SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

Sree Sainath 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 Content has been changed (20% and more)

S.No.	Course Code	Name of the course	Percentage of Content 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

S.No.	Course Code	Name of the course	Percentage of Content changed	Page Number in which Details are Highlighted
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
		Average %**(A)**	70.03	-
		Total No. of Courses in the Program **(T)**	48	
		No. of Courses where syllabus (more than 20% content) has been changed **(N)**	28	
		Percentage of syllabus content change in the courses **(C)=(A x N)/100**	**19.61**	
		Percentage of Syllabus Content changed in the Program (P)= C/T	**40.85**	

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

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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: Analyze

- Multi-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,*LakshmiPublication s(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
3070		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:

- To introduce 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 introduce the techniques used 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 writing skills 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 (10 Periods)

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.

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)

(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)** 88

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.