z- transforms
(d) Partial differential equations

DETAILED SYLLABUS

UNIT- I : FOURIER SERIES (7 periods)

Fourier series: Determination of Fourier coefficients,convergence of Fourier series (Dirichlet'sconditions),Fourier series of even and odd functions, Half-range Fourier sine and cosine expansions.

UNIT- II: FOURIER INTEGRALSAND FOURIER TRANSFORMS (8 periods)

Fourier integral theorem (statement only), Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms –properties, Inverse transform and finite Fourier transforms.

UNIT-III:LAPLACE TRANSFORMS (12 periods)

Laplace transforms of standard functions. Properties of Laplace transforms. First and second shifting Theorems. Laplace transforms of derivatives and integrals. Inverse transforms. Convolution theorem (without proof), inverse Laplace transforms by convolution theorem. Laplace transform of periodic functions, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT-IV : Z- TRANSFORMS (9 periods)

Z – transforms, inverse Z– transforms, damping rule, shifting rule, initial and final value theorems. Convolution theorem(without proof), solution of difference equations by Z– transforms.

UNIT – V : PARTIAL DIFFERENTIAL EQUATIONS (9 periods)

Formation of Partial differential equations – Solutions of first order linear equations by method of grouping. First and second order equations by method of separation of variables – Solutions of one dimensional Wave equation, Heat equation.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi,S.Ranganatham and M.V.S.S.N. Prasad,***Engineering Mathematics, vol-1***, S. Chand & Company 13/e,2014.
2. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N.Prasad, ***Mathematical Methods***,S.Chand and Company, 8/e,2013

REFERENCE BOOKS:

1. Grewal, B.S., ***Higher Engineering Mathematics***,Khanna publishers, Delhi, 42/e,2012

2. Kreyszig, E., ***Advanced Engineering Mathematics***,John Wiley and Sons, Inc.,9/e,2013.

II B. Tech. – II Semester (ECE, EEE and EIE)/

III B. Tech. – I Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)

(19BT4BS01) MATERIAL SCIENCE

(Open Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to Material Science and Engineering; Composite Materials; Smart Materials; Nano and Biomimetic Materials; Emerging Materials.

COURSE OBJECTIVES:

- To impart knowledge on processing, structure and properties of materials like composite materials, smart materials, biomimetric materials and nanomaterials.
- To develop awareness among the students about the impact of material science in engineering practices.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Attain the basic knowledge on composites, smart materials, biomimetic materials and nano materials.

CO2. Demonstrate essential information about structure and properties of various composites used in various engineering applications.

CO3. Understand the basic properties of electro-rheostatic, magneto-rheostatic and shape memory alloys used in device applications.

CO4. Accomplish the basic knowledge in nanomaterials to familiarize various nano structured device applications.

CO5. Outline the processing and properties of functionally graded materials and identify its applications in various fields.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO MATERIAL SCIENCE AND ENGINEERING (08 Periods)

Introduction - historical perspective - material science and engineering, classification of materials (metals, ceramics, polymers and composites) and advanced materials and their applications (biomaterials, smart materials and nanomaterials), modern materials needs. Processing, properties and applications of metals, polymers and ceramics (Qualitative).

UNIT- II: COMPOSITE MATERIALS (10 Periods)

Composite Materials - Classification, Laminated composites and Reinforced composite materials – Classification, structure and properties of sandwich composites – applications (commercial Aircraft, Marine Grade Sandwich, Automobile Grade Sandwich and Wind Turbine Blades), properties and applications of Nano composites - Advantages and Limitations of composites.

UNIT- III:SMART MATERIALS (07 Periods)

Classification of smart materials -Magneto-rheostatic (MR) and Electro-rheostatic (ER) materials - Shape Memory Alloys (SMA)- characteristics, Shape memory effect applications in different fields, advances in smart materials.

UNIT – IV: NANO AND BIOMIMETIC MATERIALS (10Periods)

Nanomaterials: Introduction, Low dimensional structures and energy quantization. Fabrication of nano materials - Lithographic technique using photons, metallic, semiconducting and magnetic properties of nano materials and applications (renewable energy and nano electro-mechanical systems (NEMS)).

Biomimetic materials – Introduction- classification and their applications (Lotus effect, Dolphin sound wave technology and viper as a model in defence)

UNIT- V: EMERGING MATERIALS (10 Periods)

Functionally graded materials (FGM) - Types, processing, properties and potential applications, functionally graded fibre cement – structural material, Functionally Graded Nanoelectronic, Optoelectronic and Thermoelectric Materials (Qualitative) and its applications.

Total Periods: 45

TEXT BOOKS:

1. William D Callister, David G Rethwisch, *Materials Science and Engineering*, Wiley, 9th edition, 2014.
2. K M Gupta, *Engineering Materials – Research, Applications and Advances*, CRC press (Taylor & Francis group), 2015.

REFERENCE BOOKS:

1. Sulabha K Kulkarni*, Nanotechnology: Principles and practices*, Springer, 9th edition, 2014.
2. Charles P. Poole and Frank J. Owens, *Introduction to Nanotechnology*, Wiley-Interscience, May 2003.
3. Sulabha K Kulkarni, *Nanotechnology: Principles and Practices,* Springer, 3rd edition, 2014.

III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS05)GENDER AND ENVIRONMENT

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Gender and the environment relationship, Gendered Roles in the family & community, Gender and sustainable development, Gender in environmental justice, Gender &environmental security.

COURSE OBJECTIVES:

- To enhance understanding of environmental issues by considering the particular experiences of women and men in the face of environmental degradation and key areas in gender-environment relations and gender roles in thefamily, community and international levels.
- To trace how different feminisms, build on the core concepts of sustainability and justice to transform familiar debates in global environmental politics.
- To provide analysis of how gender relations affect the natural environment and how environmental issues have a differential impact on women and men.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Apply the knowledge of gender & environment connections, key issues and topics within global environmental politics in environmental decision-making.

CO2: Comprehend the concepts of gender and sustainable development through debates, and policy documents.

CO3: Analyze the concept of environmental security and justice by identifying the sources of insecurity.

DETAILED SYLLABUS

UNIT I: GENDER ANDENVIRONMENT RELATIONSHIP (9 Periods)

Introduction–Gender and Environment–Development of gender roles–Society, gender & environment – Understanding environmental politics – Gender-environment connections–Eco-feminism - Cultural eco-feminism–Social eco-feminism - Feminist political ecology

UNIT II: GENDERED ROLES IN THE FAMILY & COMMUNITY (9 Periods)

Organization of the household – Domestic division of labour - Food: growing, harvesting, shopping, preparing, and cooking
Gender & Power- Planning – Politics – NGO – Gendering of environmental protest – Environmental decision-making

UNIT III: GENDER ANDSUSTAINABLE DEVELOPMENT (9 Periods)

Concept of sustainability & its achievement – Concept of sustainable development – Ecological Modernization – Gender & sustainability debates – Gender & sustainable development debates - Gender in policy documents – Gender, poverty & equity in sustainable development

UNIT IV: GENDER IN ENVIRONMENTAL JUSTICE (9 Periods)

Normative Concerns (Fairness, Inequality & Justice) - Making sense of Environmental justice – Ecological debt, Transnational harm,& human rights – Ecological justice – Gender & Environmental Justice – Gender, Vulnerability & risk – Women in environmental justice movements – Knowledge & participation – Gender, sustainability& justice as guiding concepts

UNITV: GENDER AND ENVIRONMENTAL SECURITY (9 Periods)

Connections between security & the environment – **Gender, environment & security:**Sustainability as security - poverty & insecurity – Insecurity as injustice – Competing ways of thinking security – Reflecting on sources of insecurity – **Case Study** – Food Security -**Case Study** – The impacts of natural disasters

Total Periods: 45

TEXT BOOKS:

1. Nicole Detraz. (2017) "Gender and the Environment"Polity Press, Cambridge, UK.
2. Susan Buckingham- Hatfield. (2000) "Gender and Environment"Routledge, London.

REFERENCE BOOKS:

1. Promillakapur (ed). (2000). "Empowering Indian Women" Publication Division, Government of India, New Delhi.
2. Ronnie Vernooy, (Ed). (2006). "Social and gender Analysis Natural Resource Management: Learnning studies and lessons from Aisa" Sage, New Delhi.
3. Swarup, Hemlata and Rajput, Pam. (2000). Gender Dimensions of Environmental and Development Debate: The Indian Experience" In SturatS.Nagel, (ed). "India"s Development and Public Policy".Ashgate, Burlington.

II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/
III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS09) LIFE SKILLS

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Positive attitude; Self-discovery-Interpersonal relationships; Cross-cultural communication; Core thinking-Problem solving and Decision making; Business presentations and Public speaking.

COURSE OBJECTIVES:

- To inculcate skills for self-efficacy required to manage effective interpersonal relationships.
- To familiarize the strategies involved in problem solving, decision making and SWOT analysis.
- To develop presentation skills required in professional arena.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Gain knowledge in strategies involved in developing positive attitude, process ofknowing oneself and managing effective interpersonal relationships.

CO2. Analyse problem solving strategies in Decision Making and SWOT analysis.

CO3. Communicate effectively with Engineering Community and Society by demonstrating presentation skills in professional arena.

DETAILED SYLLABUS:

UNIT I: POSITIVE ATTITUDE (9 Periods)

Introduction, Features of attitudes, Formation of attitudes, Ways of changing attitude in a person, Attitude in a work place, Developing positive attitude, Obstacles in developing positive attitude, Measuring attitude.

UNIT II: SELF DISCOVERY AND INTERPERSONAL RELATIONSHIPS (9 Periods)

Importance of knowing yourself, Process of knowing yourself, SWOT Analysis, Elements of attitude in interpersonal relationships, Methods to deal with different types of interpersonal relationship skills.

UNIT III: CROSS-CULTURAL COMMUNICATION (9 Periods)

Different Communication Styles, Cultural variables, communication sensitivity and variables of national culture, Individual Cultural Variables, Cross-cultural Communication Strategies, Potential hot spots in cross-cultural communication, Cross-cultural communication – Basic Tips.

UNIT IV: CORE THINKING, PROBLEM SOLVING AND DECISION MAKING (9 Periods)

Process of developing core thinking skills, Categories of thinking: Critical & Creative, Understanding problem solving, Cause of problems, Stages of problem solving, Methods of problem solving, Types of decision making.

UNIT V: BUSINESS PRESENTATIONS AND PUBLIC SPEAKING (9 Periods)

Business presentations and speeches, structuring the material, Types of delivery, Guidelines for delivery, Effective sales presentation, Controlling nervousness and stage fright.

Total Periods: 45

TEXT BOOKS:

1. Dr. K. Alex (2018) Soft Skills, S. Chand and Company Limited, New Delhi.

2. Manmohan Joshi (2017) Soft Skills, bookboon.com, Bangalore.

REFERENCE BOOKS:

1. Meenakshi Raman and Prakash Singh (2013), Oxford University Press, New Delhi.

2. Jeff Butterfield (2011) Soft Skills for Everyone, Cengage Learning India Private Limited, Delhi.

II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/

III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS11) PROFESSIONAL ETHICS

(Open Elective -2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering Ethics; Professional Ideals and Virtues; Engineering as Social Experimentation; Responsibilities and Rights; Global Issues.

COURSE OBJECTIVES:

- To impart fundamental concepts of engineering ethics, professional values and social responsibility.
- To develop skills in discharging the professional responsibilities as managers, advisors and leaders
- To apply code of ethics in workplace.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in Engineering Ethics, Responsibilities and Rights.

CO2. Analyze the concepts of Engineering in Social Experimentation and Global Issues.

CO3**.** Apply the nuances of professional ideals at work place and in social context.

DETAILED SYLLABUS:

UNIT - I: ENGINEERING ETHICS (9 periods)

Scope and aim of engineering ethics, Senses of engineering ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus and controversy.

UNIT - II:PROFESSIONAL IDEALS AND VIRTUES (8 periods)

Theories about virtues, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

UNIT - III:ENGINEERING AS SOCIAL EXPERIMENTATION (10 periods)

Engineering as experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, Engineers as responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards, Problems with the law of engineering.

UNIT - IV: RESPONSIBILITIES AND RIGHTS (9 periods)

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights and discrimination.

UNIT - V: GLOBAL ISSUES (9 periods)

Multinational corporations, Professional ethics, Environmental ethics, Computer ethics, Engineers as consultants, Witnesses, Advisors and Leaders, Engineers as Managers, Managerial ethics applied to Engineering Profession, moral leadership.

Total Periods: 45

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd edition, 2007.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.

II B.Tech.- II Semester(ECE, EEE and EIE)/
III B.Tech.- I Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)

(19BT4HS12) WOMEN EMPOWERMENT (Open Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Concept & Framework, Status of Women, Women's Right to work, International Women's Decade, and Women Entrepreneurship.

COURSE OBJECTIVES:

- To provide knowledge on the concept and framework for women empowerment, socio-economic political status of the women and develop consciousness among themselves to fight for their rights,
- To witness unprecedented efforts from various sectors to reassess the roles of women, to enlarge the information base, to search for alternative strategies for women's equality and development and to develop policies and programs addressed to women's specific problems and needs.
- To create awareness on women entrepreneurship and schemes for the development of women entrepreneurship and entrepreneurial challenges and opportunities

COURSE OUTCOMES: After successful completion of the course, the students will be able to:

CO1: Demonstrate the characteristics of empowered women, their achievements, and frame work for women empowerment, legal laws, and political status of women.

CO2: Apply the knowledge of women rights to address various societal issues and obstacles in different fields including science and technology.

CO3: Understand the significance of participation in policy debates, National conferences and common forums for women's' equality and development.

CO4: Analyze the concept of women entrepreneurship, government schemes and entrepreneurial challenges and opportunities.

DETAILED SYLLABUS:

UNIT I: CONCEPT & FRAMEWORK (9 Periods)

Introduction- Empowered Women's Characteristics- Achievements of Women's Empowerment **Concept of Empowerment:** Meaning& Concept- Generalizations about Empowerment -Empowerment Propositions - Choices women can make for empowerment - Women's participation in decision making, development process & in Governance. **Framework for Women's Empowerment** - Five levels of equality- Tenets of

Empowerment- Elements - Phases and aspects - Techniques - Categories and Models – Approaches.

UNIT II: STATUS OF WOMEN (9 Periods)

Legal Status: Present Scenario- Call for Social change- Significant trends - Legal & Schemes - Personal Law- Joint Family- Criminal Law- Shift towards Dowry - Deterrent Punishment - Criminal Law(II Amendment) - Discrimination in Employment

Political Status: Present Scenario - Political Participation & its Nature- Socio-economic Characteristics - Political Mobilization: Mass Media - Campaign Exposure - Group Orientation - Awareness of issues and participation - Progress & Future Thrust.

UNIT III: WOMEN'S RIGHT TO WORK (9 Periods)

Introduction- Present Scenario - Changes in Policy &Programme - National Plan of Action- Women's Cells and Bureau - Increase in work participation rate- Discrimination in labourmarket - Women in unorganized sector - Issues and Obstacles- Women in Education - Women in Science & Technology –

Case Study: Linking Education to Women's Access to resources.

UNIT IV: WOMEN'S PARTICIPATORY DEVELOPMENT (9 Periods)

Dynamics of social change- conscious participation - Information Explosion - Organized Articulation - National Conference - Common Forums - Participatory Development - New Issues Identified - Role of other Institutions.

UNIT V: WOMEN ENTREPRENEURSHIP (9 Periods)

Introduction–Definition-Concept- Traits of women Entrepreneurs- Role of women Entrepreneurs in India -Reasons of Women Entrepreneurship- Government schemes & Financial Institutions to develop Women Entrepreneurs - Key policy recommendations - Project Planning-Suggestions and measures to strengthen women entrepreneurship - Growth & Future challenges - Training and Opportunities –

Case Study: Training Women as Hand-pump Mechanics

Case Study : Literacy for Empowering Craftswomen

Total Periods: 45

TEXT BOOKS:

1. NayakSarojini, Nair Jeevan(2017), "Women's Empowerment in India". Pointer Publishers, Jaipur
2. SahaySushama(2013), "Women and Empowerment" Discovery Publishing House, New Delhi.

I B. Tech. – I Semester

(19BT10201) **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

(Common to EEE, ECE, EIE, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of Electrical Systems; AC Machines; Semiconductor Devices and Op-Amps.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Analyze electrical circuits by applying the conceptual knowledge of circuit elements.

CO2. Demonstrate knowledge on various generation technologies, protection devices, safety procedures and BEE standards.

CO3. Demonstrate knowledge on characteristics and applications of transformers and AC machines.

CO4. Demonstrate knowledge on characteristics and applications of diode, BJT and Op-amps.

DETAILED SYLLABUS:

UNIT-I: Principles of Electrical Systems-I (9 Periods)

Basic electrical sources: DC-Battery, AC sources–Single loop generator; Single phase and three phase supply; Electrical circuit elements (R, L and C), Ohm's law, Kirchhoff's laws, Representation of sinusoidal waveforms, peak and RMS values, phasor representation, reactive power, apparent power, real power, energy and power factor.

UNIT-II: Principles of Electrical Systems-II (9 Periods)

Significance of Power factor and power factor correction, most economical power factor. Typical layout of electrical grid; Typical layout and operation of Hydro, Thermal and Solar Power Plants; Fuse, circuit breaker (MCB, MCCB, RCCB, ELCB), relay (elementary treatment); Inverter and UPS (block diagram approach only). Earthing – importance of earthing, pipe earthing and plate earthing; Safety measures. Energy Efficiency (Star rating) standards by BEE.

UNIT-III: Transformers and AC Machines (9 Periods)

Construction and working of a single phase transformer, EMF Equation; Construction and working of three phase induction motor, torque equation, torque-slip characteristics, applications; construction and working of a resistor start &capacitor start and run single phase induction motor, applications; Construction and working of synchronous machine, applications.

UNIT-IV: Semiconductor Devices (10 Periods)

PN Junction diode, Characteristics, applications - half wave and full wave rectifier.Zener diode, characteristics, application–Regulator.BJT- operation, configurations, characteristics, applications - switch and amplifier.

UNIT-V: Op-Amps (8 Periods)

Operational Amplifier: Block diagram of Op-Amp, equivalent circuit, Op-Amp AC and DC Characteristics, Inverting and Non-Inverting modes. Applications - Adder, Comparator, Integrator and Differentiator.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. AshfaqHussain*, Fundamentals of Electrical Engineering,* Dhanpatrai& Co. (P) Ltd., *3*rd edition, New Delhi, 2009.
2. R. L. Boylestad and Louis Nashelsky, *Electronics Devices and Circuits*, PHI, 11th edition, 2009.

REFERENCE BOOKS:

1. M.S. Naidu, S. Kamakshaiah, *Introduction to Electrical Engineering ,*Tata McGraw-Hill Education, New Delhi, 2007.
2. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International Pvt. Ltd., 4th edition, 2011.

I B. Tech. – I Semester

(19BT10231) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

(Common to EEE, ECE, EIE, CSE(AI), CSE(DS) and CSBS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Physics at intermediate level.

COURSE DESCRIPTION: Practical investigations on Electrical circuits, AC Machines, Semiconductor Devices and Op-Amps.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Analyze, measure, interpret and validate the practical observations by applying the fundamental knowledge of electrical circuits, machines and electronic devices.

CO2. Design Op-amp based amplifier, voltage summer and integrator circuits for desired specifications.

CO3. Work independently and in teams to solve problems with effective communication.

List of Experiments:

Minimum **Ten** experiments are to be conducted.

1. Measurement of electrical quantities (AC & DC) using Voltmeter, Ammeter and Wattmeter.
2. Verification of Ohm's law and Kirchhoff's laws.
3. Circuit
   (a) with one lamp controlled by one switch and provision of 2-pin or 3-pin socket PVC surface conduit system.
   (b) With two lamps controlled by two switches with PVC surface conduit system.
   (c) for Stair case wiring and Godown wiring.
4. Measurement of Power factor and it's improvement.
5. Load test on 1-Phase Transformer.
6. Brake test on 3-Phase Induction Motor.
7. Brake test on 1- phase induction motor.
8. VI Characteristics of PN and Zener Diodes.
9. Ripple factor and load regulations of rectifier with and without filters.
10. Input and output characteristics of CE configuration.
11. Design of inverting and non-inverting amplifiers using op-amp.
12. Design of voltage summer and integrator using op-amp.
13. Soldering practice.

REFERENCES BOOKS/ LAB MANUALS:

1. P. S. Dhogal, *Basic Practicals in Electrical Engineering*, Standard Publishers, 2004.

2. YannisTsividis, *A First Lab in Circuits and Electronics*, Wiley, 1st edition., 2001

ADDITIONAL LEARNING RESOURCES:

1. www.vlab.co.in, Virtual Electric Circuits Lab, A initiative of MHRD under NMEICT.
2. www.vlab.co.in, Basic Electronics Lab, A initiative of MHRD under NMEICT.
3. https://nptel.ac.in/courses/117106108/
4. https://ocw.mit.edu/high-school/physics/exam-prep/electric-circuits/
5. https://nptel.ac.in/courses/108105017/
6. https://nptel.ac.in/courses/108108112/
7. https://nptel.ac.in/courses/117107094/

I B. Tech. – II Semester

(19BT10501) PROGRAMMING FOR PROBLEM SOLVING

(Common to EEE, ECE, EIE and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: A course on Basic Mathematics

COURSE DESCRIPTION: Introduction to problem solving approach, Introduction to Python programming, control structures, sequences, sets, Dictionaries, Implementation of Data structures using Python, Modular programming, file handling, Data representation and Visualization.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Demonstrate knowledge on Python constructs to solve basic problems.

CO2. Demonstrate knowledge on Python constructs to solve basic problems.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO PROBLEM SOLVING AND PYTHON PROGRAMMING (10 Periods)

Problem Solving Aspect: top-down design, implementation of algorithms, building blocks of flow charts, program verification and efficiency of algorithms.

Python Programming: tokens, literals, identifiers, keywords, special symbols and operators; fundamental data types, expressions, type conversions, handling Input and output in Python.

UNIT-II: CONTROL STRUCTURES (8 Periods)

Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.

Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops.

UNIT-III: SEQUENCES, SETS, DICTIONARIES AND DATA STRUCTURES (9 Periods)

Sequences: Lists and operations - creating, inserting elements, updating elements, deleting elements, searching and sorting, list comprehensions, nested lists; **tuples -** creating, searching and sorting, nested tuples; **strings -** Initializing a string and string operations, string handling methods, string formatting; **sets -** set creation and operations; **dictionaries -** operations on dictionaries, dictionary methods, sorting elements using lambdas.

Data structures: Stacks - push, pop, peek and display operations on stack, applications of stack; **Queues –** enqueue, dequeue and display operations on queue, applications of queues.

UNIT-IV: MODULAR PROGRAMMING AND FILE HANDLING (10 Periods)

Modular Programming: need for functions, function definition, function call, variable scope and lifetime, return statement, positional arguments, keyword arguments, default arguments and variable-length arguments, recursive functions; Modules - math, NumPy, date and time.

File Handling: types of files, opening and closing files, reading and writing data.

UNIT-V: DATA REPRESENTATION AND VISUALIZATION (8 Periods)

Pandas: creating data frame, reading data from CSV files, indexing and selecting data, dealing with rows and columns; Visualization - bar plots, histogram, Scatter Plot.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. R. NageswaraRao, *Core Python Programming,* 2nd edition, Dreamtech Press, 2018.
2. R. G. Dromey, *How to solve i*t by Computer,* Pearson, 2006.

REFERENCE BOOKS:

1. ReemaThareja, *Python Programming using Problem Solving Approach*, 1st edition, Oxford University Press, 2017.
2. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem-Solving Focus*, Wiley India, 2016.

I B. Tech. – II Semester

(19BT10531) PROGRAMMING FOR PROBLEM SOLVING LAB

(Common to EEE, ECE, EIE and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on Basic Mathematics

COURSE DESCRIPTION: The course is designed to provide hands on practice on Scratch programming and python programming for problem solving.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Develop scripts using Scratch tool to simulate simple problems.

CO2. Apply Python Constructs and Modules to develop solutions for real-life problems.

CO3. Function effectively as an individual and in team to foster knowledge and creativity.

CO4. Write and present a substantial technical report/ document effectively.

PRACTICAL EXERCISES:

1) a) Design a script in Scratch to simulate Airplane for take-off and land.

   b) Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.

2) a) Design a script in Scratch to calculate factorial of a given number.

   b) Design a script in Scratch to simulate Maze game. (Hint: To get Maze images refer http://inventwithScratch.com/downloads/)

3) a) Write a python script to read two integer numbers and perform arithmetic operations.

   b) Write a python script to evaluate following expressions by considering necessary inputs.

   i) $ax^2 + bx + c$ ii) $ax^5 + bx^3 + c$ iii) (ax + b) / (ax - b) iv) x - a / b + c

4) a) Write a python script to convert given decimal number into octal, hexa decimal and binary.

   b) Write a python script to read four integer values separated with commas and display the sum of those four numbers.

   c) Write a python script to print "SVEC" with prefix of ten spaces by using format().

5) a) Write a python script to calculate electricity bill based on following slab rates.

Consumption units	Rate (in Rupees/Unit)
0-100	4
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8

(Hint: To get Consumption units take current Meter reading, old meter reading from the user as input)

b) Print the following pattern using python script.

```
        1
      1 2 1
    1 2 3 2 1
  1 2 3 4 3 2 1
1 2 3 4 5 4 3 2 1
```

6) a) Write a python script to read *N* student details like name, roll number, branch and age. Sort the student details based on their names and display.

b) Write a python script to delete duplicate strings from a list of strings. (Insertion order should maintain after deleting duplicate string).

c) Write a python script to read N number of student details into nested list and convert that as a nested dictionary.

7) a) Design a function that can perform sum of two or three or four numbers.

b) Write a python script to implement towers of Hanoi problem.

c) Write a Python function prime square (l) that takes a nonempty list of integers and returns True if the elements of l alternate between perfect squares and prime numbers, and returns False otherwise. Note that the alternating sequence of squares and primes may begin with a square or with a prime. Here are some examples to show how your function should work.

```
>>>primesquare([4])
True
>>>primesquare([4,5,16,101,64])
True
>>>primesquare([5,16,101,36,27])
False
```

8) a) Write a python script to perform arithmetic operations on numpyarrays.

b) Write a python script to perform following matrix operations using numpy.

i) Dot product ii) Matrix product iii) Determinant iv) Inverse

9) a) Write a python script to Create Pandas data frame using list of lists.

b) Write a python script to load data from a CSV file into a Pandas Data Frame and perform basic operations on it.

10) a) Draw a Scatter Plot by considering an appropriate data set.

b) Draw histograms by considering an appropriate data set.

11) **Mini Project-1**

12) **Mini Project-2**

TEXT BOOK:

1. R. NageswaraRao, *Core Python Programming*, 2nd edition, Dreamtech Press, 2018.

II B. Tech. - II Semester

(19BT315AC)DESIGN THINKING

(Audit Course)
(Common to ECE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION:

Design thinking process, Design thinking phases, empathy tools; Idea generation, visualizing and empathizing; Fidelity for prototypes, prototyping; prototyping for physical products.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1. Analyze design thinking concepts and principles to perform human centered design process for creative problem solving.

CO2. Create empathy maps to visualize user attitudes and behavior for gaining insights of customers.

CO3. Develop innovative products or services for a customer base using ideation techniques.

CO4. Build prototypes for complex problems using gathered user requirements.

CO5. Apply design thinking tools techniques to produce good design and relevant products or services for a specific target market.

CO6. Improve prototype by testing it with a specific set of users for making it sustainable by following ethics.

DETAILED SYLLABUS:

UNITI:INTRODUCTION TO DESIGN THINKING (6 Periods)

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools.

UNIT II: EMPATHIZE (6 Periods)

Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools : Customer Journey Map, Personas.

UNIT III:IDEATION (6 Periods)

Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method**,** Ideation Tools: How Might We? (HMW), Story board, Brainstorming.

UNITIV: PROTOTYPING (6 Periods)

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype

UNIT V: TESTING PROTOTYPES (6 Periods)

Prototyping for digital products: What's unique for digital, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.

Total Periods: 30

Topics for Self Study are provided in the Lesson Plan

TEXTBOOKS:

1. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam, "Introduction to Design Thinking",TataMcGraw Hill, First Edition,2019.
2. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly,2017.

REFERENCE BOOKS

1. Michael G. Luchs, Scott Swan , AbbieGriffin,"Design Thinking – New Product Essentials from PDMA", Wiley, 2015.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.

ADDITIONAL LEARNING RESOURCES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://nptel.ac.in/courses/109/104/109104109/
6. https://nptel.ac.in/courses/110106124/

II B. Tech. - II Semester

(19BT50409) GREEN TECHNOLOGIES

(Open Elective-2)

(Common to CE, ME, CSE, CSSE, IT, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: *After successful completion of the course, students will be able to:*

CO1. Analyze energy efficient communication systems such as Telecommunication systems, ICT, Wireless networks and cellular networks by understanding the principles of green communications.

CO2. Understand the impact of conventional energy sources on environment and realize the significance and principles of green energy sources for sustainability.

CO3. Understand the environmental impacts of IT and approaches for Green IT.

CO4. Analyze concepts of sustainable green construction using appropriate tools and techniques following latest developments and considering safety and environment besides communicating effectively in graphical form.

CO5. Demonstrate the environmental impact of traditional manufacturing and explore the need for green manufacturing process promoting sustainability.

DETAILED SYLLABUS:

UNIT I–PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS (9 periods)

Principles of Green Engineering: Introduction, Definition of green engineering, Principles of green engineering

Green Communications: Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT II–GREEN ENERGY (9 periods)

Introduction, green energy systems - composition, adverse impacts,Green energy and sustainability, the target and solution.Diversification and localization of energy systems, green energy and sustainable development.Energy sources and their availability. Green energy sources - solar energy, wind energy, geothermal energy, ocean energy, biomass and biogas.

UNIT III–GREEN IT **(9 periods)**

Introduction, Awareness to Implementation: Green IT Trends, Green Engineering, Greening by IT: Using RFID for Environmental Sustainability, Smart Grids, Smart Buildings and Homes, Green Supply Chain and Logistics, Enterprise-Wide Environmental Sustainability, A Seven-Step Approach to Creating Green IT Strategy: Balancing the Costs and Benefits of Going Green, Research and Development Directions.

UNIT IV–GREEN CONSTRUCTION **(9 periods)**

Green Building: Concept, Necessity, Characteristics, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures, case studies of residential and commercial green buildings.

Vastu: Concept, History, scientific approach, elements of vastu for selecting a plot.

Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT V – GREEN MANUFACTURING **(9 periods)**

Green Manufacturing - Introduction, Background and Definition; Impact of traditional manufacturing in environmental ecology, Need for green manufacturing, Motivation and barriers to green manufacturing, Advantages and Limitations of green manufacturing, Green manufacturing strategies,Green manufacturing and sustainability, Green manufacturing through clean energy supply, Green packaging and Supply chain.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. KonstantinosSamdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice*, John Wiley & Sons, 2015.
2. G.D. Rai, *Non-conventional Energy Sources*, KhannaPublishers, Delhi, 5th Edition,2011.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices*, John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, Volume 1, E & FN Spon, an imprint of Thomson Science & Professional.
5. J Paulo Davim, *Green Manufacturing: Processes and Systems*, Springer, 2012.
6. David A Dornfeld, *Green Manufacturing: Fundamentals and Applications*, Springer, 2013.

REFERENCE BOOKS:

1. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
2. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
3. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.

IV B.Tech. - I Semester

(16BT70412)GREEN TECHNOLOGIES

(Open Elective)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:

Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. Deploy conceptual knowledge in green technologies pertaining toengineering practice.
CO2. Analyze various green technologies for engineering practice.
CO3. Provide green solutions to engineering problems.
CO4. Apply various green techniques in the engineering practice.
CO5. Consider health and safety issues while providing green solutions to the society.
CO6. Understand issues related to environment sustainability.
CO7. Apply ethical standards for environmental sustainability in the engineering practice.

DETAILED SYLLABUS:

UNIT-I: PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS (11 Periods)

Principles of Green Engineering:

Introduction, Definition of green engineering, Principles of green engineering.

Green Communications:

Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT-II: GREEN ENERGY (09 Periods)

Introduction, adverse impacts of carbon emission, control of carbon emission– methods, greenhouse gas reduction – methods, Energy sources and their availability, Green energy for sustainable development. Green energy sources – Solar energy, Wind energy, Fuel cells, Biofuels, Wave and Geothermal energy (Principle of generation only).

UNIT-III: GREEN IT (09 Periods)

The importance of Green Information technologies, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social Media, Regulating Green IT- Laws, Standards and Protocols; RoHS, REACh, WEEE, Legislating for GHG Emissions and Energy Use of IT Equipment, Non-regulatory Government Initiatives, Industry Associations and Standard Bodies, Green Building Standards, Green Data Centres, Social Movements and Greenpeace, Conclusions.

UNIT-IV: GREEN CONSTRUCTION (09 Periods)

Green Building: Definition, Typical features, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures.

Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT-V: GREEN MANUFACTURING (09 Periods)

Introduction, background, definition, motivation and barriers to green manufacturing, Impact of manufacturing in environmental ecology, Need for green manufacturing, Advantages and Limitations, green manufacturing strategies, Green manufacturing and sustainability, Sustainability tools; Waste stream mapping and application, Green manufacturing through clean energy supply, green lean manufacturing, green packaging and supply chain.

Total Periods: 47

TEXT BOOKS:

1. KonstantinosSamdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice,*John Wiley & Sons, 2015.
2. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices,* John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, *Volume 1*, E & FN Spon, an imprint of Thomson Science & Professional.
5. *IGBC Green Homes Rating System Version 1.0* – A bridged reference guide.
6. J Paulo Davim, Green Manufacturing: Processes and Systems, Springer, 2012.
7. David A Dornfeld, Green Manufacturing: Fundamentals and Applications, Springer, 2013.

REFERENCE BOOKS:

1. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.
2. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, Delhi, 5thEdition,2011.
3. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
4. R. K. Gautham, *Green Homes*, BS publications, 2009.

III B. Tech. – I Semester

(19BT50104) **TRANSPORTATION ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Surveying, Soil Mechanics

COURSE DESCRIPTION: Highway development and planning; Highway geometric design; Pavement materials; Pavement design; Traffic engineering; Railway engineering; Airport engineering.

COURSE OBJECTIVES:

CEO1 To impart the knowledge on highway development, planning and geometric design; pavement materials; pavement design; traffic engineering; railway engineering; and airport engineering.
CEO2 To develop analysis, design, problem solving and communication skills in transportation engineering using appropriate tools and techniques.
CEO3 To inculcate ethics and lifelong learning in solving transportation engineering problems considering society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze highway development, planning and highway materials to solve complex highway engineering problems using appropriate tools and techniques following relevant codes considering society and environment besides communicating effectively in graphical form.
CO2 Design highway, railway and airport geometric features to solve complex highway, railway and airport engineering problems using appropriate techniques and following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.
CO3 Design bituminous mix and pavements to solve complex highway and airport engineering problems using appropriate techniques and following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.
CO4 Analyze traffic to solve complex traffic engineering problems using appropriate tools and techniques following relevant codes and latest developments considering society and environment.
CO5 Analyze various components of railways to solve complex railway engineering problems using appropriate tools and techniques considering society and environment besides communicating effectively in graphical form.
CO6 Analyze various components of airports to solve complex airport engineering problems using appropriate tools and techniques considering society and environment besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT – I: HIGHWAY DEVELOPMENT, PLANNING AND GEOMETRICDESIGN

(9 Periods)

Highway Development and Planning: Highway development in India; Highway planning; Different road development plans; Classification of roads; Road network patterns; Highway alignment – Factors affecting, Engineering surveys, Drawings and reports.

Highway Geometric Design: Importance of geometric design; Design controls and criteria; Highway cross sectional elements; Sight distance elements; Stopping sight distance; Overtaking sight distances; Design of horizontal curves - Design of super elevation and extra widening, Design of transition curves; Design of vertical alignment - Gradients,Vertical curves.

UNIT-II: PAVEMENT MATERIALS AND DESIGN (9 Periods)

Pavement Materials: Soil, Aggregates and bitumen –Desirable properties; Tests on subgrade soil – CBR test, Tests on aggregate and bitumen; Aggregate-bitumen mixes – Desirable properties, Mix design by Marshal method; Cement and cement concrete.

Pavement Design: Pavements – Types, Functions and components; Design factors; Flexible pavement design methods – G.I., CBR and Triaxial method; Design of rigid pavements - Critical load positions, Westergaard's stress analysis, Computing radius of relative stiffness and equivalent radius of resisting section, Stresses in rigid pavements, Design of expansion and contraction joints in CC pavements, Design of dowel bars and tie bars.

UNIT-III: TRAFFIC ENGINEERING (9 Periods)

Significance and scope, Characteristics of road users – Driver and vehicle characteristics, Skid resistance and braking efficiency; Components of traffic engineering - Road, Traffic and land use characteristics, Basic characteristics of traffic – Human characteristics, Vehicle characteristics; Traffic parameters and their studies - Volume, Speed and density, Latest trends; Highway Capacity – Definition, Importance and Factors; Levels of service – Concept, Types; Concept of service volume.

UNIT-IV: RAILWAY ENGINEERING (9 Periods)

General features of Indian railways; Route alignment surveys - Conventional and modern methods; Gauges – types, choice of gauge; Permanent way – cross section, components, functions, coning of wheels; Rails - Rail joints, Welding of rails, Creep of rails, Sleeping – Types, Density and spacing, Adzing of sleepers; Ballast; Subgrade; Track geometric design; Points and crossings; Signaling and interlocking.

UNIT-V: AIRPORT ENGINEERING (9 Periods)

Aircraft characteristics; Planning and site selection; Obstruction criteria; Air traffic control; Runways - orientation, length, design of geometric features, capacity, configuration; Taxiways -design of geometric features, fillets, high speed exit taxiway;Taxiways -design of geometric features, fillets, high speed exit taxiway; Terminal building - functional areas and facilities; Visual aids; Airport drainage.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Khanna, K. and Justo, C. E. G., *Highway Engineering,* Nem Chand & Bros, Roorkee, 10th Edition, 2014.
2. Chandra, S. and Agarwal, M.M., *Railway Engineering*, Oxford University Press, New Delhi, India, 2nd Edition, 2013.

3. Khanna, S. K. and Arora, M. G., *Airport Planning and Design*, Nem Chand & Bros., 6th Edition, 2017.

REFERENCE BOOKS:

1. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Technical Publications, Delhi, 7th Edition, 2010.
2. JotinKhisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction,* Prentice Hall of India Pvt. Ltd., 3rd Edition, 2016.
3. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.
4. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning,* Prentice Hall of India Pvt. Ltd.,3rd Edition, 2009.
5. Mannering, F. L. And Washburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley& Sons, Inc., 5th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Yang H. Huang, *Pavement Analysis and Design*, Pearson Prentice Hall, 2nd Edition, 2004.
2. Nicholas J. Garber and Lester A. Hoel, *Traffic and Highway Engineering*, Cengage Learning, 4th Edition, 2009.

CODES:

IRC 37 – 2018	: Design of Flexible Pavements
IRC 58 – 2015	: Design of Rigid Pavements
IS2386-1963 (Part I to IV)	: Methods of Test for Aggregates for Concrete

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. New Units i.e., Unit-IV: Railway Engineering and Unit-V: Airport Engineering were introduced.
2. CEOs, COs, and CO-PO mapping were modified.
   Additional Learning Resources were added.

III B.Tech. – II Semester

(16BT60102)HIGHWAYANDTRAFFIC ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Surveying, Soil Mechanics.

COURSEDESCRIPTION: Highwaydevelopmentandplanning;Highway geometricdesign;Highwaymaterials;Pavementdesign;Traffic engineering;Trafficmeasurementandanalysis;Highwaycapacity; Traffic regulation, control and controldevices.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate knowledge on highway and trafficengineering.

CO2. Analyzehighwaymaterials,pavements,trafficandparking facilities.

CO3. Design highway geometry, pavements and trafficsignals.

CO4. Providesolutionstocomplexhighwayandtrafficengineering problems throughinvestigations.

CO5. Useappropriatemethodstoassesshighwaymaterials,traffic; and designpavements.

CO6. FollowISandIRCCodesinthedesignofhighwayandtraffic engineeringsystems.

CO7. Maintainethicalstandardsforqualityinhighwayandtraffic engineeringpractice.

CO8. Communicateeffectivelyonhighwayandtrafficengineeringin written and graphicalforms.

DETAILED SYLLABUS:

UNIT - I: HIGHWAY DEVELOPMENT, PLANNING AND GEOMETRIC DESIGN (10Periods)

HighwayDevelopmentandPlanning: HighwaydevelopmentinIndia, Highwayplanning,Differentroaddevelopmentplans,Classificationof roads,Roadnetworkpatterns,Highwayalignment–Factorsaffecting, Engineering surveys, Drawings andreports.

Highway Geometric Design: Importance of geometric design, Design controlsandcriteria,Highwaycrosssectionalelements,Sightdistance elements,Stoppingsightdistance,Overtakingsightdistances,Design ofhorizontalcurves-Designofsuperelevationandextrawidening; Design of transition curves, Design of vertical alignment,Gradients, Verticalcurves.

UNIT - II: HIGHWAY MATERIALS AND PAVEMENT DESIGN (09 Periods)

HighwayMaterials: Soil,Aggregatesandbitumen–Desirableproperties, Testsonsubgradesoil–CBRtest,Testsonaggregateandbitumen; Specifications,Aggregate-bitumenmixes–Desirableproperties,Mix designbyMarshalmethod;Cementandcementconcrete.

PavementDesign: Pavements–Types,Functionsandcomponents; Designfactors,Flexiblepavementdesignmethods–G.I,CBRandTriaxial

method;Designofrigidpavements,Criticalloadpositions,Westergaard's stress analysis, Computing radius of relative stiffness and equivalent radiusofresistingsection,Stressesinrigidpavements,Designof expansionandcontractionjointsinCCpavements,Designofdowelbars and tiebars.

UNIT-III:TRAFFICENGINEERING (08Periods)

Traffic Engineering: Significance and scope, Characteristics of road users

–Driverandvehiclecharacteristics,Skidresistanceandbraking efficiency;Componentsoftrafficengineering-Road,Trafficandland usecharacteristics.

Traffic Characteristics: Basic characteristics of traffic - Human characteristics, Vehicle characteristics - Volume, Speed and density, Relationship among traffic parameters.

UNIT -IV:TRAFFICMEASUREMENT,ANALYSIS AND HIGHWAYCAPACITY (09Periods)

TrafficMeasurement: Trafficvolumestudies–Objectives,Types; ConceptofPCU,Datacollectionandpresentation,Speedstudies– Objectives, Types, Methods; Data collection and presentation,Origin and destination studies, Pedestrian studies, Basic principles of traffic flow.

Highway Capacity: Definition and Importance, Factors, Levels of service

– Concept, Types; Concept of service volume.

UNIT-V:PARKINGFACILITIES,TRAFFICREGULATION,CONTROL ANDCONTROLDEVICES (09Periods)

ParkingFacilities: Typesofparkingfacilities,Parkingstudies,Analysis ofparkingdataandparkingcharacteristics,Designstandards.

TrafficRegulationandControl: Trafficproblemsinurbanareas,Accident studiesandanalysis,Trafficcontrolmeasures–Channelization,Principle anddesignofintersections,gradeseparationsandinterchanges;Traffic control aids and street furniture andlighting.

TrafficControlDevices: Trafficsigns-Types,Specifications;Traffic signals– Signaldesign,Computerapplicationsinsignaldesign;Traffic Islands– Channelizingislands;Pavementmarkings–Types, Specifications.

Total Periods: 45

TEXT BOOKS:

1. Khanna,S.K.,Justo,C.E.G.andVeeraragavan,A.,*Highway Engineering,Nem*Chand&Bros,Roorkee,Revised10thEdition, 2014.
2. Kadiyali,L.R.,*TrafficEngineeringandTransportPlanning,*Khanna Technical Publications, Delhi, 7th Edition, 2010.

REFERENCE BOOKS:

1. JotinKhisty,C.andKentLall,B.,*TransportationEngineering– AnIntroduction,*PrenticeHallofIndiaPvt.Ltd.,3rdEdition, 2006.
2. ParthaChakroborthyandAnimeshDas,*Principlesof TransportationEngineering,*PrenticeHallofIndiaPvt.Ltd,2005.
3. Papacostas, C. S. and Prevedouros, P. D., *Transportation EngineeringandPlanning,*PrenticeHallofIndiaPvt.Ltd.,2006.

4. Mannering,F.L.andWashburn,S.S.,*PrinciplesofHighway EngineeringandTrafficAnalysis*,JohnWiley&Sons,Inc.,5th Edition,2013.

IIIB. Tech. – ISemester

(19BT50105)**CONSTRUCTION EQUIPMENT AND AUTOMATION**

(Interdisciplinary Elective 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

Pre - Requisites: Course onConstruction, Planning and Project Management

Course Description: Construction equipment and management; Earthwork equipment and material handling equipment; Asphalt and concrete plants and other construction equipment; Building automation system; Automation and robotics in construction.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on construction equipment and automation.
CEO2. To develop skills in analysis, problem solving, communication, project management and finance skills in construction equipment and automation.
CEO3. To inculcate ethics and lifelong learning in construction equipment and automation considering safety, society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Categorize construction equipment to solve complex construction problems considering safety, project management and finance besides communicating effectively in graphical form.
CO2. Analyze earthwork and material handling equipment to solve complex construction problems ensuring safety and environment besides communicating effectively in graphical form.
CO3. Analyze asphalt and concrete plants and other construction equipment to solve construction problems following latest developments ensuring safety and environment besides communicating effectively in graphical form.
CO4. Analyze building automation system to solve construction problems using appropriate tools and techniques following relevant standards and latest developments considering society, project management and finance besides communicating effectively in graphical form.
CO5. Analyze automation and robotics in constructionto solve construction problems using appropriate techniques following latest developments considering society, project management and finance besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT I CONSTRUCTION EQUIPMENT AND MANAGEMENT (8 periods)

Identification, Planning of equipment, Selection of Equipment, Equipment Productivity, Equipment Management in Projects, Maintenance Management, Equipment cost, Operating cost, Cost Control of Equipment, Depreciation Analysis, Replacement of Equipment, Replacement Analysis, Safety Management

UNIT II EARTHWORK EQUIPMENT AND MATERIAL HANDLING EQUIPMENT (10 Periods)

Earthwork Equipment: Fundamentals of Earth Work Operations, Earth Moving Operations, Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers; Front end Waders – Dozer, Excavators, Rippers, Loaders, Compacting Equipment, Finishing equipment.
Material Handling Equipment: Forklifts and related equipment, Portable Material Bins, Conveyors, Trucks and Hauling equipment.

UNIT III ASPHALT AND CONCRETE PLANTS AND OTHER CONSTRUCTION EQUIPMENT (10 Periods)

Asphalt and Concrete plants:Aggregate production, Different Crushers, Feeders, Screening Equipment, Handling Equipment, Batching and Mixing Equipment, Pumping Equipment, Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment
Other Construction Equipment*:* Equipment for Dredging, Trenching, Drag line and clamshells, Tunnelling, Equipment for Drilling and Blasting, Pile driving Equipment, Erection Equipment, Crane, Mobile crane, Types of pumps used in Construction, Equipment for Dewatering and Grouting, Equipment for Demolition.

UNIT - IV BUILDING AUTOMATION SYSTEM (8 Periods)
Building Automation System (BAS)**-** Concept, Applications, Requirements, Design considerations, Effect on functional efficiency, Architecture and Components of BAS; Building Information Modelling (BIM) – Construction life cycle using BIM, Applications; Sensors to collect and process data, Virtual reality during project planning, training and management.

UNIT - V AUTOMATION AND ROBOTICS IN CONSTRUCTION (9 Periods)
Automation: Advantages and disadvantages, Need, Applications - Automation in precast construction industry, high rise building construction, prefabrication of masonry, onsite masonry construction, manufacture of brick wall masonry blocks, timber construction, production of steel components; Autonomous machines on the construction site, Drones to survey working areas, Automatic concrete screeding machine.
Robotics in Construction: Tele-operated robots, Programmed Robots and Cognitive Robots - Use of robots for repetitive activities; Challenges in construction robotics, Robotics in concrete works, Concrete surface finishing robot, Transformable welding robot.

Total periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Sharma, S.C. *Construction Equipment and Management*, Khanna Publishers, New Delhi, 6th Edition, 2015.
2. Mahesh Varma, *Construction Equipment and its Planning and Application*, Metropolitan Book Company, New Delhi. 1983.

REFERENCES:

1. Deodhar, S.V., *Construction Equipment and Job Planning*, Khanna Publishers, New Delhi, 1988.
2. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., *Construction Planning, Equipment and Methods*, McGraw Hill, Singapore, 2006.

3. Thomas Boak and Thomas Linner, *Construction Robots - Elementary Technologies and Single-Task Construction Robot*, Cambridge University Press, 2017.
4. Bimal Kumar, *A Practical Guide to Adopting BIM in Construction Projects*, Whittles Publishing Pvt. Ltd., Dunbeath, Scotland, 2015.

ADDITIONAL RESOURCES:

1. Carpehart, B. L. and Lynne C. Capehart, *Web Based Enterprize Energy and Building Automation Systems*, Fairmont Press, 2007.
2. Mikell P. Groover, *Automation Production System and Computer – Integrated Manufacturing*, Pearson Higher Education, Inc., 4th Edition, 2015.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. New course "Construction Equipment and Automation" is added in SVEC19 regulation.

IIIB. Tech. ISemester

(19BT50106) **PIPELINEENGINEERING**

(**Inter Disciplinary Elective-1**)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	*60*	*100*	*3*	-	-	*3*

PRE-REQUISITES: Course on Fluid Mechanics, Hydraulic Engineering.

COURSE DESCRIPTION: Elements of pipeline design and route selection; Pressure drop calculations; Gas compression and coolers; Pumps and transient flow in liquid; Pipeline design.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on analysis, design, laying, operation and maintenance of pipelines.

CEO2. To develop analysis, design, problem solving, communication and cost management skillsin pipeline engineering using appropriate techniques.

CEO3. To inculcate ethics in solving pipeline engineering problems considering safety, stability, society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze elements of pipeline design and route selection to solve pipeline engineering problems using appropriate techniques by following relevant codes and standards considering society, environment and economics besides communicating effectively in graphical form.

CO2 Analyze pressure drop calculations to solve complex pipeline engineering problems using appropriate techniques by following relevant codes for the benefit of the society considering environment besides communicating effectively in graphical form.

CO3 Analyze gas compressors and coolers to solve complex pipeline engineering problems using appropriate techniques by following relevant codes considering safety and environment besides communicating effectively in graphical form.

CO4 Design pump station piping for the fluid flow to solve complex pipeline engineering problems using appropriate techniques by following relevant codes

considering safety and environment besides communicating effectively in graphical form.

CO5 Analyze transient flow in liquid to solve complex pipeline engineering problems using appropriate techniques considering safety and environment besides communicating effectively in graphical form.

CO6 Design a pipeline to solve complex pipeline engineering problems using appropriate techniques by following relevant codes considering safety and environment besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT I– ELEMENTS OF PIPELINE DESIGN AND ROUTE SELECTION (09 periods)

Elements of Pipeline Design: Scope of Pipeline Engineering; History of Pipelines in India, Fluid properties; Environment - Effects of pressure and temperature; Supply/Demand scenario; Codes and standards – Environmental and hydrological considerations; Economics - Materials/Construction – Operation; Pipeline protection - Pipeline integrity monitoring.

Pipeline Route Selection: Introduction - Preliminary route selection - Key factors for route selection; Engineering survey - Legal survey - Construction /As-built survey - Geotechnical design.

UNIT II – PRESSURE DROP CALCULATIONS (09 periods)

General flow equation – Weymouth Equation, Panhandle A equation, Panhandle B Equation, Steady state; Transmission Factor, Effect of Pipeline Elevation (Single Slope, Multiple Slope), Pressure drop calculation for pipeline in series and parallel; Pipeline gas velocity –Erosional velocity, Friction Factor Calculations.; Optimum pressure drop for design purposes; Pipeline packing –Determining gas leakage using pressure drop method; Wall thickness/pipe grade; Temperature profile – Optimization process – Gas transmission solved problems.

UNIT III – GAS COMPRESSION AND COOLERS (09 periods)

Gas Compression: Types of compressors; Compressor drivers; Compressor station configuration; Thermodynamics of isothermal and adiabatic gas compression; Temperature change in adiabatic gas compression; Thermodynamics of polytropic gas compression; Gas compressors in series; Centrifugal compressor horsepower; Enthalpy / Entropy charts (Mollierdiagram); Centrifugal compressor performance curve; Reciprocation compressors.

Coolers: Gas coolers – Aircooled heat exchangers; Heat transfer equations for coolers; Fan air mass flow rate; Required fan power; Gas pressure drop in coolers; Iterative procedure for calculations based on unknown T_2.

UNIT IV –PUMPS *AND TRANSIENT FLOW IN LIQUID* (8 periods)

Pumps: Fully developed laminar flow in a pipe; Turbulent flow; Centrifugal pumps – Retrofitting for centrifugal pumps (Radial-flow); Pump station control – Pump station piping design.

Transient Flow in Liquid: Purpose of transient analysis; Theoretical fundamentals and transient solution technique; Applications – Computer applications.

UNIT V – PIPELINE DESIGN (10 periods)

Pipeline Mechanical Design: Codes and standards, Location classification; Pipeline design formula, Expansion and flexibility, Joint design for pipes of unequal wall thickness; Value assemblies, Scraper traps, Buoyancy control; Crossings – Depth of cover – Aerial markings –Warning signs; Pipeline Construction and Commissioning.

Materials Selection: Elements of design – Materials designation standards.

Pipeline Protection: Pipeline coating; Cathodic protection –Cathodic protection calculations for land pipelines; Internal corrosion; Flow meters and their calibration – Sensors – Pigs.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Mahitpour, M., Golshan, H. and Murray, M.A., *Pipeline Design and Construction: A Practical Approach*, ASME Press, 3rd Edition, 2010.
2. Henry Liu, *Pipeline Engineering*, Lewis Publishers (CRC Press), 2003.

REFERENCE BOOKS:

1. George, A., Antaki, *Piping and Pipeline Engineering-Design, Construction, Maintenance Integrity and Repair*, CRC Press, 2003.
2. Alkazraji, D., *A Quick Guide to Pipeline Engineering*, Woodhead Publishing, 2008.
3. ShashiMenon, E., *Pipeline Planning and Construction Field Manual*, Gulf Professional Publishing, 2011.
4. McAllister, E. W., *Pipeline Rules of Thumb Handbook,* 7th Edition, 2009.

ADDITIONAL LEARNING RESOURCES:

1. ShashiMenon, E., *Liquid Pipeline Hydraulics,* Mareel Dekker, Inc., 2004.
2. Skonberg Eric, R., and Tennyson, M., Muindi, *Pipeline Design for Installation by Horizontal Directional Drilling,* American Society of Civil Engineers, 2014.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New subject "Pipeline Engineering" is added in SVEC19 Regulation

III B. Tech. - I semester
(19BT50432) SOCIALLY RELEVANT PROJECT-1

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	-	1

PREREQUISITES: -

COURSE DESCRIPTION:

Identification of topic for the socially relevant project; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the socially relevant project; Preparation of thesis and presentation.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

CO1: Create/Design engineering systems or processes to solve complex societal problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.

CO2: Consider environment, sustainability, economics and project management in addressing societal problems.

CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical formson socially relevant project.

III B. Tech. – II Semester

(19BT60102) **ADVANCED STRUCTURAL ANALYSIS**

(Program Elective - 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	--	--	3

PRE-REQUISITES: Courses on Engineering Mechanics, Mechanics of Solids, Structural Analysis

COURSE DESCRIPTION: Flexibility method; Stiffness method; Portal frames; Approximate method; Redundant pin–jointed frames; Two hinged arches; Three hinged arches; Cables and suspension bridges.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on the analysis of beams and portal frames, redundant pin–jointed frames, arches, cables and suspension bridges.
CEO2. To develop analysis, problem solving and communication skills in advanced structural analysis using appropriate techniques.
CEO3. To inculcate the sense of responsibility in carrying out the advanced structural analysis ensuring safety and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze continuous beams to solve complex structural analysis problems using matrix methods besides communicating effectively in graphical form.
CO2 Analyze portal frames to solve complex structural analysis problems using appropriate methods besides communicating effectively in graphical form.
CO3 Analyze redundant pin-jointed plane trusses to solve complex advanced structural analysis problems using Castigliano's theorem besides communicating results effectively in graphical form.
CO4 Analyze three hinged and two hinged arches to solve complex advanced structural analysis problems using appropriate techniques ensuring safety and environment.
CO5 Analyze cables and suspension bridges to solve complex advanced structural analysis problems using appropriate techniques ensuring safety and environment.

DETAILED SYLLABUS:

UNIT - I: MATRIX METHODS (09 periods)

Flexibility Method: Flexibility coefficients, Flexibility matrices, Application to continuous beams without and with settlement of supports.

Stiffness Method: Stiffness coefficients, Stiffness matrices, Application to continuous beams without and with settlement of supports.

UNIT – II: PORTAL FRAMES (09 Periods)

Analysis of single bay, single storey, portal frame including side sway;Shear force and bending moment diagrams by slope deflection method, moment distribution method and Kani's method.

UNIT - III: APPROXIMATE METHODSAND REDUNDANT PIN–JOINTED FRAMES

(09 Periods)

Approximate Methods: Analysis of multi-storey frames for lateral loads using portal and cantilever methods.

Redundant Pin–Jointed Frames: Indeterminate frames, Static and kinematic indeterminacies, Castigliano's theorem, Analysis of pin–jointed frames up to two degrees of internal and external indeterminacies.

UNIT – IV: ARCHES (09 Periods)

Three Hinged Arches: Types of arches, Elastic theory of arches, Eddy's theorem, Determination of horizontal thrust, bending moment, normal thrust and radial shear; Effect of temperature.

Two Hinged Arches: Determination of horizontal thrust bending moment, normal thrust and radial shear; Rib shortening and temperature stresses, Tied arches, Fixed arches(No analytical question).

UNIT - V: CABLES AND SUSPENSION BRIDGES (09 Periods)

Basic concepts, Suspension cables, Reactions, Tension and length of suspension cable; Effect of change in temperature, Suspension bridges with two and three stiffening girders.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Vaidyanathan, R. and Perumal, P., *Structural Analysis- Vol. I and II*, Laxmi Publications, 4th Edition, 2016.
2. Vazirani, V. N., Ratwani, M. M. and Duggal, S. K., *Analysis of Structures– Vol. I and Vol. II*, Khanna Publications, 17th Edition, 2013.

REFERENCES

R1. Bhavikatti S. S., *Structural Analysis– Vol. I and II,* Vikas Publishing House Pvt. Ltd., 4th Edition, 2010.
R2. Thandavamoorthy, T. S., *Structural Analysis*, Oxford University Press, 5th Edition, 2011.
R3. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *SMTS–II –Theory of Structures*, Laxmi Publications (P) Ltd., 12th Edition, 2004.
R4. Khurmi, R. S., *Theory of Structures*, S. Chand & Company Ltd., 22nd Edition, 2010.

ADDITIONAL LEARNING RESOURCES

1. Pandit, G., Gupta, S. and Gupta, R., *Theory of Structures – Vol. II*, Tata Mc–Graw Hill Publishing Co. Ltd., 1st Edition, 1999.
2. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, Dhanpat Rai Publishing Co. Ltd., 9th Edition, 2014.
3. Shah, H. J. and Junnarkar, S. B., *Mechanics of Structures – Vol. II*, Charotar Publishing House, 21st Edition, 2010.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. Rearrangement of the units done in SVEC19.
2. Combine the units of "flexibility method" and "Stiffness method" named unit as "matrix methods" in SVEC19.
3. In unit-II, topic of "Single bay- single storey portal frames with and without side sway" using kani's method has added from Structural analysis-II in SVEC 16.
4. The topic of "Substitute frame method for vertical loads" was considered self-study in SVEC19.
5. The unit of "Redundant Pin–Jointed Frames" has added from Structural analysis-II in SVEC 16.
6. Unit-V of "Beams curved in plan" in SVEC16 has removed and considered as self-study topic under unit-IV: arches in SVEC19.
7. A new unit added of "Cables and suspension bridges" in SVEC19.
8. New text book has been included.

CEOs, COs and CO-PO-PSO mapping were modified.

III B.Tech. – II Semester

(19BT60103) **ADVANCED SURVEYING**

(Professional Elective -1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics, Surveying.

COURSE DESCRIPTION: Astronomical surveying; Construction and boundary surveys; Theory of errors; Land surveys; Triangulation and baseline measurements; GPS surveying.

COURSE OBJECTIVES:

CEO4. To impart knowledge on Astronomical surveying; Construction and boundary surveys; Theory of errors; Land surveys; Triangulation and baseline measurements; GPS surveying.

CEO5. To develop analysis, design, problem solving and communicationskills in surveying using appropriate tools and techniques.

CEO6. To inculcate ethics and lifelong learning in surveying practice considering society, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze astronomical surveying techniques for measuring azimuth, distances, angles and coordinates to solve complex surveying problems using appropriate tools and techniques by following ethics and considering society, environment besides communicating effectively in graphical form.

CO2 Analyze construction and boundary surveys to solve complex surveying problems using appropriate tools and techniques by following ethics and considering society, environment besides communicating effectively in graphical form.

CO3 Analyze errors in surveying to solve complex surveying problems using appropriate tools and techniques by following ethics and considering society, environment besides communicating effectively in graphical form.

CO4 Develop layouts of land surveys to solve complex surveying problems using appropriate tools and techniques by following ethics and considering, society and environment besides communicating effectively in graphical form.

CO5 Analyze triangulation and baseline measurementsto solve complex surveying problems using appropriate tools and techniques by following ethics and considering society, environment besides communicating effectively in graphical form.

CO6 Analyze GPS surveyingto solve complex surveying problems using appropriate tools and techniques by following ethics and through continuous learning considering society by ensuring environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT - I: ASTRONOMICAL SURVEYING (08 Periods)

Astronomical coordinate systems, Terrestrial coordinate systems, Astronomical triangle, Determination of azimuth, Determination of latitude and longitude, Time correlations.

UNIT - II: CONSTRUCTION AND BOUNDARY SURVEYS (10 Periods)

Construction Surveys: Specialized equipment for construction surveys, Staking out pipe line, Staking out buildings, Staking out highways, Construction surveys using total station and GNSS equipment, Sources of errors and mistakes in construction surveys.
Boundary Surveys: Categories of land surveys, Property description - By metes and bounds, By block and lot system and by coordinates; Retracement surveys, Partitioning land, Sources of errors and mistakes in boundary surveys.

UNIT -III: THEORY OF ERRORS AND LAND SURVEYS (09 Periods)
Theory of Errors: Types and sources of errors, Loss of accidental errors, Loss of weights, Theory of least squares, Method of weights, Method of correlates, Angle and station adjustment, Figure adjustment.
***Land Surveys*:**Layouts, Measurements

UNIT - IV: TRIANGULATION AND BASELINE MEASUREMENTS (9 Periods)
Principle and classification oftriangulation systems, Selection of base line and stations, Orders of triangulation, Station marks, Signals, Towers, Baseline measurement - Rigid bars, Flexible apparatus, Problems; Satellite station and reduction to centre.

UNIT - V: GPS SURVEYING (09 Periods)
Principles of GPS surveying and methods, Components of GPS-Space segment, Receiver segment, User segment; Errors in observations and corrections, Mapping with GPS, Application of GPS, Advantages over conventional methods, DGPS, Latest advancements in GPS surveying.

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. Arora, K. R., *Surveying – Vol. III*, Standard Book House, 12th Edition, 2015.
2. Ghilani, C.D., *Elementary Surveying-An Introduction to Geomatics*, Pearson India Education Services Pvt. Ltd, 13th Edition, 2018.
3. Chandra, A. M., *Higher Surveying*, New Age International (P) Limited Publishers, 3rd Edition, 2015.

REFERENCE BOOKS:

1. Duggal, S. K., *Surveying – Vol. I and II*, Tata McGraw–Hill Publishing Co. Ltd., 5th Edition, 2019.
2. Benton, A. R., and Taety, P. J., *Elements of Plane Surveying*, McGraw Hill, 3rd Edition, 2010.
3. Punimia, B. C., Ashok Jain, K and Jain, A.K., *Surveying – Vol. II*, Laxmi Publications (P) Ltd, 16th Edition, 2016.
4. Kanetkar, T. P and Kulakarni, S. V., *Surveying and Leveling*, Vidyarthi Griha Prakasham, 24th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Venkatramaih, C., *Textbook of Surveying*, Universities Press (India) Limited, Hyderabad, 2nd Edition, 2011.
2. Parkinson, B. W., Spilker, J. J., *Global Positioning System: Theory and Applications, Volume 1*, American Institute of Aeronautics and Astronautics, 1996.
3. Nathanson, J. A., Lanzafama, M.T and Philip Kissam, *Surveying Fundamentals and Practices*, Pearson Publications, 7th Edition, 2017.
4. Sickle, J.V., *GPS for Land Surveyors*, CRC Press, 4th Edition, 2015.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. CEOs, COs and CO-PO-PSO mapping are modified.
2. Changed the entire syllabus content of UNIT-II i.e. Construction surveys and Boundary surveys.
3. Included additional topic "latest advancements in GPS surveying" in UNIT-V.
4. Added new book in references.
5. Added additional learning resources.

III B.Tech. – II Semester

(16BT60107) **ADVANCED SURVEYING**

(Programme Elective – 1)

Int. Marks	Ext.Marks	TotalMarks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics, Surveying.

COURSE DESCRIPTION: Astronomical surveying; Construction and boundary surveys; Theory of errors; Land surveys; Triangulation and baseline measurements; GPS surveying.

COURSEOUTCOMES: Onsuccessfulcompletionofthiscourse, the students will ableto:

CO1. Demonstrate the knowledge on advanced surveying techniques.

CO2. Analyzeadvancedsurveyingtechniques,toolsandsurvey data.

CO3. Prepare surveymaps.

CO4. Solve complex engineering survey problems through proper survey andinterpretation.

CO5. Use appropriate modern tools in advanced surveying practice.

CO6. Follow ethics in surveyingpractice.

CO7. Communicateeffectivelyonadvancedsurveyingissues inwrittenandgraphicalforms.

DETAILED SYLLABUS:

UNIT-I:ASTRONOMICALSURVEYING **(08Periods)**

Astronomical coordinate systems, Terrestrial coordinate systems, Astronomical triangle, Determination of azimuth, Determination of latitude and longitude, Time correlations.

UNIT-II: CONSTRUCTION AND BOUNDARY SURVEYS

(09 Periods) Equipment for construction surveys, Setting out pipe line, Setting out buildings and structures, Setting out a highway.

UNIT-III: THEORY OF ERRORS AND LAND SURVEYS

(10 Periods) Theory of Errors: Types and sources of errors, Loss of accidental errors, Loss of weights, Theory of least squares, Method of weights, Method of correlates, Angle and station adjustment, Figure adjustment.

Land Surveys: Layouts, Measurements

UNIT-IV:TRIANGULATIONANDBASELINEMEASUREMENTS

(10 Periods) Principle and classification of triangulation systems, Selection of base line and stations, Orders of triangulation, Station marks, Signals, Towers, Baseline measurement - Rigid bars, Flexible apparatus, Problems; Satellite station and reduction to centre.

UNIT-V:GPSSURVEYING (08 Periods)

Principles of GPS surveying and methods, Components of GPS- Space segment, Receiver segment, User segment; Errors in observations and corrections, Mapping with GPS, Application of GPS, Advantages over conventional methods, DGPS.

Total Periods: 45

TEXT BOOKS:

1. Arora,K.R.,*Surveying–Vol.III,*StandardBookHouse, 11th Edition,2013.
2. A.M.Chandra,Higher*Surveying,*NewAgeInternational (P) Limited, Publishers, 3rd Edition, 2015.

REFERENCEBOOKS:

1. S. K. Duggal, *Surveying – Vol. I and II*, Tata McGraw– HillPublishingCo.Ltd.,4thEdition,2013.
2. Arthur R. Benton and Philip J. Taetz, *Elements of Plane Surveying,* McGraw-Hill,3rdEdition,2010.
3. B.C.Punimia,AshokK.JainandArunK.Jain,*Surveying–Vol.II,*Laxmipublications(P)Ltd.,17thEdition,2016.

T.P.KanetkarandS.V.Kulakarni,*SurveyingandLeveling*,PuneVidyarthiGrihaPrakashan,Pune,24thEdition,2013

III B.Tech. – II Semester

(19BT60107) **URBAN STORMWATER MANAGEMENT**

Professional Elective–1

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	-	3

PRE-REQUISITES: Course on Engineering Hydrology, Fluid Mechanics.

COURSE DESCRIPTION: Concept of Urban hydrology, Rainfall analysis for urban stormwater design, Rainfall abstraction, Urban stormwater analysis and management and Overview of urban stormwater models.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on urban stormwater management.
CEO2. To develop analysis, design, problem solving, communication and management skills in urban stormwater management using appropriate tools and techniques.
CEO3. To inculcate ethics and lifelong learning in solving urban stormwater problems considering society, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO7. Analyze urban hydrological cycle for estimating stormwater runoff considering latest developments, society, environment, and sustainability besides communicating effectively in graphical form.
CO8. Analyze rainfall data for solving complex urban drainage problems using different techniques considering latest developments,relevant guidelines, society, environment and sustainabilitybesides communicating effectively in graphical form.
CO9. Analyze abstractions losses from urban catchments for solving for solving complex urban hydrology problems using different tools and techniques considering latest developments, relevant guidelines, environment and sustainabilitybesides communicating effectively in graphical form.
CO10. Design synthetic hydrographs for solving complex urban stormwater drainage problems using different tools and techniques considering latest developments,relevant guidelines, safety, environment, sustainabilityand management besides communicating effectively in graphical form.
CO11. Design urban drainage networks for solving complex urban stormwater drainage problems using different tools and techniques considering latest developments,relevant guidelines, safety, environment and sustainabilitybesides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT - I: URBAN HYDROLOGY (09 Periods)

Urban hydrological cycle, Urban water resources – Major problems, Historical perspective;Effects of urbanization on catchment hydrology, Interaction of land use and urban stormwater runoff, Need for urban drainage system.

UNIT - II: RAINFALL ANALYSIS FOR URBAN STORMWATER DESIGN(09 Periods)

Rainfall data, Depth-duration-rainfall analysis, Areal effect of point rainfall, Design rainfall duration, Time distribution of design rainfall, examples of design rainfall development.

UNIT - III: RAINFALL ABSTRACTION (10 Periods)

Introduction, Interception, Detention and retention concepts, Depression storage, Infiltration, SCS method, The Φ-Index, Importance of losses in urbanized basins, Open channel flows in urban watersheds.

UNIT - IV: URBAN STORMWATER ANALYSIS AND MANAGEMENT (09 Periods)

Rational method, SCS composite hydrograph method, time of concentration, Synthetic unit hydrograph method, urban runoff processes, Hydraulic analysis and design guidelines, Flow and storage capacity of urban components, Temple tanks, Social awareness and involvement.

UNIT - V: OVERVIEW OF URBAN STORMWATER MODELS (08 Periods)

Introduction, Structural and nonstructural control measures, Types of models, Role of urban stormwater models and levels of analysis, Storm water management model (SWMM), Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Hall, M.J., *Urban Hydrology*, Elsevier Applied Science Publishers, 1st Edition, 1984.
2. David, F. K.,*Urban Stormwater Hydrology (Water Resources Monograph)*, American Geophysical Union, 4th Edition, 1991.

REFERENCE BOOKS:

1. David, B., Christopher, J. D., Christos, M. and John, W. D, *Urban Drainage*, CRC Press, 4th Edition, 2018.
2. Osman, A. A. and Houghtalen, R. J., *Urban Hydrology, Hydraulics, and Stormwater Quality: Engineering Applications and Computer Modeling*, Wiley Publications, 1st Edition, 2003.
3. Overtens, D.E. and Meadows, M.E., *Storm Water Modelling*, Academic Press, New York, 1st Edition, 1976.
4. Wanielista, M.P. and Yousef, Y.A., *Stormwater Management*, John Wiley and Songs,Inc., New York, 1993.

ADDITIONAL LEARNING RESOURCES:

1. Oke, T. R., *Urban Climates*, Cambridge University Press.
2. Vieux,B. E., *Distributed Hydrologic Modeling Using GIS*, Springer Nature.
3. Singh,V. P., *Computer Models of Watershed Hydrology*, Water Resources Publications.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. New subject "Urban stormwater management" is added in SVEC19 Regulation.

III B. Tech. – II Semester

(19BT60108) **RAILWAY ENGINEERING**

(Professional Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	--	--	3

PRE-REQUISITES: Course onTransportation Engineering.

COURSE DESCRIPTION: Railways in India and alignment of railway lines; Permanent way; Geometric design of railway tracks; Points and Crossings; Rolling stock; Railway stations and yards; Signaling and interlocking; Maintenance of railway track.

COURSE OBJECTIVES:

CEO1 To impart the knowledge on Indian railways, alignment of railway lines, permanent way, geometric design of railway tracks, points and crossings, rolling stock, railway sections and yards, signalling and interlocking and maintenance of railway track.

CEO2 To develop analysis, design, problem solving and communication skills in railway engineering using appropriate tools and techniques.

CEO3 To inculcate ethics in solving railway engineering problems considering safety, society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze Indian railways and alignment of railway lines considering society and environment besides communicating effectively in graphical form.

CO2 Analyze various components of permanent way to solve railway engineering problems using appropriate tools and techniques following relevant guidelines considering society and environment besides communicating effectively in graphical form.

CO3 Design the geometric features of a railway track and tongue rail to solve complex railway engineering problems using appropriate techniques and following relevant guidelines considering society, environment and sustainability besides communicating effectively in graphical form.

CO4 Analyze various components of points and crossings in a railway track to solve railway engineering problems using appropriate tools and techniques following relevant standards considering safety besides communicating effectively in graphical form.

CO5 Analyze rolling stock, layouts of railway stations and yards following relevant guidelines considering safety besides communicating effectively in graphical form.

CO6 Analyze signalling, interlocking and maintenance of railway track to solve railway engineering problems using appropriate tools and techniques following relevant specifications considering safety besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT – I: RAILWAYS IN INDIA AND ALIGNMENT OF RAILWAY LINES (9 Periods)

Railways in India: Role of Indian Railways in national development, Classification of railway lines in India.

Alignment of Railway Lines: Importance of good alignment, Basic requirements of an ideal alignment, Selection of a good alignment.

UNIT-II: PERMANENT WAY AND GEOMETRIC DESIGN (11 Periods)

Permanent Way: Components and their functions, Rails – Functions and types, Rail fastenings; Concept of gauges, Coning of wheels, Creep; Sleepers – Functions and requirements, Sleeper density and spacing types, Methods of fixing rails with pre-stressed concrete and wooden sleepers; Ballast – functions, types, sizes.

Geometric Design of Railway Tracks: Necessity for geometric design, Gradients, Grade compensation on curves; Curves – Circular, Transition, Compound and reverse; Superelevation.

UNIT - III: POINTS AND CROSSINGS (8 Periods)

Switches – Types, Switch angle, Flangeway clearance, Heel divergence, Throw of the switch; Tongue rails – design; Crossings – types; Turnouts – types.

UNIT-IV: ROLLING STOCK, RAILWAY STATIONS AND YARDS (8 Periods)

Re-laying of track, Layouts of railway stations and yards, Rolling stock, Tractive power, Track resistance, Level crossings.

UNIT-V: SIGNALING, INTERLOCKING AND MAINTENANCE OF RAILWAY TRACK (9 Periods)

Signalling and Interlocking: Signalling, Interlocking and track circuiting - Construction and maintenance.

Maintenance of Railway Track: Maintenance program - Monsoon, pre monsoon, post monsoon maintenance; Causes for maintenance, Tools for railway track maintenance and their functions, Surface defects and their remedial measures.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

4. Chandra, S. and Agarwal, M. M., *Railway Engineering*, Oxford University Press, New Delhi, India, 2nd Edition, 2013.
5. Saxena, S. C. and Arora, S. P., *A Text book of Railway Engineering*, Dhanpat Rai Publications, 2010.

REFERENCES

6. Jotin Khisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction,* Prentice Hall of India Pvt. Ltd., 3rd Edition, 2016.
7. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd., 2005.
8. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning*, PearsonIN, 3rd Edition, 2015.
9. Mannering, F. L. and Washburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley& Sons, Inc., 5th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Rangwala, S. C., *Railway Engineering*, Charotar Publishing House Pvt. Ltd., 27th Edition, 2017.
2. *Indian Railways Code for Engineering Department*, 4th Edition, 2012.
3. *A hand book for DO's and DON'Ts on Points & Crossings* by Government of India, Ministry of Railways.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New subject "Railway Engineering" is added in SVEC19 Regulation

III B.Tech. - II Semester

(19BT60114) **SOLID AND HAZARDOUS WASTE MANAGEMENT**

(Professional Elective–2)

Int. Marks	Ext. Marks	Total	L	T	P	C
40	60	100	3	-	–	3

PREREQUISITES: Course on Environmental Science.

COURSE DESCRIPTION: Sources and types of municipal solid wastes; Onsite handling; Storage and processing; Collection and transfer; Off-site processing and disposal, Hazardous waste management.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on solid and hazardous waste management.
CEO2. To develop analysis, problem solving, communication, economics and project management skills for solid and hazardous waste management using appropriate tools and techniques.
CEO3. To inculcate ethics and lifelong learning in solving solid and hazardous waste management problems considering health, society, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze municipal solid waste to solve complex problems associated with it using appropriate tools and techniques, following relevant codes, regulations and latest developments considering health, society, environment, sustainability and economics besides communicating effectively in graphical form.
CO2 Analyze on–site storage and processing of municipal solid waste to solve complex problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment and sustainability and economics besides communicating effectively in graphical form.
CO3 Analyze collection and transfer of municipal solid waste to solve complex problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment, sustainability and economics besides communicating effectively in graphical form.
CO4 Analyze off–site processing of municipal solid waste to solve complex problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment, sustainability, economics and project management besides communicating effectively in graphical form.
CO5 Design sanitary landfills to solve complex municipal solid waste disposal problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment, sustainability, economics and project management besides communicating effectively in graphical form.
CO6 Analyze hazardous waste to solve complex problems associated with it using appropriate tools and techniques following relevant codes, regulations and latest developments considering health, society, environment, sustainability and project management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT – I: MUNICIPAL SOLID WASTE (09 Periods)

Sources and types of solid wastes – Quantity, Factors affecting generation of solid wastes, Characteristics, Methods of sampling and characterization, , Public health effects, Social and economic aspects, Public awareness, Role of NGOs, Legislation.

UNIT – II: ON–SITE STORAGE AND PROCESSING (09 Periods)

Principles of solid waste management, On–site segregation and storage methods, Materials used for containers, Public health and economic aspects of storage, Options under Indian conditions, Critical evaluation of options.

UNIT – III: COLLECTION AND TRANSFER (09 Periods)

Methods of collection, Types of vehicles, Manpower requirement, Analysis of Collection routes, Transfer stations, Selection of location, Operation and maintenance, Collection options under Indian conditions.

UNIT – IV: OFF–SITE PROCESSINGAND DISPOSAL (08 Periods)

Off–Site Processing: Processing techniques and equipment, Resource and energy recovery from solid wastes – Composting, Incineration and pyrolysis.

***Disposal*:** Dumping of solid waste, Effects of improper disposal of solid wastes, Sanitary landfills – Site selection, Design and operation of sanitary landfills, Leachate collection and treatment.

UNIT – V: HAZARDOUS WASTE MANAGEMENT (10 Periods)

Introduction to Hazardous wastes, Definition of Hazardous waste, The magnitude of the problem, Risk assessment, Environmental legislation, Characterization and site assessment, Waste minimization and resource recovery, Transportation and disposal of hazardous waste; Biomedical waste management – Incineration and pyrolysis.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. George Tchobanoglouset, *Integrated Solid Waste Management*, McGraw–Hill Publishers, 2nd Edition, 2002.
2. Woodside, G., *Hazardous Materials and Hazardous Waste Management*, John Wiley & Sons, 2nd Edition, 1999.

REFERENCE BOOKS:

1. Ramachandra, T. V., *Management of Municipal Solid Waste*, The Energy and Resources Institute (TERI), 1st Edition, 2011.
2. *Manual on Municipal Solid Waste Management*, CPHEEO, Ministry of Urban Development, Government of India, 2000.
3. Asnani, P. U., and Chris Zurbrugg, *Improving Municipal Solid Waste Management in India: A Sourcebook for Policymakers and Practitioners*, World Bank Publications, 1st Edition, 2007.
4. Bhide, A. D. and Sundaresan, B. B., *Solid Waste Management in Developing Countries*, INSDOC, 1st Edition, 2010.

ADDITIONAL LEARNING RESOURCES:

1. Burke, Gwendolyn, Ben Ramnarine Singh, and Louis Theodore, *Handbook of Environmental Management and Technology*, John Wiley & Sons, 2nd Edition, 2000.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. CEOs, Cos and CO-PO-PSO mapping were modified.
2. Previous Unit V was merged with Unit IV.
3. Unit V on hazardous waste management was added.

III B.Tech. – II Semester

(16BT60110) SOLIDWASTE MANAGEMENT

(Program Elective - 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES: Course on Environmental Studies

COURSE DESCRIPTION: Sources and types of municipal solid wastes; Onsite handling; Storage and processing; Collection and transfer; Off sites processing; Disposal.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate the knowledge on sources, characterization, collection, segregation, transportation, storage, off-site processing and disposal of solid waste.

CO2. Analyze characteristics; collection, transportation, storage, processing and disposal methods of solid waste.

CO3. Design of solid waste disposal systems.

CO4. Investigate and interpret data to recommend suitable solutions to solid waste management.

CO5. Use appropriate techniques for solid waste management.

CO6. Consider health and safety in solid waste management.

CO7. Ensure environmental sustainability in solid waste management.

CO8. Follow environmental acts in solid waste management.

CO9. Provide economically viable solid waste management solutions.

DETAILED SYLLABUS:

UNIT–I: MUNICIPAL SOLID WASTE **(09 Periods)**

Sources and types of solid wastes–Quantity, Factors affecting generation of solid wastes, Characteristics, Methods of sampling and characterization, Effects of improper disposal of solid wastes, Public health effects, Social and economic aspects, Public awareness, Role of NGOs, Legislation.

UNIT–II: ON–SITE STORAGE AND PROCESSING (09 Periods)

Principles of solid waste management, On–site segregation and storage methods, Materials used for containers, Public health and economic aspects of storage, Options under Indian conditions, Critical evaluation of options.

UNIT–III:COLLECTIONANDTRANSFER (09Periods)

Methodsofcollection,Typesofvehicles,Manpowerrequirement,Analysis of Collection routes, Transfer stations, Selection of location, Operation and maintenance, Collection options under Indianconditions.

UNIT – IV:OFF–SITEPROCESSING (08Periods)

Processing techniques and equipment, Resource and energy recovery from solid wastes – Composting, Incineration and pyrolysis.

UNIT–V:DISPOSAL (10Periods)

Dumpingofsolidwaste,Sanitarylandfills–Siteselection,Designand operation of sanitary landfills, Leachate collection and treatment; Biomedical waste management – Incineration andpyrolysis.

Total Periods: 45

TEXT BOOKS:

1. T.V.RamaChandra,*ManagementofMunicipalSolidWaste*, 2011.
2. B.Bilitewski,G.HardHe,K.Marek,A.Weissbach,andH. Boeddicker, *Waste Management*, Springer,1994.

REFERENCE BOOKS:

1. George Tchobanoglous, Hilary Theisen and Samuel A. Vigil., *Integrated Solid Waste Management: Engineering Principlesand Management Issues*, McGraw–Hill Publishers,2002.
2. *Manual on Municipal Solid Waste Management*, CPHEEO, Ministry of Urban Development, Government of India,2000.
3. Bhide, A. D. and Sundaresan, B. B., *Solid Waste Management in Developing Countries*, INSDOC,2010.
4. G. Burke , B. R. Si ngh and L . The odore , *Han dbook of EnvironmentalManagementandTechnology*,JohnWiley&Sons, 2nd Edition,2000.

III B. Tech. – II Semester

(19BT60115) TRANSPORTATION PLANNING AND MANAGEMENT

(Professional Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	--	--	3

PRE-REQUISITES: Course onTransportation Engineering.

COURSE DESCRIPTION: Transportation planning process; Transportation surveys; Trip generation; Trip distribution; Mode choice; Trip assignment; Transport economics; Land use transportation models; Mass transit systems.

COURSE OBJECTIVES:

CEO1 To impart the knowledge on transportation planning process, transportation surveys, trip generation, trip distribution, mode choice, trip assignment, transport economics, land use transportation models and mass transit systems.

CEO2 To develop analysis, problem solving, communication, finance and project management skills in transportation planning and management by using appropriate tools and techniques.

CEO3 To inculcate ethics and lifelong learning in solving transportation planning and management problems considering society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze transportation planning process and surveys to solve transportation problems using appropriate techniques considering society and environment.

CO2 Analyze trip generation and trip distribution to solve complex transportation problems using appropriate techniques considering safety besides communicating effectively in graphical form.

CO3 Analyze mode choice and trip assignment to solve complex transportation problems using appropriate techniques following relevant guidelines considering safety besides communicating effectively in graphical form.

CO4 Analyze transportation economics and land use transport models to solve transportation planning and management problems using appropriate techniques considering society besides communicating effectively in graphical form.

CO5 Analyze mass transit systems to solve complex transportation problems using appropriate techniques following relevant codes and latest developments considering society and environment besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT – I: TRANSPORTATION PLANNING PROCESS AND SURVEYS (9 Periods)

Transportation Planning Process: System approach to transportation planning; Stages in transportation planning and difficulties in transportation planning process.

Transportation Surveys: Study area zoning, Types of surveys – Home interview survey, Commercial vehicle survey, Intermediate public transport survey, Cordon line survey, Post card questionnaire survey, Registration number survey, Tag-on-vehicle survey.

UNIT-II: TRIP GENERATION AND TRIP DISTRIBUTION (9 Periods)

Trip Generation: Factors governing trip generation and attraction, Multiple linear regression analysis.

Trip Distribution: Presentation of trip distribution data, Uniform and average factor method of trip distribution, Fratar method of trip distribution, Furness method of trip distribution, Gravity model of trip distribution.

UNIT-III: MODE CHOICE AND TRIP ASSIGNMENT (9 Periods)

Mode Choice: Influencing factors, Trip-end type modal split model, Trip-interchange modal split model, Disaggregate mode-choice model, Logit model of mode-Choice.

Trip Assignment: Description of transport network, Route choice behaviour, The minimum path, Minimum path algorithm, Route assignment techniques, All-or-nothing assignment, Multipath traffic assignment, Capacity-restrained traffic assignment.

UNIT-IV: TRANSPORTATION ECONOMICS AND LAND USE TRANSPORT MODELS (9 Periods)

Transportation Economics: Economic evaluation of highway schemes - Necessity, Cost and benefits of transportation projects; Basic principles of economic evaluation - Net present value method, Benefit/Cost ratio method, Internal rate of return method; Vehicle operating costs, Value of travel time saving, Accident costs.

Land Use Transport Models: Selection of land, Lowry model, Grain-Lowry model, Applications of Lowry model.

UNIT-V: MASS TRANSIT SYSTEMS (9 Periods)

Urban passenger transport modes and classifications; System Performance - Capacity and quality of service; Planning issues - Route determination, Network design, Service policy and schedule development; Scheduling - Trip generation, Blocking, Runcutting and rostering, Priority measures and their implementations, Improvements in mass transportation system - Issues and challenges.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 9th Edition, 1999.
2. Jotin Khisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction*, Prentice Hall of India Pvt. Ltd., 3rd Edition, 2006.

REFERENCES

1. Hutchinson, B. G., *Principles of Urban Transport Systems Planning*, McGraw-Hill Book Co., New York, 1974.
2. Vuchic Vukan, R., *Urban Transit: Operations, Planning and Economics*, Prentice Hall, 2005.
3. Gray, G. E. and Hoel, L. A., *Public Transportation*, Prentice Hall, 2nd Edition, 1992.
4. Ortuzar, J. D. and Willumsen, L. G., *Modelling Transport*, Wiley, 4th Edition, 2011.

ADDITIONAL LEARNING RESOURCES:

1. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering*, Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.
2. Ashish Verma and Ramanayya, T. V., *Public Transport Planning and Management* in Developing Countries, CRC Press, 2020.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

3. New topics have been included in Mode choice and Trip assignment chapters (3rdunit).

4. A separate unit on mass transit system has been introduced by replacing previous syllabus.
5. The units were rearranged to make the learning process smoother.
6. CEOs, COs and CO-PO-PSO mapping were modified.

IV B.Tech. - I Semester

(16BT70109) TRANSPORTATION PLANNING AND MANAGEMENT

(Program Elective –2)

Int.Marks	Ext.Marks	TotalMarks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Transportation planning; Transport demand analysis; Traffic assignment; Landuse transport models and theory of traffic flow; Transport economics; Public transportation–mass transit systems; Scheduling; Planning; Softwares.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Demonstrate the knowledge on transportation planning and management.

CO2. Analyzeproblemsassociatedwithtransportationplanningand management.

CO3. Develop transportation plans and managementsystems.

CO4.Solvecomplex problemsintransportationplanningand managementthroughproperinvestigations,analysisand interpretation.

CO5.Useappropriatetoolsandtechniquesintransportationplanning andmanagement.

CO6. Consider societal issues in transportation planning and management.

CO7. Provide solutions to transportation planning and management problems considering environment.

CO8. Maintain ethics in transportation planning and management practice.

CO9.Considereconomicalissuesintransportationplanningand management.

DETAILED SYLLABUS:

UNIT-I:TRANSPORTATIONPLANNING (08Periods)

Transportation planning process, System approach totransportation planning,Stagesintransportationplanninganddifficultiesin transportation planning process - Transportation survey, Studyarea, Zoning;Typesofsurveys-Inventoryoftransportationfacilities;Land use and economicactivities.

UNIT-II:TRANSPORTDEMANDANALYSIS (09Periods)

Trip purpose - Factors governing trip generation and attraction, Multiple linear regression analysis; Trip distribution models - Gravity model, Modal spilt models, Probit analysis, Traffic assignment models; Travel demandforecasting,Tripgenerationanalysis,Tripclassification– Multipleregression analysis, category analysis, modal split analysis; Trip distributionanalysis-Methodsoftripdistribution,Uniformandaverage factor method, Fratar method, Furness method, Gravity model;Linear programming approach to tripdistribution.

UNIT-III:TRAFFICASSIGNMENT,LANDUSETRANSPORTMODELS ANDTHEORYOFTRAFFICFLOW (09Periods)

Traffic Assignment: Purpose, Techniques - All or nothing assignment, Multiple route assignment, Capacity restraint assignment;Diversion curves, Route buildingalgorithms

LanduseTransportModels:Selectionofland,Lowrymodel,Grain-Lowry model, Applications of Lowrymodel.

Theory of Traffic Flow: Scope, Definitions and basic relationship, Hydrodynamic analogies, Car following theory, Probabilistic description of traffic flow, Queuing theory as applied to traffic flow problems for study state conditions, Simulation studies.

UNIT-IV:TRANSPORTECONOMICSANDPUBLICTRANSPORTATION– MASSTRANSITSYSTEMS (08Periods)

Transport Economics: Economic evaluation of highway schemes, Necessity, Cost and benefits of transportation projects, Basic principles of economic evaluation - Net present value method, Benefit/Cost ratio method, Internal rate of return method; Vehicle operating costs, Value of travel time saving, Accident costs.

Public Transportation–Mass Transit Systems: Bus and rail transit, characteristic capacities – Introduction to advanced computational techniques for transportation planning.

UNIT-V:SCHEDULING,PLANNINGANDSOFTWARES (11Periods)

Scheduling: Grouping of plant and machinery; Incorporating in project planning; Preparation of plant schedule.

Planning: WBS, Network development, Resource allocation, Planning and controlling of resources.

Softwares: Primavera and MS Project.

Total Periods: 45

TEXT BOOKS:

1. Kadyali, L. R., *Traffic Engineering and TransportationPlanning*, Khanna Publications, 7th Edition,2012.
2. Chitkara, K. K., *Construction Project Management:Planning, SchedulingandControlling*,TataMcGraw-HillEducationPvt.Ltd., 3rd Edition,2010.

REFERENCE BOOKS:

1. Saxena, S. P. and Arora, S. P. *Railway Engineering – A Text BookofTransportationEngineering,*S.ChandandCo.Ltd.,7th Edition,2010.
2. Chandola, S. P.,*A Text Book of Transportation Engineering*,S. Chand & Co Ltd,2011.
3. Par tha Chakr obort hy a nd An imesh Das, *Pri ncip lesof TransportationEngineering,*PrenticeHallofIndiaPvt.Ltd,2005.
4. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning,* Prentice Hall of India Pvt. Ltd.,2006

III B.Tech. – II Semester

(19BT60120) LAND SURVEY AND REAL ESTATE DEVELOPMENT

(Professional Elective–3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Surveying.

COURSE DESCRIPTION: Land survey and layouts; Building bye–laws and regulations; Real estate development; Retail real estate; Portfolio and real estate management.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on land survey and real estate development.
CEO2. To develop skills in analysis, communication, finance and project management skills in land survey and real estate development using appropriate techniques.
CEO3. To inculcate ethics and lifelong learning in land survey and real estate development considering society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO6. Analyze land survey and layouts to solve real estate problems using appropriate techniques by following relevant standards and codes considering society, environment besides communicating effectively in graphical form.
CO7. Analyze building bye-laws and regulations to solve real estate problems by following latest developments considering society, environment besides communicating effectively in graphical form.
CO8. Analyze real estate development to solve real estate problems following relevant standards, regulations and latest developments considering society, finance and project management.
CO9. Analyze retail real estate to solve real estate problems following relevant standards, regulations and latest developments considering society, finance and project management.
CO10. Analyze portfolio and real estate management to solve the real estate problems using appropriate techniques following relevant standards, regulations and latest developments considering society, finance and project management.

DETAILED SYLLABUS:

UNIT - I: LAND SURVEY AND LAYOUTS (08 Periods) Field surveying - Definition and objectives; Concept of geoid and reference spheroids, Coordinate systems, Plane and geodetic surveys; Maps - Types, Importance, Scales or centre line, Conventional symbols and generalization; Topographic maps, Map projection systems, Sheet numbering systems, Map layout; Engineering project surveys - Requirements and specifications.

UNIT – II: BUILDING BYE–LAWS AND REGULATIONS (10 Periods) Meaning of terms of law, legislation, ordinance, bill, act, regulation and bye-laws; Significance of law and its relationship to urban planning, Benefits of statutory backing of schemes, Law of eminent domain and police powers, Evolution of planning legislation – A brief history of planning legislation in India and abroad, Town and country planning act 1957, Improvement trust act 1961, Development authorities act 1957, State housing board act, Land acquisition act 1986, Urban land (ceiling and regulation) act 1976, Slum areas (improvement and clearance) act 1956, Rent control act1946, Apartment ownership act 1983; Significance of land development controls – Zoning, Subdivision regulations, Building regulation and bye-laws; Land layout development.

UNIT - III: REAL ESTATE DEVELOPMENT (09 Periods)

Organizational set up and its functions, General procedure for development permission, Authorities and discretionary powers, Duties of staff, Policy decisions; Documents from owner, architect or surveyor; Permissions by corporation, Finance for investment in real properties, FDI, Method of valuation - Open lands, Rental method, Capital value, Outgoings, Depreciation, Valuation of licensed premises.

UNIT - IV: RETAIL REAL ESTATE (09 Periods)

Merchandising, Warehousing, Franchising, Shopping malls, General free and unfree tenure, Land system in India, Concept of term value, Different forms of value, Supply and demand forces, Occupation value and investment value, Factors affecting changes in market value, Classification of values, Building redevelopment proposal, Slum rehabilitation and development schemes, Latest developments.

UNIT - V: PORTFOLIO AND REAL ESTATE MANAGEMENT (09 Periods)

Risk management in real estate, Strategic business risks and corporate real estate, Competitive risks; Managing portfolio - Property assets, Contracts and relationships, Workplace and infrastructure; Risk management - Financial risks, Property market risks, Business risks, Understanding risks and informing decision making; Business ethics - Normative ethics, Prescriptive ethics, Applied ethics, Concept of right and duty, Definition and scope relevance in social changes, Corporate code of conduct.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1.Mike E. Miles, Laurence M. Netherton and Adrienne Schmitz, *Real Estate Development: Principles and Process*, Urban Land Institute, 5th Edition, 2015.

2. Rena Mourouzi-Sivitanidou and Petros Sivitanides, *Market Analysis for Real Estate*, Routledge, 1st Edition, 2020.

REFERENCE BOOKS:

1.Charles D. Ghilani, *Elementary Surveying - An Introduction to Geomatics*, Pearson India Education Services Pvt. Ltd, 13th Edition, 2018.

2. David L. Cleland and Lewis R. Ireland, *Project Management: Strategic Design and Implementation,* McGraw-Hill Education; 5th Edition, 2006.

3. Downs, J.C., *Principles of Real Estate Management*, Institute of Real Estate Management, 1980.

4. Dutta, B.N., *Estimating and Costing in Civil Engineering,* CBS Publishers & Distributors Private Limited, 28th Edition, 2020.

ADDITIONAL LEARNING RESOURCES:

1. National Building Code of India 2016.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

This course introduced in SVEC19 Regulation

III B.Tech. II Semester

(19BT60122) **SUSTAINABLE WATER RESOURCES DEVELOPMENT**

(Professional Elective -3)

Int. Marks	*Ext. Marks*	*Total Marks*	L	T	P	C
40	60	100	3	0	-	3

PRE-REQUISITES: Course on Engineering Hydrology, Irrigation Engineering and Hydraulic Structures.

COURSE DESCRIPTION: Challenge of water sustainability; Water Economics; Sustainable Planning Approaches; Sustainable Practices for water resources management; Integrated Management of Water Supply.

COURSE OBJECTIVES:

CEO4. To impart the knowledge on sustainable water resources development.
CEO5. To develop analysis, problem solving, communication, economics and management skills in sustainable water resources management using appropriate tools and techniques.
CEO6. To inculcate ethics and lifelong learning in solving sustainable water resources management problems considering society, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Analyze global water issues and challenges to solve water resource problems considering latest developments, relevant guidelines, society, environment, and sustainability besides communicating effectively in graphical form.
CO2. Analyze water resource economics as linked to hydrology, ecology, pollution, consumptive and non-consumptive uses for solving complex problems considering latest developments, relevant guidelines, society, environment, and sustainability besides communicating effectively in graphical form.
CO3. Analyze sustainable planning approaches of water resources to solve complex problems considering relevant guidelines, latest developments and society besides communicating effectively in graphical form.
CO4. Analyze sustainable practices to solve complex water resources problems using best management practices considering latest developments, relevant guidelines, environment and sustainability besides communicating effectively in graphical form.
CO5. Analyze integrated management of water supply methods to solve complex water resources problems considering latest developments, relevant guidelines, environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT I – CHALLENGES OF WATER SUSTAINABILITY (9 periods)

Water as a global issue - Key challenges, Need and importance of water resources; Ecosystem services, Water security, Sustainable water use; Overview of water resources – rivers, streams, groundwater and aquifers, lakes and reservoirs, wetlands and coastal zones; Global warming, Climate change and its impacts.

UNIT II – WATER ECONOMICS (9 periods)

Economic view of water issues, Economic characteristics of water goods and services, International funding organizations, Non-market monetary valuation methods, Water economic instruments, Policy options for water conservation and sustainable use – Case

studies; Pricing -Distinction between values and charges; Private sector involvement in water resources management - PPP Objectives, Options, Processes, Experiences through case studies, Links between PPP and IWRM.

UNIT III – SUSTAINABLE PLANNING APPROACHES (9 periods)

National laws, Acts and Policies; Watershed planning, Tools for water resource analysis, Stormwater management and erosion control, Land use planning and management, Urban hydrology -Existing systems, Impervious cover model, Trees in urban watersheds; Groundwater protection - A Sustainable approach, Data at the local and national levels.

UNIT IV – SUSTAINABLE PRACTICES FOR WATER RESOURCES MANAGEMENT (9 periods)

River, Lake and Wetland restoration; Low-impact development and smart growth, Recreational use, Wildlife management and habitat restoration, New lakes, Reservoirs and dams, Land acquisition, Best management practices - Structural and nonstructural, Vegetative Practices, Runoff and sediment control, Wetlands; Rainwater harvesting.

UNIT V – INTEGRATED MANAGEMENT OF WATER SUPPLY (9 periods)

Integrated management of water supply for large cities, Managing water supply using groundwater recharge, Assessment of surface storage requirement, Using flood water for artificial recharge and space irrigation, Optimal usage of irrigation water, Watershed approach for controlling erosion and non-point source pollutants to water bodies, Environment impact assessment of water resources – Objectives, Advantages and limitations.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Sipes, J., *Sustainable Solutions for Water Resources Policies, Planning and Implementation*, John Wiley & Sons, Inc., 1st Edition, 2010.
2. MaysL, W., *Water Resources Sustainability*, McGraw-Hill Education, 1st Edition, 2007.

REFERENCE BOOKS:

1. Ojh, C.S.P., Berndtsson, R., and Bhunya, P., *Engineering Hydrology*, Oxford University Press, 1st Edition, 2008.
2. Lenton, R., and Muller, M., *Integrated Water Resources Management in Practice*, MPG Books 1st Edition, Ltd., 2015.
3. Grigg, N.S., *Integrated Water Resources Management,* Macmillan Publishers Ltd., 1st Edition, 2016.
4. Setegn, S.G., and Donoso, M.C., *Sustainability of Integrated Water Resources Management,* Springer International Publishing Switzerland, 1st Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Biswas, A.K., and Cecilia, T., Water Security, *Climate Change and Sustainable Development*, Springer Singapore, Heidelberg, New York, 1st Edition, 2016.
2. Shukla, V., and Kumar, N., *Environmental Concerns and Sustainable Development*, Springer Nature Singapore Pte Ltd., 1st Edition, 2020.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New subject "Sustainable Water Resources Development" included in SVEC19 regulation

III B. Tech. – II Semester

(19BT60124) INTELLIGENT TRANSPORTATION SYSTEMS

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	--	--	3

PRE-REQUISITES: Course onTransportation Engineering.

COURSE DESCRIPTION: Intelligent Transportation Systems (ITS**)**; Telecommunications in ITS; ITS Functional areas; ITS User needs and services; Automated highway systems.

COURSE OBJECTIVES:

CEO4 To impart the knowledge on ITS, data collection techniques, telecommunications in ITS, ITS functional areas; ITS user needs and services; and automated highway systems.
CEO5 To develop analysis, problem solving and communication skills in ITS using appropriate tools and techniques.
CEO6 To inculcate ethics and lifelong learning in solving ITS problems considering society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze intelligent transport systems to solve complex transportation problems using appropriate techniques following relevant guidelines and latest developments considering society and environment besides communicating effectively in graphical form.
CO2 Analyze telecommunications in ITS to solve complex transportation problems using appropriate techniques considering society and environment besides communicating effectively in graphical form.
CO3 Analyze ITS functional areas to solve complex transportation problems using appropriate techniques following relevant guidelines and latest developments considering society and environment.
CO4 Analyze ITS user needs and services to solve complex transportation problems using appropriate techniques following relevant guidelines and latest developments considering safety and environment.
CO5 Analyze automated highway systems to solve transportation problems following relevant guidelines and latest developments considering society and environment.

DETAILED SYLLABUS:

UNIT – I: INTELLIGENT TRANSPORTATION SYSTEMS (ITS) (9 Periods)

Intelligent Transportation Systems (ITS) – Definition of ITS and identification of ITS objectives, Historical background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), Video data collection.

UNIT-II: TELECOMMUNICATIONS IN ITS (9 Periods)

Importance of telecommunications in the ITS system, Information management, Traffic Management Centres (TMC); Vehicle – Road side communication, Vehicle positioning system.

UNIT-III: ITS FUNCTIONAL AREAS (9 Periods)

Advanced Traffic Management Systems (ATMS), Advanced Traveller Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

UNIT-IV: ITS USER NEEDS AND SERVICES (9 Periods)

Travel and traffic management, Public transportation management, Electronic payment, commercial vehicle operations, Emergency management, Advanced vehicle safety systems, Information management.

UNIT-V: AUTOMATED HIGHWAY SYSTEMS (9 Periods)

Vehicles in platoons – Integration of automated highway systems; ITS Programs in the world – Overview of ITS implementations in developed countries, ITS in developing countries.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Pradip Kumar Sarkar and Amit Kumar Jain, *Intelligent Transport Systems*, PHI Learning, 2018.
2. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.

REFERENCES

5. Jotin Khisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction*, Prentice Hall of India Pvt. Ltd., 2006.
6. Chakroborthy, P. and Das, A., *Principles of Transportation Engineering*, Prentice Hall of India Pvt. Ltd, New Delhi, 2nd Edition, 2017.
7. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning*, PearsonIN, 3rd Edition, 2015.
8. Mannering, Fred L., Walter P. Kilareski., Scott S. Washburn, *Principles ofHighway Engineering and Traffic Analysis*, John Wiley & Sons, 3rd Edition, 2004.

ADDITIONAL LEARNING RESOURCES:

1. *National ITS Architecture Documentation*, US Department of Transportation, 2007.
2. Kan Paul Chen and John Miles, *ITS Hand Book 2000: Recommendations for World Road Association (PIARC)*.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. New subject "Intelligent Transportation Systems" is added in SVEC19 Regulation.

III B.Tech. – II Semester

(19BT60125)**SMART MATERIALS AND STRUCTURES**

(Inter Disciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	--	--	3

PRE-REQUISITES: Civil Engineering Materials and Concrete Technology;Structural Analysis; Reinforced Cement Concrete Structures; Steel Structures

COURSE DESCRIPTION: Smart materials and structures; Measuring techniques and types; Sensing systems; Actuators; Data acquisition and processing.

COURSE OBJECTIVES:

CEO1. To provide the knowledge on smart materials and smart structures:, measuring techniques and types, sensing systems, actuators, data acquisition and processing.
CEO2. To impart the skill of analyzing and selecting appropriate smart materials, measuring techniques, sensing systems and actuators in smart materials and structures.
CEO3. To instill safety and sustainability in structures and inculcate lifelong learning by acquiring and processing the data from sensing systems and monitoring the structures.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Analyze smart materials and various components of smart structures to solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.
CO2. Analyze various strain measuring tools to solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.
CO3. Analyze various sensing systems to solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.
CO4. Analyze various materials and techniques used in actuators to solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.
CO5. Analyze the signals from the smart structures and monitor the structural deficiencies prior to failure to solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.

DETAILED SYLLABUS:

UNIT – I: SMART MATERIALS AND STRUCTURES (08 Periods)

Smart materials and structures, Instrumented structures functions and response Sensing systems, Self-diagnosis, Signal processing consideration, Actuation systems and effectors

UNIT – II: MEASURING TECHNIQUES AND TYPES (08 Periods)

Strain measuring techniques using electrical strain gauges- Types, Resistance, Capacitance, Inductance, Wheatstone bridges, Pressure transducers, Load cells, Temperature compensation, Strain rosettes.

UNIT–III: SENSING SYSTEMS (11 Periods)

Sensing technology, Types of sensors, Physical measurement using piezo electric strain measurement, Inductively read transducers, LVDT, Fiber optic techniques, Chemical and Bio-chemical sensing in structural assessment, Absorptive chemical sensors, Spectroscopes, Fibre optic chemical sensing systems and distributed measurement.

UNIT – IV: ACTUATORS (09 Periods)

Actuator techniques, Actuator and actuator materials, Piezoelectric and electrostrictive material, Magneto structure material, Shape memory alloys, Electro rheological fluids, Electromagnetic actuation, Role of actuators and Actuator materials.

UNIT – V: DATA ACQUISITION AND PROCESSING (09 Periods)

Data acquisition and processing, Signal processing and control for smart structures, Sensors as geometrical processors, Signal processing, Control system- Linear and non-linear.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Brain Culshaw, *Smart Structure and Materials*, Artech House – Borton. London, 2004.
2. Srinivasan, A. V. and Michael McFarland, D., *Smart Structures: Analysis and Design*, Cambridge University Press, 2009.

REFERENCE BOOKS

1. Gandhi, M.V. and Thompson, B.S., *Smart Materials and Structures*, Chapman and Hall, NewYork, 1992
2. Mel. M Schwartz, *Encyclopedia of Smart Materials*, John Wiley and Sons Inc., 2002.
3. Srinath, L. S., Raghavan, M.R., Lingaiah, K., Gargesa. G., Pant. B., Ramachandra, K., *Experimental Stress Analysis*, Tata McGraw-Hill, 1984.
4. Dally, J. W. and Riley, W. F., *Experimental Stress Analysis*, Tata McGraw-Hill, 3rd Edition, 1991.

ADDITIONAL LEARNING RESOURCES:

1. Michelle Addington and Daniel L. Schodek, *Smart Materials and Technologies: For the Architecture and Design Professions*, Routledge, 2005.
2. Gauenzi, P., *Smart Structures: Physical Behaviour, Mathematical Modelling and Applications*, Wiley, 2009

Cady, W. G., *Piezoelectricity Volume One*, Dover Publication, 2018.

III B. Tech. – I Semester

(19BT61531) INTERNET OF THINGS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	2	2

PRE-REQUISITES:-

COURSE DESCRIPTION:
Setting up **IoT** work-flow, Programming with Python, Micro-controller programming using Arduino, Building **IoT** Applications using Raspberry Pi, **IoT** Cloud Infrastructure.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO1: Design an interface to embedded systems using real time sensors with Arduino and Raspberry Pi.
CO2: Develop applications to capture the data generated by sensors and send to cloud.
CO3: Develop real time applications using NodeMCU and BLYNK.
CO4: Design applications to push sensor data to cloud using MQTT protocol.
CO5: Work independently and in team to solve problems with effective communication.

Theory Component: (10 Periods)
Arduino IDE, 7-segment display, Servo motor, ultrasonic sensor, LCD, Flame sensor, gas sensor, Humidity & temperature sensors, MQTT protocols, ECG System, Raspberry Pi, Home security system with camera, PIR sensor, light sensor, motion detector, NodeMCU, BLYNK, cloud

LIST OF EXPERIMENTS:
1. (a) Design and Simulate LED 7-Segment Display interfacing with Arduino.
(b) Design and Simulate Servo motor interfacing with Arduino.
2. (a) Design and Simulate ultrasonic sensor and LCD interfacing with Arduino.
(b) Design and Simulate Flame Sensor interfacing with Arduino.
3. Design and Implement to capture Gas Sensor and send sensor data to cloud from your NodeMCU device using Arduino IDE.
4. Design and Implementation of Humidity and Temperature Monitoring Using Arduino and upload data to cloud using MQTT.
5. Design and Implementation of an IoT ECG (Electrocardiogram) System to record hearts electrical activity.
6. Design and Simulate controlling an LED 7-Segment Display with Raspberry Pi.
7. Design and implementation of Raspberry Pi Home Security System with Camera and PIR Sensor with Email Notifications.
8. Design and Implement to upload Light sensor (TSL) data to cloud through Raspberry Pi.

9. Design and Implementation of Motion Detector with NodeMCU and BLYNK.
10. Design and Implementation of Fire notification IoT system with BLYNK.

REFERENCE BOOKS:

1. Adrian McEwen and Hakin Cassimally, *Designing the Internet of Things,* Wiley India.

2. Simon Monk, *Programming Aurdino,* Second Edition, McGraw-Hill Education**,**2016.

3. Matt Richardson and Shawn Wallace, *Getting Started with Raspberry Pi*, O'Reilly, 2014.

4. Rahul Dubey, *An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications* , Cengage Learning India Pvt. Ltd,2019

III B. Tech. - II semester

(19BT60132) SOCIALLY RELEVANT PROJECT-2

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	-	1

PREREQUISITES: -

COURSE DESCRIPTION:

Identification of topic for the socially relevant project; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the socially relevant project; Preparation of thesis and presentation.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

CO1: Create/Design engineering systems or processes to solve complex societal problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.

CO2: Consider environment, sustainability, economics and project management in addressing societal problems.

CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical forms on socially relevant project.

III B. Tech. – I Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE and IT) /

III B. Tech. – II Semester (ECE, EEE, EIE, CE and ME)

(19BT5MC01) **UNIVERSAL HUMAN VALUES**

(Mandatory Course)

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
40	-	40		2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION: Process for Value Education; Harmony in the Human Being - Harmony in Myself!; Harmony in Family and Society- Human Relationship; Harmony in the Nature and Existence – Coexistence; Implications of Holistic Understanding of Harmony on Professional Ethics.

COURSE OBJECTIVES:

- To inculcate Values and skills among the students for sustained happiness and prosperity.
- To emphasize on realistic implications of a Holistic understanding of ethical human conduct, trustful and mutually fulfiling human behaviour.
- To imbibe an attitude of Holistic perspective among the students towards life and profession through a positive understanding of the Human reality and existence.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand Values and skills for sustained happiness and prosperity.

CO2. Analyse realistic implications of a Holistic understanding of ethical human conduct, trustful and mutually fulfilling human behaviour.

CO3. Apply holistic approach in personal life and profession through a positive understanding of the Human reality and existence.

DETAILED SYLLABUS:

UNIT I: VALUE EDUCATION (6 Periods)

Human Values-Introduction; Self-Exploration - Natural Acceptance; Human Aspirations-Right understanding- the current scenario: understanding and living in harmony.

UNIT II: HUMAN BEING AND SELF (6 Periods)

Understanding human being - I' and the material 'Body'; needs of Self ('I') and 'Body'-happiness and physical facility; Body as an instrument of 'I' - characteristics and activities of 'I' and harmony in 'I'; harmony of I with the Body.

UNIT III: FAMILY, THE SOCIETY AND THE NATIONS (6 Periods)

Values in human relationship (nine universal values) - foundational values of

relationship; Difference between intention and competence; Difference between respect and differentiation; harmony in the society; Universal harmonious order in society.

UNIT IV: HARMONY WITH THE NATURE (6 Periods)

Harmony in the Nature; Interconnectedness and mutual fulfilment - the four orders of nature - Recyclability and Self-regulation; Existence as Co-existence; Holistic perception of harmony and existence.

UNIT V: HARMONY WITH PROFESSIONAL ETHICS (6 Periods)

Acceptance of human values; Ethical Human Conduct; Basis for Humanistic Education; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

Total Periods: 30

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

REFERENCE BOOKS:

JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999

IV B. Tech. – I Semester

(19BT70105)**ENVIRONMENTAL HYDRAULICS**

Professional Elective–4

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	-	3

PRE-REQUISITES: Course on Engineering Hydrology,Fluid Mechanicsand Environmental Engineering.

COURSE DESCRIPTION: Eco-hydrological background, Water uses, Hydraulic principles and Eco-friendly design approach, Water hazards and their management, Eco-technological practices for sustainable development.

COURSE OBJECTIVES:

CEO1 To impart the knowledge on Environmental Hydrology.
CEO2 To develop analysis, design, problem solving, communication and management skills in solving environmental hydraulicproblems using appropriate tools and techniques considering environmental concerns.
CEO3 To inculcate ethics andlifelong learning in solving hydraulic engineering problems considering safety, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO6. Analyze eco-hydrological Processes for solving environmental hydraulic problemsusing different tools and techniques considering society, environment, and sustainability besides communicating effectively in graphical form.
CO7. Analyze water uses for solving environmental hydraulic problems using different techniques considering relevant guidelines, society, environment and sustainability besides communicating effectively in graphical form.
CO8. Designeco-friendly water systems for solving complex environmental hydraulic problems using different tools and techniques, relevant guidelines, environment and sustainability besides communicating effectively in graphical form.
CO9. Analyze water hazard classes for solving complex environmental hydraulic problems using different tools and techniques considering latest developments, relevant guidelines, safety, environment and sustainability besides communicating effectively in graphical form.
CO10. Analyze eco-technological water management practices for solving complex environmental hydraulicproblems using different tools and techniques considering latest developments, relevant guidelines, safety, environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT - I: ECO-HYDROLOGICAL BACKGROUND (09 Periods)

Environmental Hydrology in General, Hydrologic Cycle and its Processes, Rainfall-Runoff-Infiltration-Evaporation Analysis, The Water Balance, Water Bodies.

UNIT - II: WATER USES (09 Periods)

Introduction, Water supply for Rural and Urban Neighborhoods, Water for Agriculture, Water for Industries, Water for Hydropower Generation, Water for Navigation, Water for Pisciculture, Water for Recreation.

UNIT - III: HYDRAULIC PRINCIPLES AND ECO-FRIENDLY DESIGN APPROACH (10 Periods)

Conservation Principles in General, Mass Conservation Principle and Applications, Energy Conservation Principle and Applications, Momentum Conservation Principle and Applications, Angular Momentum Conservation Principlesand Applications, Flow Measurement Devices in Pipes and Open Channels, Basic Considerations for Eco-friendly Design ofWater Systems.

UNIT - IV: WATER HAZARDS AND THEIR MANAGEMENT (09 Periods)

Overview of hazards, Water and the nature of its Pollution, Flood Disaster and its Management, Landslide Hazards and their Management, Disaster due to Collapse of Dams, Hazards due to Droughts, Information and System Organization forDisaster Mitigation.

UNIT - V: ECO-TECHNOLOGICAL PRACTICES FOR SUSTAINABLE DEVELOPMENT 08 Periods)

Introduction, Traditional Water Conservation Practices, Recent Eco-Technological Practices, Sustainable Development through IntegratedWater Management.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

3. Ghosh,S.N. and Desai, V.R., *Environmental Hydrology and Hydraulics*, Science Publishers,1st Edition, 2006.
4. Ward,A. D., Trimble,S. W., Burckhard,S. R. and Lyon, J. G. *Environmental Hydrology*, CRC Press, 1st Edition, 2016.

REFERENCE BOOKS:

1. Eslamian, S., *Handbook of Engineering Hydrology: Environmental Hydrology and Water Management*, CRC Press, 1st Edition, 2014.
2. Singh,V. P. and Hanger, W. H., *Environmental Hydraulics*, Springer Nature, 1996.
3. Tsanis, I., Huihua,J.W. and Valeo, S. C., *Environmental Hydraulics*, Elsevier Science, 1st Edition, 2006.
4. Tanguy, J.M., *Environmental Hydraulics*, Wiley Publication, 1st Edition, 2010.

ADDITIONAL LEARNING RESOURCES:

1. French, R. H., McCutcheon, S C. and Martin, J. L., *Environmental Hydraulics* (Chapter 5), *Hydraulic Design Handbook*, McGraw-Hill Professional, New York, NY, 5.1-5.33, (1999).
2. Ramos, H.M., Carravetta, A., Nabola, A. Mc. and Adeyeye K., *Environmental Hydraulics Research*, Water 2020, 12, 2749; doi:10.3390/w12102749.

IV B.Tech. – I Semester

(19BT70108) **RIVER ENGINEERING AND RIVER BASIN MANAGEMENT**

(Professional Elective - 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	-	3

PRE-REQUISITES: Course on Fluid Mechanics, Hydrology

COURSE DESCRIPTION: River functions; river hydraulics; river flow mechanism and social aspects; river training works; river basin management.

COURSE OBJECTIVES:

CEO7. To impart the knowledge on river engineering and river basin management.
CEO8. To develop analysis, design, problem solving, communication and management skills in river engineering and river basin management using appropriate tools and techniques.
CEO9. To inculcate ethics and lifelong learning in solving river engineering and river basin management problems considering society, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO11. Analyze river systems for solving river engineering problems considering society, environment, and sustainability besides communicating effectively in graphical form.
CO12. Analyze behavior of river hydraulics for solving complex river engineering problems using different techniques considering relevant guidelines, society, environment and sustainability besides communicating effectively in graphical form.
CO13. Analyze mechanism of river flow for solving complex river engineering problems using different tools and techniques, relevant guidelines, environment and sustainability besides communicating effectively in graphical form.
CO14. Design river training works for solving complex river engineering problems using different tools and techniques considering relevant guidelines, safety, environment and sustainability besides communicating effectively in graphical form.
CO15. Analyze integrated river basin management practices for solving complex river basin management problems using different tools and techniques considering latest developments, relevant guidelines, safety, environment and sustainability besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT - I: RIVER FUNCTIONS (09 Periods)

Rivers – Origin and evolution of river systems, Classification of rivers, Alluvial river channel and flood plainfeatures, Sediment transport, River morphology and various classification schemes.

UNIT - II: RIVER HYDRAULICS (09 Periods)

Behavior of rivers - Introduction, River channel patterns, Straight river channels, Causes;River meandering –Causes, Characteristics, Shapes of meanders and control; Instability of rivers, Hydraulic geometry, Delta formation and control.

UNIT - III: RIVER FLOW MECHANISM AND SOCIAL ASPECTS (09 Periods)

Mechanics of alluvial rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration.

UNIT - IV: RIVER TRAINING WORKS (09 Periods)

River training works and river regulation works, Classification, Protection for bridges with reduced waterways, Floodplain management, Waves and tides in estuaries, Interlinking of rivers, River stabilization.

UNIT - V: RIVER BASIN MANAGEMENT (09 Periods)

Basic concepts of River Basin Management (RBM) - Integrated River Basin Management (IRBM), River Basin Organizations (RBOs); Theories and principles of IRBM - Need for IRBM, Irrigation-objectives and benefits of IRBM; Key Activities and Challenges in IRBM - Various Guiding Principles of IRBM, Scenarios in Developed and Developing Countries, Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Garg,S. K., *River Engineering*, Khanna Publishing House, 1st Edition, 2019.
2. Gupta, K. D., *River Engineering,* Vayu Education of India, 1st Edition, 2014.

REFERENCE BOOKS:

1. Janson, PL., Ph., Lvan Bendegam Jvanden Berg, Mdevries A. Zanen (Editors), *Principles of River Engineering – The non tidal alluvial rivers – Pitman*, 1st Edition, 1979.
2. Pierre, Y. J., *River Mechanics*, Cambridge University Press, 2nd Edition, 2018.
3. Bucu, D., *River Basin Management*, INTECH Publication, 2nd Edition, 2017.
4. Brebbia, C.A., *River Basin Management*, Wessex Institute of Technology, UK, 2011.

ADDITIONAL LEARNING RESOURCES:

3. Laurence, S., Keith P., Kevin H., Mary J. P. and David B., *Catchment and River Basin Management*, Routledge Publication, 2017.
4. Xiangzheng, D., and Gibson J., *River Basin Management*, Springer Nature, 2019.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New subject "River engineering and river basin management" is added in SVEC19 Regulation

IV B.Tech. – I Semester

(19BT70110)**ANALYSIS AND DESIGN OF COMPOSITE STRUCTURES**

(Professional Elective-5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: - Courses on Structural Analysis, Reinforced Cement Concrete Structures, Steel Structures.

COURSE DESCRIPTION: Steel-concrete composite construction; Design of composite members; Design of shear connectors; Design of composite box girder bridges; Case studies and seismic behavior of composite structures.

COURSE OBJECTIVES:

CEO4. To impart the knowledge on analysis and design of composite structures.
CEO5. To develop analysis, design, problem solving and communication skills in composite structures using appropriate techniques.
CEO6. To inculcate ethics in the analysis and design of composite structures considering safety, society, serviceability and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO6. Analyze steel-concrete composite construction to solve composite structures using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.
CO7. Design composite members to solve complex problems using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.
CO8. Design the shear connectors to solve complex problems using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.
CO9. Design composite box girder bridges to solve complex problems using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.
CO10. Analyze the seismic behavior of composite structures to solve complex problems using appropriate techniques considering safety, society, environment and code of practice.

DETAILED SYLLABUS:

UNIT – I: STEEL-CONCRETE COMPOSITE CONSTRUCTION (09 Periods)

Introduction to steel-concrete composite construction, Codes, Composite action, Serviceability and construction issues in design.

UNIT – II: DESIGN OF COMPOSITE MEMBERS (09 Periods)

Design of composite beams, slabs, columns and beam–columns; Design of composite trusses.

UNIT – III: DESIGN OF SHEAR CONNECTORS (09 Periods)

Shear connectors, Types, Design of connections in composite structures, Design of shear connectors, Partial shear interaction.

UNIT – IV: DESIGN OF COMPOSITE BOX GIRDER BRIDGES (09 Periods)

Introduction, Behavior of box girder bridges, Design of composite box girder bridges.

UNIT – V: CASE STUDIES AND SEISMIC BEHAVIOR OF COMPOSITE STRUCTURES (09 Periods)

Case studies on steel-concrete composite construction in buildings, seismic behavior of composite structures.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

3. Johnson R.P., *Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings- Vol.I*, Blackwell Scientific Publications, 2004.
4. Oehlers D.J. and Bradford M.A., *Composite Steel and Concrete Structural Members*: *Fundamental Behaviour*, Pergamon Press, 1st Edition 2013.

REFERENCES

1. Qing Quan Liang, *Analysis and Design of Steel and Composite Structures*, CRC Press, 1st Edition, 2015**.**
2. Owens, G.W. and Knowles, P., *Steel Designers Manual*, Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.
3. Narayanan, R., *Steel-Concrete Composite Structures*, CRC Press, 1st Edition, 1988.
4. Manoj Kumar Buragohain, *Composite Structures: Design, Mechanics, Analysis, Manufacturing, and Testing*, CRC Press, 1st Edition, 2017.

ADDITIONAL LEARNING RESOURCES

1. Ever J. Barbero, *Introduction to Composite Materials Design*, CRC Press, 3rd Edition, 2017.

IS Codes:

IS: 3935 - 1966 : Code of Practice for Composite Construction.

IS: 11384 – 1985 : Code of Practice for Composite Construction in Structural Steel and Concrete.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New Program Elective introduced in SVEC19 syllabus

IV B.Tech. - I Semester

(19BT70112) CIVIL INFRASTRUCTURE FOR SMART CITY DEVELOPMENT

(Professional Elective – 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Smart cities;Urban planning for smart city;Smart city development; Smart buildings; Smart city mobility;Smart city utilities and services.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on civil infrastructure for smart city development.
CEO2. To develop analysis, problem solving and communication skills in civil infrastructure for smart city development, using appropriate tools and techniques.
CEO3. To inculcate ethics in developing civil infrastructure for smart city considering health, safety, society, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Analyze various elements of smart city infrastructure to solve complex problems following relevant policies considering health, safety, society, environment, sustainability and project management.
CO2. Analyze urban planning to solve complex smart city problems following relevant standards by using appropriate tools and techniques considering society, environment and sustainability besides communicating effectively in graphical form.
CO3. Analyze smart city development and smart buildings to solve complex problems using appropriate tools and techniques following relevant standards considering health, safety, environment, sustainability, economics and management.
CO4. Analyze smart city mobility to solve complex smart city problems using appropriate tools and techniques following relevant policies considering safety, society, environment and sustainability.
CO5. Analyze smart city utilities and services to solve complex smart city problems using appropriate tools and techniques considering health, society, environment, sustainability, economics and management.

DETAILED SYLLABUS:

UNIT – I: SMART CITIES (08 Periods)

Smart City; Elements of Smart city infrastructure – Buildings, Mobility, Energy, Water, Waste management, Health and Digital layers; Need for an integrated approach; Role of science, technology and innovation in the implementation of smart infrastructure; Smart infrastructure design principles and policies; Case studies: Gujarat International Finance Tech-City in India.

UNIT – II: URBAN PLANNING FOR SMART CITY (09 Periods)

Introduction to concepts of urban planning; Various levels – Development Plan, Regional Plan, Sub-city Plans; Provision of local needs; Importance of local area and neighborhood planning; Land use controls and zoning; Housing and slum rehabilitation; Urban patterns; Conservation of Natural and built heritage environment; Elements of

urban design; Indian best practices in urban planning; Application of Remote Sensing(RS) for land use/land cover, agriculture and urban planning.

UNIT – III: SMART CITY DEVELOPMENT AND SMART BUILDINGS (10 Periods)

Smart City Development: Evolution and Concept; Objectives; Contemporary features; Relevance and Importance; Barriers and Drivers; Smart City Governance and Public Institutions; Sustainability and Resilience; Livability index; Smart city ranking index; Application of BIM in Smart city development.

Smart Buildings: Smart building; Siting the building; Materials; Measuring the Performance of a Building – Financial metrics, Security and life safety, Productivity and satisfaction of building occupants; Essential attributes of a smart building – HVAC, Lighting control, Electric power management, Access control, Video surveillance, Fire alarm and mass notification; Design, Construction, and Renovation process; The Economics of smart buildings; Energy and sustainability; Case studies.

UNIT – IV: SMART CITY MOBILITY (09 Periods)

Introduction; Issues of urban transport; Demand and supply side solutions; Design concepts (pedestrian friendly/vehicle friendly design, safety considerations); Sustainable transportation; Urban transport planning process;Traffic operation policies; Intelligent Transportation System (ITS) for efficient utilization of resources; Components of ITS; Public transportation systems - Metro rail and Bus Rapid Transit System (BRTS); New trends in urban mobility; Case studies.

UNIT – V: SMART CITY UTILITIES AND SERVICES (09 Periods)

Sector wise issues in city infrastructure services such as water distribution; waste water collection; waste treatment; Tariff structures; Metering and billing; 24x7 water supply system; Urban sanitation; Integrated Water Resource Management System (IWRM); Smart city applications using RS &Geographic Information System(GIS)for water and waste water utilities; Street lighting system; Case studies.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. James Sinopoli, *Advanced Technology for Smart Buildings*, Artech House, 2016.
2. Sussman, J.S., *Perspectives on Intelligent Transportation Systems (ITS),* Springer Science & Business Media, 2008.

REFERENCES

1. Geertman, S., Ferreira, J., Goodspeed, R. & Stillwell, J., *Planning Support Systems and Smart Cities*, Springer, 2015.
2. Vinodkumar, T.M., *Geographic Information System for Smart Cities*, Copal Publishing, 2014.
3. James M. Sinopoli, *Smart Buildings Systems for Architects, Owners and Builders*, Butterworth-Heinemann, 1st Edition, 2009.
4. Jha, R., Chandiramani, J., *Perspectives in Urban Development-Issues in Infrastructure, Planning and Governance*, Capital Publishing, New Delhi, 1st Edition, 2012.

ADDITIONAL LEARNING RESOURCES

1. Khisty, C.J. and Lall, B.K., *Transportation Engineering*, Pearson Education India, 3rd Edition, 2017.
2. *Smart Cities Mission Statement & Guidelines*, Ministry of Urban Development Government of India, June 2015.
3. *Smart Cities and Infrastructure,* Commission on Science and Technology for Development, Nineteenth Session, United Nations Conference on Trade and Development, 09 - 13 May 2016, Room XVIII, Palais des Nations, Geneva, Switzerland.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New course "Civil Infrastructure for Smart City Development" is added in SVEC19 regulation

IV B. Tech. – I Semester

(19BT70114)**GEOTECHNICS FOR UNDERGROUND STRUCTURES**

(Professional Elective **-** 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: - Courses on Soil Mechanics, Foundation Engineering.

COURSE DESCRIPTION: Underground structures and geotechnical investigations; Underground space planning and design;Failure criteria for soil and rock; Analysis and design of underground structures; Non-destructive testing and health monitoring.

COURSE OBJECTIVES:

CEO1. To impart the knowledge on geotechnics for underground structures.
CEO2. To develop analysis, design, problem solving, communication, cost and project management skills in foundation engineering using appropriate tools and techniques.
CEO3. To inculcate ethics and lifelong learning in underground engineering practice considering safety, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1 Analyze underground structures and geotechnical investigationsto solve complex problems associated with underground structures using appropriate tools and techniques by following the relevant codes of practice and latest developments considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.
CO2 Design underground space and planning to solve complex problems associated with underground structures using appropriate techniques by following the relevant codes of practice considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.
CO3 Analyze the failure criteria for soil and rock to solve complex problems associated with underground structures using appropriate techniques considering safety besides communicating effectively in graphical form.
CO4 Design underground structures to solve complex problems associated with underground structures using appropriate techniques by following the relevant codes of practice considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.
CO5 Analyze non–destructive testing and health monitoring of underground structures using appropriate techniques to solve complex problems by following the relevant codes of practice and latest developments considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT - I: UNDERGROUND STRUCTURES AND GEOTECHNICAL INVESTIGATIONS

(09 Periods)

Underground structures - Introduction, Necessity for underground construction, Types and applications of underground structures, Parameters for site selection, Laboratory

and field tests of soil, Materials used in underground structures, Geoengineering; Investigations for rock or rock mass characterization - Topographical and geological survey, augering, drilling, soil and rock sampling and testing, Preparing subsurface geological cross section, Georadar use and data analysis for shallow tunnels, Geophysical investigations to identify deeper sub-surface features, Characterization of ground profile.

UNIT – II: UNDERGROUND SPACE PLANNING AND DESIGN (09 Periods)

Determination of appropriate location, size, shape and alignment; Assessment of behaviour of tunnelling media - Deformation modulus and support pressure measurement, Application of numerical modelling in space design, Earthquake effects on tunnels, Design of underground space in rocks with the help of field data; Design of underground openings - Design based on empirical methods such as RSR, RMR, Q systems, Design based on Rock support interaction analysis; Observational methods - NATM, Convergence - confinement method, Key block analysis; Stability of excavation face and tunnel portals.

UNIT – III: FAILURE CRITERIA FOR SOIL AND ROCK (09 Periods)

Failure theories - Failure criteria for soil and rock masses, Mohr-Coulomb yield criterion, Hoek-Brown criterion, Tensile yield criterion, Jointed rock yield criterion, Hardening soil criterion, Strength of discontinuities.

UNIT – IV: ANALYSIS AND DESIGN OF UNDERGROUND STRUCTURES (09 Periods)

Beam on elastic foundation method, Stress based analysis, Deformation-based analysis, Soil–structure interaction, Analysis of geotechnical structures using Boundary element method, finite element method, Rankine's and Coulomb's earth pressure theory, Earth pressure for design of excavation, Design of box culvert structures, Design of foundation pit retaining walls.

UNIT – V: NON-DESTRUCTIVE TESTING AND HEALTH MONITORING (09 Periods)

Strain integrity testing, Cross hole sonic tests, Health monitoring of underground structures, Use of sensors, Vibrating wire displacement sensor, Potentiometric displacement sensor, inclinometer/in place-inclinometer, Wireless tilt meter, Data loggers – Measurement and interpretation of test data.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Zhen-Dong Cui, Zhong-Liang Zhang, Li Yuan, Zhi-Xiang Zhan and Wan-Kai Zhang, *Design of Underground Structures,* Springer, 2020.
2. Pietro Lunardi, *Design and Construction of Tunnels,* Springer, 2008.

REFERENCES:

1. Sinha, R.S., *Underground Structures: Design and Instrumentation*, Elsevier Science Publisher, 1989.
2. Bai Yun., *Underground Engineering: Planning, Design, Construction and Operation of the Underground Space*, Academic Press, 2019.

3. Goel, R.K., Singh, B., Zhao, J., *Underground Infrastructures: Planning, Design and Construction*, Elsevier, 2012.

ADDITIONAL LEARNING RESOURCES:

1. John A Hudson and John P Harrison, *Engineering Rock Mechanics: An Introduction to the Principles,* Elsevier Science and Technology, 2000.
2. Richard E. Goodman, *Introduction to Rock Mechanics*, John Wiley and Sons, 2nd Edition, 1989.
3. Bieniawski, Z.T., *Rock Mechanics Design in Mining and Tunneling,* A.A. Balkema, 1984.
4. Obert, L. and Duvall, W.I., *Rock Mechanics and the Design of Structures in Rock,* Wiley, 1967.
5. Bieniawski, Z.T., *Engineering Rock Mass Classifications: A Complete Manual for Engineers and Geologists in Mining, Civil, and Petroleum Engineering,* Wiley, 1989.
6. Sherif, A., Piergiorgio, G., *Engineering Challenges for Sustainable Underground Use*, Proceedings of the 1st GeoMEast International Congress and Exhibition, Egypt, 2017.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

1. This course has been introduced in SVEC19 regulation.

IV B. Tech. – I Semester
(19BT70115) **TRAFFIC ENGINEERING AND MANAGEMENT**

(Professional Elective-5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	--	--	3

PRE-REQUISITES: Course one Transportation Engineering**.**

COURSE DESCRIPTION: Traffic engineering; Traffic characteristics; Traffic studies; Parking studies; Highway capacity; Highway safety; Traffic signs and road markings; Traffic and environment; Traffic control, regulation and Traffic management.

COURSE OBJECTIVES:

CEO7 To impart the knowledge on traffic engineering, traffic characteristics, traffic studies, parking studies, highway capacity, highway safety, traffic signs, road markings; traffic and environment; traffic control, regulation and traffic management.

CEO8 To develop analysis, problem solving, communication and project management skills in traffic engineering and management by using appropriate tools and techniques.

CEO9 To inculcate ethics and lifelong learning in solving traffic engineering and management problems considering society and environment.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO6 Analyze traffic and traffic characteristics to solve complex traffic engineering problems using appropriate techniques following relevant codes considering society and environment besides communicating effectively in graphical form.

CO7 Analyze traffic measurements to solve complex traffic engineering problems using appropriate techniques following relevant codes considering society and environment besides communicating effectively in graphical form.

CO8 Analyze highway capacity and safety to solve complex traffic engineering problems using appropriate techniques following relevant codes considering environment besides communicating effectively in graphical form.

CO9 Analyze traffic signs, road markings; traffic and environment to solve complex traffic engineering problems using appropriate techniques following relevant standards considering safety besides communicating effectively in graphical form.

CO10 Analyze traffic control, regulation and management to solve complex traffic engineering problems using appropriate techniques following relevant standards and latest developments considering society and environment besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT – I: TRAFFIC ENGINEERING AND TRAFFIC CHARACTERISTICS (9 Periods)

Traffic Engineering: Significance and scope; Characteristics of vehicles and road users; Skid resistance and braking efficiency (Problems); Components of traffic engineering - Road, traffic and land use characteristics.

Traffic Characteristics: Basic characteristics of traffic - volume, speed and density; Relationship among traffic parameters; Temporal headway and spatial headway; Vehicular speed trajectories; Car-following and lane change theories - Macroscopic flow models, Microscopic flow models; Shockwave analysis with examples.

UNIT-II: TRAFFIC MEASUREMENTS (9 Periods)

Traffic Studies: Traffic volume studies - Objectives, Types of volume studies, Concept of PCU, Data collection and presentation; Speed studies - Types of speeds, Objectives of speed studies, Methods of conducting speed studies, Data collection and presentation, Statistical methods for analysis of speed data; Origin and destination studies, Pedestrian studies, Basic principles of traffic flow.

Parking Studies: Types of parking facilities, On-street and off-street parking facilities, Parking inventory study, Parking survey by patrolling method, Analysis of parking data and parking characteristics, Multi storey car parking facility, Design standards.

UNIT-III: HIGHWAY CAPACITY AND SAFETY (9 Periods)

Highway Capacity: Definition of capacity, Importance of capacity, Factors affecting capacity, Concept of level of service, Different levels of service, Concept of service volume, Peak hour factor.

Highway Safety: Problem of highway safety, Types of road accidents, Causes, Engineering measures to reduce accidents, Enforcement measures, Educational measures, Road safety audit, Principles of road safety audit.

UNIT-IV: TRAFFIC SIGNS, ROAD MARKINGS, TRAFFIC AND ENVIRONMENT (9 Periods)

Traffic Signs and Road Markings: Types of traffic signs; Cautionary, regulatory and informative signs; Specifications, Pavement markings, Types of markings, Lane markings and object markings, Standards and specifications for road markings.

Traffic and Environment: Detrimental effect of traffic on environment, Air pollution, Pollutants due to traffic, Measures to reduce air pollution due to traffic, Noise pollution, Measures to reduce noise pollution.

UNIT-V: TRAFFIC CONTROL, REGULATION AND MANAGEMENT (9 Periods)

Traffic Control and Regulation: Traffic problems in urban areas, Importance of traffic control and regulation, Traffic regulatory measures, Channelization; Principle and design of intersections, grade separations and interchanges; Traffic signals, Saturation flow, Design of traffic signals and signal co-ordination (Problems), Signal phasing and timing diagrams, Traffic control aids and street furniture, Street lighting, Computer applications in signal design.

Traffic Management: Transportation system management (TSM), Travel demand management (TDM), Traffic forecasting techniques, restrictions on turning movements, One-way Streets, Traffic segregation, Traffic calming, Tidal flow operations, Exclusive bus lanes, Introduction to intelligent transportation system (ITS).

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 9th Edition, 1999.
2. Khanna, K. and Justo, C. E. G., *Highway Engineering,* Nem Chand & Bros, 8th Edition, 2009.

REFERENCES

9. Roger Roess, P. Elena, S. Prassas and William, R. Shane, M. C., *Traffic Engineering*, Prentice Hall, 4th Edition, 2010.
10. Chakroborthy, P. and Das, A., *Principles of Transportation Engineering*, Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.

11. Subhash, C. and Saxena, A., *Course in Traffic Planning and Design*, Dhanpat Rai Publications, 2010.
12. JotinKhisty, C. and KentLall, B., *Transportation Engineering – An Introduction*, Prentice Hall of India Pvt. Ltd., 3rd Edition, 2002.

ADDITIONAL LEARNING RESOURCES:

1. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning*, PearsonIN, 3rd Edition, 2015.
2. Fred L Mannering and Scott S Washburn, *Principles ofHighway Engineering and Traffic Analysis*, Wiley, 7th Edition, 2019.
3. Indian Roads Congress (IRC) Specifications: *Guidelines and Special Publications on Traffic Planning and Management*.
4. *Guidelines of Ministry of Road Transport and Highways*, Government of India.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

New subject "Traffic Engineering and Management" is added in SVEC19 Regulation

IV B. Tech. – I Semester

(19BT701AC) **SPREAD SHEET APPLICATIONS IN CIVIL ENGINEERING**

(Civil Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
			-	-	2	-

PRE-REQUISITES: MS Excel; Knowledge on Civil Engineering Courses.

COURSE DESCRIPTION: MS Excel as a spreadsheet tool; Spreadsheet creation; Design of slabs, Footings; Analysis of frames; Design of notches, Weirs; Design of pipes; Design of pavements.

COURSE OBJECTIVES:

CEO10. To impart the knowledge on spreadsheet applications in civil engineering.
CEO11. To develop analysis, design, problem solving, team spirit, communication and cost management skills pertain to spreadsheet applications in civil engineering.
CEO12. To inculcate ethics and lifelong learning in developing spreadsheet applications in civil engineering considering safety, serviceability, environment and sustainability.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO11 Apply the principles of spreadsheet for the formation of cells, formatting and creation of tables following latest developments.
CO12 Design structures and structural components to solve complex structural engineering problems using spreadsheet tool following relevant codes considering safety, serviceability, environment, sustainability and cost effectiveness.
CO13 Design footings and pavements to solve complex geotechnical engineering and pavement engineering problems using spreadsheet tool following relevant codes considering safety, serviceability, environment, sustainability and cost effectiveness.
CO14 Design water resources and environmental engineering systems to solve complex engineering problems using spreadsheet tool following relevant codes considering safety, serviceability, environment, sustainability and cost effectiveness.
CO15 Perform individually or in a team besides communicating effectively in written, oral and graphical forms on spread sheet applications in civil engineering.

DETAILED SYLLABUS:

This laboratory provides training to the students in using MS Excel as a spreadsheet tool for various Civil Engineering Applications as mentioned below.

LIST OF EXERCISES:

1. Introduction to MS Excel as a Spreadsheet tool, overview of toolbars, accessing, saving excel files, using help and resources. Creating a spreadsheet using the features: Gridlines, format cells, summation, auto fill, formatting text, formulae in excel charts.
2. Creating a spreadsheet using the features: Split cells, Sorting, Conditional formatting, freeze panes, pivot tables, data validation.
3. Design of singly reinforced beam
4. Design of doubly reinforced beam

5. Design of one-way slab
6. Design of two-way slab
7. Design of isolated footings
8. Design of frames
9. Design of surplus weir
10. Design of trapezoidal notch
11. Design of canal regulator
12. Design of sewer pipe
13. Design of sewage treatment plant
14. Design of pavement

TEXT BOOKS

1. Sylvan Charles Bloch, *Excel for Engineers and Scientists in Geotechnical Engineering*, Wiley, 2002.
2. Craig T. Christy, *Engineering with the Spreadsheet: Structural Engineering Templates using Excel*, ASCE Publications, 2006.

REFERENCES

1. Thomas F. Wolff, *Spreadsheet Applications in Geotechnical Engineering*, 1st Edition, PWS Publishing Company, 1995.

CODES

IS 456 – 2000 : *Plain and Reinforced Concrete*, Bureau of Indian Standards, New Delhi.

IS 800 – 2007 : *General Construction in Steel*, Bureau of Indian Standards, New Delhi.

SP-16 – 1980 :*Design Aids for Reinforced Concrete*, Bureau of Indian Standards, New Delhi.

SP-34 – 1987 : *Hand Book on Concrete Reinforcement* and Detailing, Bureau of Indian Standards, New Delhi.

IMPROVEMENTS OVER SVEC16 SYLLABUS:

Newly incorporated in SVEC 19