

E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai
Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)
NAGAPATTINAM – 611 002



B.E. Civil Engineering

Full Time Curriculum and Syllabus

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MA101	Engineering Mathematics I	3	2	0	4	40	60	100
1701PH101	Applied Physics for Engineers	3	0	0	3	40	60	100
1701EN101	Technical English	3	0	0	3	40	60	100
1701CH103	Water Technology & Green Chemistry	3	0	0	3	40	60	100
1701GE104	Fundamentals of Mechanical Engineering	2	0	2	3	50	50	100
1701GEX04	Engineering Mechanics	2	2	0	3	40	60	100
Laboratory Course								
1701HS151	Physics and Chemistry Laboratory - I	0	0	2	1	50	50	100
1701GEX53	Workshop Practice	0	0	2	1	50	50	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701MA101

ENGINEERING MATHEMATICS I
(Common to all B.E / B.Tech Degree Programmes)

L	T	P	C
3	2	0	4

COURSE OBJECTIVES:

1. To educate Matrix Algebra Technique and curvature Theory
2. To impart knowledge of Techniques in solving Ordinary Differential Equations and to apply in solving Modern Engineering Problems
3. To acquaint the students about functions of several variables and also to familiarize the students in infinite series and their convergence

UNIT I EIGEN VALUE PROBLEMS

9 Hours

Characteristic equation - Eigen values and Eigen vectors of a real matrix – Properties - Cayley– Hamilton theorem- Diagonalization of Matrices - Reduction of a quadratic form to a canonical form by orthogonal transformation – Application of Matrices in Structural Engineering and image processing

UNIT II ORDINARY DIFFERENTIAL EQUATIONS

9 Hours

Higher order linear differential equations with constant coefficients – Cauchy’s and Legendre’s linear equations – Method of variation of parameters in solution of ordinary differential equations.

UNIT III DIFFERENTIATION AND GEOMETRICAL APPLICATIONS

9 Hours

Derivative of special functions (Trigonometry, Exponential, Logarithmic), Derivative by rule (Product, Quotient, Chain rule), Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature- Evolutes and involutes.

UNIT IV MULTIVARIABLE CALCULUS

9 Hours

Functions of two variables and solutions(Partial derivatives and Euler’s theorem)– Taylor’s series - Maxima and Minima – Application of Partial Derivatives to find the optimum requirement using Lagrangian multipliers.

UNIT V SEQUENCES AND SERIES

9 Hours

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D’Alembert’s ratio test – Alternating series – Leibnitz’s test – Application of Sequences in real life.

TOTAL: 45 + 15 HOURS

FURTHER READING:

1. Modeling and solutions using Newton’s Law of Cooling of Bodies
2. Differentiation of implicit Functions, Jacobians and Properties

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

- CO1: Analyze the characteristics of a linear system with Eigen value and Eigen Vectors
CO2: Recognize and solve Higher order Ordinary Differential Equations
CO3: Solve Derivative of special functions and apply it in solving Geometrical problems
CO4: Apply Partial Derivatives in finding Maxima and Minima of a function
CO5: Test the convergence of any series

REFERENCES:

1. Veerarajan R., “Engineering Mathematics”, updated second edition for semester I and II,(2017)
2. Grewal. B.S, “Higher Engineering Mathematics”, 44th Edition, Khanna Publications, Delhi, (2014).
3. Bali N. P and Manish Goyal, “Text book of Engineering Mathematics”, Sixth edition, Laxmi Publications(p) Ltd.,(2014).
4. Glyn James, “Advanced Modern Engineering Mathematics”, 3rd Edition, Pearson Education, (2012).
5. P.Kandasamy, K. Gunavathy and K. Thilagavathy, Engineering Mathematics ,Volume II, S. Chand & Co ., New Delhi, (2009)
6. Erwin Kreyszig, Advanced Engineering Mathematics,9th Edition, Wiley International edition, (2006)
7. Ramana B.V, “Higher Engineering Mathematics”,Tata McGrawHill Publishing, New Delhi, (2007).
8. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co.(2003)
9. nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
10. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.htm

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1701EN101

TECHNICAL ENGLISH
(Common to all B.E / B.Tech Degree Programmes)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To develop the ability to read and comprehend technical texts in the field of Engineering
2. To develop vocabulary building through the study of word construction
3. To develop ability to write formal definitions of technical terms and expression.
4. To recognize various grammatical structures that will aid the student improve his/her theoretical knowledge.

UNIT I

9 Hours

Articles-Preposition-Subject-Verb-Object-Adjective-Adverb-Conjunction-Nouns- Usages of Have, has, had- Simple Present-Simple Past-Simple Future-Self introduction-Framing Questions

UNIT II

9 Hours

Present Continuous-Past Continuous-Future Continuous-Describing a place, person or thing-Framing negative questions-Gerund-Listening to Articles, speeches and audios

UNIT III

9 Hours

Present perfect-past perfect-future perfect-writing short paragraph-sentence pattern- Infinitive-Tag questions- Reading newspaper cutting

UNIT IV

9 Hours

Present perfect continuous –Past perfect continuous-Future perfect continuous-writing an Essay in 100 words-Types of sentences-Prefix-suffix-word formation-Dialogue writing.

UNIT V

9 Hours

Active voice-passive voice-impersonal passive voice –Synonyms and Antonyms-phrasal verbs- Punctuation- Common Errors-Letter writing.

TOTAL: 45 HOURS

FURTHER READING:

Letters from a Father to His Daughter- Jawaharlal Nehru

COURSE OUTCOMES:

On the successful completion of the course, Students will be able to

- CO1: Read and comprehend technical texts in the field of Engineering
- CO2: Acquire vocabulary building and write effectively in technical writing
- CO3: Write formal definitions of technical terms and expression in both verbal and written form.
- CO4: Understand grammatical structures and use flawless English in the professional documents

REFERENCES:

1. Meenakshi Raman, Sangeetha Sharma, “*Technical Communication : English Skills for Engineers*” Oxford University Press: New Delhi, 2016.
2. Rizvi Ashrav.M, “*Effective Technical Communication*” Tata McGraw Hill: New Delhi, 2017
3. Herbert, A.J, “*Structure of Technical English*”, London English Language Society. <https://archive.org/details/in.ernet.dli.2015.136456>
4. J.D. O'Connor, Better *English Pronunciation* Paperback, 2nd edition, 162 pages, Published September 16th 2013 by Cambridge University Press, October 23rd 1967
5. Nehru, Jawaharlal. *Letters from a Father to His Daughter*, Puffin Books, 2004
6. *Technical English* by faculty of English –published by EGS Pillay press 2017

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1701CH103	WATER TECHNOLOGY AND GREEN CHEMISTRY (B.E. Civil Engineering)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. Imparting knowledge on the principles of water characterization, treatment methods and industrial applications.
2. Understanding the principles and application of electrochemistry and corrosion science.
3. Basic information and application of polymer chemistry, nanotechnology and analytical techniques.

UNIT I WATER TECHNOLOGY 9 Hours

Sources, hard & soft water-Degree of hardness and its estimation (EDTA method)- Water Quality Parameters - boiler feed water-requirements - softening of hard water -external treatment -demineralization, internal treatment- boiler compounds - boiler troubles- desalination of sea water -reverse osmosis- Domestic water treatment -disinfection of water - Basic principle of green chemistry (12 guiding principles)-detergents.

UNIT II CORROSION AND PROTECTIVE COATING 9 Hours

Corrosion - types-chemical, electrochemical corrosion (galvanic, differential aeration) - Factors influencing corrosion -corrosion control - material selection and design aspects - electrochemical protection - sacrificial anode method and impressed current cathodic method. Protective coatings: Electroplating of gold and electroless plating of nickel. Paints - Constituents and Functions.

UNIT III POLYMER AND NANO TECHNOLOGY 12 Hours

Introduction: Classification of polymers - Natural and synthetic; Thermoplastic and Thermosetting. Functionality - Degree of polymerization. Addition (Free Radical Mechanism) condensation and copolymerization. Fabrication of Plastics. Application -Nylon 66, Teflon and Epoxy resin.

Unique properties of nano material - introduction to quantum materials, quantum dots, supramolecular materials and molecular crystal engineering - molecular machines and devices- Logic gate using electronics material for molecular electronic- nano cluster, nano rod, nanotube (CNT) and nanowire. - Synthesis-precipitation, thermolysis, chemical vapour deposition, laser ablation; Nano polymers- Properties and applications.

UNIT IV ENGINEERING MATERIALS 9 Hours

Abrasives: definition, classification -grinding wheel, Application. Refractories: definition, characteristics, classification, properties -Manufacture of alumina, magnesite and silicon carbide, Portland cement-manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement-properties and uses.

UNIT V INSTRUMENTAL TECHNIQUES OF CHEMICAL ANALYSIS 6 Hours

Laws of photochemistry - Grothus-Draper law, Stark-Einstein law and Lambert-Beer Law. Electromagnetic spectrum - UV-visible and IR spectroscopy - principles, instrumentation (Block diagram only) - Applications. Colorimetry- principles, instrumentation (Block diagram only) estimation of iron. Flame photometry - principles, instrumentation (Block diagram only) estimation of sodium.

TOTAL: 45 HOURS

FURTHER READING:

1. Synthesis and applications of bio-fuels
2. Cambridge structural database (protein data bank)-noting data bank
3. Brief account of fuel cell, hydrogen fuel (fuel of future), H₂O₂ fuel cell, materials for solar energy conversion and storage devices. Lithium battery

COURSE OUTCOMES:

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

- CO1: Understand the chemistry of water and its industrial & domestic application
- CO2: Utilization of electrochemistry principle in corrosion control and industrial application.
- CO3: Differentiate the polymers and materials used in day to day life based on its source, properties and applications.
- CO4: Identify the applications of nanotechnology and analytical methods for the estimation of elements.

REFERENCES:

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
2. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science", New Age
3. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
4. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Education Company, Ltd., New delhi 2010
5. https://en.wikipedia.org/wiki/Ramachandran_plot

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7. https://link.springer.com/chapter/10.1007/978-3-642-28030-6_2
8. www.santarosa.edu/~yataiyya/4D/QuantumDotsMk2.ppt
9. onlinelibrary.wiley.com/doi/10.1002/9780470661345.smc107/pdf
10. https://en.wikipedia.org/wiki/Molecular_electronics
11. Jain and Jain, "Engineering Chemistry", Sixteenth edition, Dhanpatrai publications, 2012.

1701GE104

**FUNDAMENTALS OF MECHANICAL
ENGINEERING**

L	T	P	C
2	0	2	3

(Common to B.E - Mech. & Civil Programmes)

COURSE OBJECTIVES:

1. To make the students practice various fundamental and derived units to manipulate length, time, mass, temperature and derived concepts from the fundamental quantities.
2. To make the students familiar with various forces and its conversions, material properties and geometric properties through demonstrations.
3. To make the students capable for understanding the energy in various forms (except nuclear energy) and make them capable of converting energy in one form to another form.
4. To familiarize students with all commonly used mechanical elements along with its applications.
5. To expose students with all conventional and unconventional manufacturing techniques along with their application for enabling them to start doing mechanical projects from the second semester.

UNIT I ENGINEERING MEASUREMENTS I

7 Hours

Basic Concepts : Length using scale, sine rule and cosine rule, radians, calculation of surface area and volume of standard objects, time zones, period and frequency, linear velocity, linear acceleration, volume flow rate, angular velocity, angular acceleration, mass, density, specific volume, specific gravity, mass flow rate, momentum, conservation of mass and energy, temperature, heat, conduction, convection, radiation, insulation, thermal expansion, specific heat, calorific value, self-ignition temperature, cryogenic temperature, latent heat, evaporation, condensation. Demonstration, measurement and experiments: Length, surface area and volume of standard objects, periods and frequency, linear velocity, linear acceleration, volume flow rate, angular velocity, mass, density, momentum, conservation of mass and energy, temperature, heat, conduction, convection, radiation, insulation, thermal expansion, specific heat, calorific value, self-ignition temperature, latent heat.

UNIT II ENGINEERING MEASUREMENTS II

7 Hours

Basic Concepts: Newton's Laws, Force, Centripetal Force, Work, Energy, Power, Pressure load area relation, Stress and its types, Atmospheric Pressure, Types of fluids, Elasticity, Plasticity, Fluid Pressure Head Velocity head relation, Surface tension, Archimedes, Principle, Pascal's Law, Force Displacement Relations, Speed and Torque relations, Siphon, Compressibility, Hardness, Brittleness, Toughness, Ductility, Moment, First moment of Area, Second moment of Area. Demonstration, measurement and experiments: Newton's laws, force, centripetal force, power, pressure, pressure load area relation, stress and its types (tension, compression and shear), atmospheric pressure, fluid pressure head and velocity head relation, elasticity, plasticity, types of fluid, surface tension, viscosity, Archimedes principle, Pascal law, siphon, compressibility, hardness, brittleness, toughness, ductility, moment, first moment of area, second moment of area.

UNIT III ENERGY CONVERSION

6 Hours

Basic Concepts : Kinetic energy in linear and rotary form, potential energy in head and pressure form, energy stored in springs, elastic energy, mechanical energy, thermal energy, chemical energy, magnetic energy, law of conservation of energy, conversion of kinetic energy to potential energy vice versa, mechanical energy in various forms to thermal energy, chemical energy to mechanical energy, fluid energy to mechanical energy vice versa, damping, electrical energy to mechanical energy vice versa, electrical energy to thermal energy, efficiency, flywheel energy storage, thermal energy storage, transmission of energy in pressure form, thermal form, kinetic energy form. Demonstration, measurement and experiments: Conversion of linear kinetic, rotary kinetic, potential in pressure head, spring, elastic, thermal, chemical into other forms, law of conservation of energy, energy storage in flywheel and thermal form, transmission of energy in pressure, thermal and kinetic form.

UNIT IV MECHANICAL ELEMENTS

5 Hours

Basic Concepts, Demonstration, measurement and experiments: Bearings - ball bearing, roller bearing, thrust bearing, linear bearing, tapper roller bearing, journal / bush bearing, needle bearing, spherical roller bearings,

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bearing blocks, one way bearings-Gears - spur, helical, herringbone, internal ring, face, hypoid, straight bevel, spiral bevel, screw, worm gears, rack and pinion, sprockets, ratchet and Paul, gear trains, sun planet gears-Couplings - rigid coupling - sleeve, flange, clamp couplings. Flexible coupling - Oldham, belt, universal, jaw and fluid couplings. Torque limiter -Belt drives - flat belt, v belt, timing belt drives. Chain drives, cable drives, chain block-Conveyers - roller conveyer, belt conveyer, vertical conveyer, pneumatic conveyer, chain conveyer, screw conveyer-Shafts, keys, spline shafts-Cam and followers - plate cam, wedge / translating cam, barrel cam, face cam, Globoidal cam, Geneva mechanism-Springs - tension spring, compression spring, coil spring, torsion spring, leaf spring, gas spring-Fasteners - screws, bolts, nuts and their specifications in mm and inch scale-Tools - double end spanners, box spanners, Allen keys and standards.

UNIT V MANUFACTURING PROCESSES

5 Hours

Basic Concepts, Demonstration, measurement and experiments: Turning, facing, drilling, internal and external thread cutting, boring, grooving, taper turning in lathe. Milling using end milling cutters. drilling using universal drilling machine -sheet metal spinning, deep drawing, forging of clay models, making water tank using FRP, sheet metal work-arc welding, brazing, riveting -investment casting, sand casting, injection molding, vacuum molding, blow molding -powder coating.

FURTHER READING:

Triangulation, projectile motion in trebuchet, water hammer, water bug, air suspension, MR fluid, five axis milling.

EXPERIMENTS

1. Measure the size, area and volume of given object. **2 Hours**
2. Measure the natural period, natural frequency and maximum velocity of an oscillating pendulum. **2 Hours**
3. Measure the volume and mass low rate of water through a given pipe. **2 Hours**
4. Measure the mass, weight and density of given material or fluid. **2 Hours**
5. Demonstrate the conservation of energy in a colliding object and name all the energy conversions. **2 Hours**
6. Design a setup to prevent heat loss from a given hot object through conduction, convection and radiation. **2 Hours**
7. Find the calorific value, specific heat and self-ignition temperature of a given fuel. **2 Hours**
8. Demonstrate an experimental setup to prove Archimedes Principle. **2 Hours**
9. Design an experimental setup to prove Pascal Law. **2 Hours**
10. Identify the given materials based on their mechanical properties such as hardness, brittleness and Toughness. **2 Hours**
11. Design an experimental setup to convert mechanical energy in rotation form to any other form. **4 Hours**
12. Design an experimental setup to convert potential energy into mechanical rotation. **4 Hours**

TOTAL: 30 + 30 HOURS

COURSE OUTCOMES:

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

- CO1: Use the instruments to measure any fundamental quantities such as length, time, mass, temperature.
- CO2: Measure force, fluid and material related parameters and convert the measured values from instruments into any system of units.
- CO3: Convert energy in one form into another form by understanding conservation of mass energy principle.
- CO4: Identify any commonly known mechanical component along with its application and its working principle.
- CO5: Identify any conventional manufacturing process and understand their limits and capabilities.

REFERENCES:

1. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition International Student Version, John Wiley & Sons, 2014.
2. Moaveni, Saeed, Engineering fundamentals: an introduction to engineering, Cengage Learning, 2015.
3. Wickert, Jonathan, and Kemper Lewis, An introduction to mechanical engineering, Cengage learning, 2012.
4. Serway, Raymond, and John Jewett. Physics for scientists and engineers with modern physics, Cengage learning, 2013.
5. Roger Timing, Engineering Fundamentals, Newnes, 2002.
6. C. F. Gerald and P. O. Wheatley, Applied Numerical Analysis, Education 2003.

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1701GEX04

ENGINEERING MECHANICS
(Common to B.E - Mech. & Civil Programmes)

L	T	P	C
2	2	0	3

COURSE OBJECTIVES:

1. To familiarize on various methods of adding and resolving various force systems in a real world environment.
2. To provide knowledge on understanding the effects of forces on a point and at a distance and to arrive at equivalent systems from the given force system.
3. To provide knowledge on various support conditions of a rigid body and deciding a support system for given condition.
4. To expose students with impact of geometries of load bearing systems and make them calculate moment of inertia of various cross sections.
5. To make students understand concepts of friction under various applications and make them calculate frictional forces induced.

UNIT I BASIC CONCEPTS AND FORCE SYSTEM

5 Hours

Introduction to mechanics - idealization of mechanics - laws of mechanics - principle of transmissibility - vector - addition, subtraction and product. Force- types - system of forces - resultant forces - composition of forces - resolution of force-free body diagram for real world systems.

UNIT II STATICS OF PARTICLES AND FORCE SYSTEM

6 Hours

Equilibrium of particle in space, moment of couple-equilibrant Moment about point and specific axis-moment at couple- simplification of force and couple systems.

UNIT III STATICS OF RIGID BODIES

7 Hours

Equilibrium of rigid bodies in two and three dimensions - beams - types of loads, supports and their reactions Two and three force Members-Static determinacy.

UNIT IV PROPERTIES OF SURFACES AND SOLIDS

7 Hours

Determination of centroid of areas, volumes and mass - Pappus and Guldinus theorems - moment of inertia of plane and areas Parallel axis theorem radius of gyration of area- product of inertia- mass moment of inertia.

UNIT V FRICTION

5 Hours

Introduction - mechanism of friction-types -laws of friction - friction on horizontal and inclined planes, ladder and wedge friction - rolling resistance.

FURTHER READING:

Moment of Inertia of flywheel - Internal force of a member - Equilibrium of rigid bodies in three dimensions: Ball and socket joint.

TOTAL: 30 + 15 HOURS

COURSE OUTCOMES:

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

- CO1: Draw a free body diagram from the given real world system and add or subtract or resolve the forces involved in the system.
- CO2: Calculate the moment created by the applied force with reference to any reference in a three dimensional space.
- CO3: Determine the appropriate support system for the given real world system by calculating the reactions generated.
- CO4: Suggest suitable cross section or geometry for a load bearing support to prevent it from collapsing due to bending.
- CO5: Calculate the frictional force involved in various real world systems.

REFERENCES:

1. F.P. Beer, and Jr. E.R Johnston, Vector Mechanics for Engineers - Statics and Dynamics, Tata McGraw-Hill Publishing Company, New Delhi, 2007.
2. N.H. Dubey, Engineering Mechanics- Statics and Dynamics, Tata McGraw-Hill Publishing Company, New Delhi, 2013.
3. Irving H. Shames, Engineering Mechanics - Statics and Dynamics, Pearson Education Asia Pvt. Ltd., 2006.
4. R.C. Hibbeler, Engineering Mechanics: Combined Statics & Dynamics, Prentice Hall, 2009.
5. D. P. Sharma, Engineering Mechanics, Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2010.
6. S. Rajasekaran and G. Sankara subramanian, Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.

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1701HS151

PHYSICS AND CHEMISTRY LABORATORY-I
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To make the students gain practical knowledge to co-relate with the theoretical studies
2. To achieve perfectness in experimental skills
3. To bring confidence and ability to develop and fabricate engineering and technical equipments.
4. To train the students to analyses the water sample
5. To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis

PHYSICS

LIST OF EXPERIMENTS:

1. Determine the moment of inertia of the disc and calculate the rigidity modulus of a given wire using torsion pendulum (symmetrical masses method).
2. Find the elevation of the given wooden beam at the midpoint by loading at the ends and hence calculate the Young's modulus of the material by uniform bending.
3. Determine the coefficient of viscosity of the given liquid by Poiseuille's method.
4. From the interference fringes from the air wedge setup and calculate the thickness of the given wire.
5. By applying the principle of diffraction, determine the wavelength of given laser light and the average particle size of lycopodium powder using laser source.
6. Determine the
 - (i) Wavelength of ultrasonic in a liquid medium
 - (ii) Velocity of ultrasonic waves in the given liquid
 - (iii) Compressibility of the given liquid using ultrasonic interferometer.

CHEMISTRY

LIST OF EXPERIMENTS:

1. Determination of total, temporary & permanent hardness of water by EDTA method
2. Determination of strength of given hydrochloric acid using pH meter
3. Estimation of iron content of the given solution using potentiometer
4. Estimation of sodium present in water using flame photometer
5. Corrosion experiment – weight loss method
6. Determination of molecular weight of a polymer by viscometry method
7. Conductometric titration of strong acid Vs strong Base

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

- CO1: Realize the concept of properties of matter and apply the same for practical applications.
- CO2: Identify the suitable laser source for fiber optic communication applications.
- CO3: Determine the velocity of ultrasonic waves and apply the same for day today applications.
- CO4: Classify the different types of crystal structures and analyze their properties.
- CO5: Comprehend the efficacy of quantum equations in modern areas.
- CO6: Identify the pH of the solution.
- CO7: Find the iron content of the water sample using potentiometer.
- CO8: Explain and demonstrate the conductance of the solution.
- CO9: Interpret the hardness and metal ions present in the water.

REFERENCES:

1. D.S.Mathur, Elements of Properties of matter, 5th edition, S.Chand & Company Ltd., New Delhi, 2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, Concepts of Modern Physics, 6th edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd, 2013.
7. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New Yor (2001).
8. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R.. "Vogel's Textbook of practical organic chemistry", LBS Singapore (1994).
9. Jeffery G.H., Bassett J., Mendham J. and Denny vogel's R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
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B.E. Civil Engineering

Full Time Curriculum and Syllabus

First Year – Second Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MA201	Engineering Mathematics II	3	2	0	4	40	60	100
1701PH203	Material Science	3	0	0	3	40	60	100
1701CH201	Environmental Studies	3	0	0	3	40	60	100
1701GEX01	Basic Electrical and Electronics Engineering	3	0	0	3	40	60	100
1701GEX02	Engineering Graphics	2	2	0	3	50	50	100
1701GEX03	Programming in 'C'	3	0	0	3	40	60	100
	Language Elective	3	0	0	3	100	-	100
Laboratory Course								
1701HS251	Physics and Chemistry Lab II	0	0	2	1	50	50	100
1701GEX51	Programming in 'C' Lab	0	0	2	1	50	50	100
1701GEX52	Communication Skill Lab	0	0	2	1	50	50	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

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1701MA201

ENGINEERING MATHEMATICS II
(Common to all B.E / B.Tech Degree Programmes)

L	T	P	C
3	2	0	4

COURSE OBJECTIVES:

1. To develop an understanding of the standard techniques of Complex variable theory to apply in areas such as heat conduction, elasticity, fluid Dynamics and flow of electric current
2. To train the students with the concepts of Vector calculus needed for problems in all Engineering Disciplines
3. To make the Students apply Laplace Transform to create a new domain in which it is easier to handle the problem that is being investigated

UNIT I ANALYTIC FUNCTIONS

9 Hours

Analytic functions – Cauchy Riemann Equations – Properties – Determination of Analytic function using Milne Thomson's method, Conformal Mappings – Mappings of $w = z + a$, az , $1/z$ – Bilinear Transformation – Application of Analytic Functions.

UNIT II COMPLEX INTEGRATION

9 Hours

Cauchy's fundamental theorem (statement only) – Application of Cauchy's Integral formula – Laurent's series – Classification of singularities – Cauchy's Residue theorem (statement only) – Contour integration.

UNIT III MULTIPLE INTEGRAL

9 Hours

Double integration – Cartesian and polar coordinates – Change the order of Integration – Applications: Area of a curved surface using double integral – Triple integration in Cartesian co-ordinates – Volume as triple integral.

UNIT IV VECTOR CALCULUS

9 Hours

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration: Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Applications of the above theorems to find surface area of a closed region and volume of cube and parallel piped.

UNIT V LAPLACE TRANSFORM

9 Hours

Laplace Transform – Conditions for existence – Transform of Elementary Functions – Basic Properties – Transform of Unit step function and Impulse function – Transform of Periodic function – Inverse Laplace Transform – Convolution Theorem (excluding Proof) – Initial and Final value Theorems – Solution of Linear ODE of Second order with constant coefficient using Laplace Transform techniques.

TOTAL: 45 + 15 HOURS

FURTHER READING:

1. Volume of Cylindrical and spherical polar co ordinates.
2. Application of Integral theorems in finding Volume/Area of Hemispheres, cylinders etc.

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

- CO1: Construct Analytic functions and trace the image of a region using transformation.
CO2: Solve complex integrals.
CO3: Apply multiple integral technique to find area and volume.
CO4: Compute surface and volume integral in vector field.
CO5: Apply Laplace Transform in solving Boundary value problems of second order ODE.

REFERENCES:

1. Veerarajan R., "Engineering Mathematics", updated second edition for Semester I and II, 2017.
2. Grewal. B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publications, Delhi, 2014.
3. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Sixth edition, Laxmi Publications Pvt. Ltd., 2014.
4. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.
5. P.Kandasamy, K. Gunavathy and K. Thilagavathy, Engineering Mathematics, Volume II, S. Chand & Co., New Delhi, 2009.
6. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing, New Delhi, 2007.
7. Veerarajan R., "Engineering Mathematics", fifth Edition, Tata Mc Graw Hill Publishing Company, New Delhi, 2006.
8. M K Venkataraman, Engineering mathematics, Volume I, 2nd ed., National Publishing Co. 2003.
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10. www.learnerstv.com/Free-maths-video-lectures-111105035-page1.htm

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1701PH203

MATERIALS SCIENCE
(Common to B.E - Mech. & Civil Programmes)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To explain the properties of conducting, semiconducting and dielectric materials.
2. To impart fundamental knowledge in optical materials.
3. To understand the nature and application of different magnetic materials.

UNIT I ELECTRICAL PROPERTIES OF METALS 9 Hours

Quantum free electron theory – Fermi – Dirac distribution function – Fermi energy and its variation with temperature – density of energy states – calculation of density of electrons and Fermi energy at 0 K – mean energy of electrons at 0 K – problem solving.

UNIT II SEMICONDUCTING PROPERTIES OF MATERIALS 9 Hours

Introduction – elemental and compound semiconductors – intrinsic semiconductors: expression for number of electrons and holes – determination of carrier concentration and position of Fermi energy – electrical conductivity – band gap energy determination – carrier concentration in extrinsic semiconductors. Hall Effect theory and experimental determination – uses – problem solving.

UNIT III DIELECTRIC PROPERTIES OF MATERIALS 9 Hours

Introduction – fundamental definitions in dielectrics – expression for electronic and ionic polarizations-orientation polarization – space charge polarization – Langevin – Debye equation – frequency and temperature effects on polarization – internal field – expression for internal field (cubic structure) – Clausius – Mosotti equation and its importance – applications of dielectric materials – problems solving.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9 Hours

Introduction – optical absorption in metals, semiconductors and insulators. Fluorescence and phosphorescence. Light emitting diode: principle, construction, working and applications. Liquid crystal display: general properties – dynamic scattering display – twisted pneumatic display – applications – comparison between LED and LCD. Blue ray disc – principle – working.

UNIT V MAGNETIC PROPERTIES OF MATERIALS 9 Hours

Introduction – orbital and spin magnetic moments – Bohr magneton – basic definitions – classification of magnetic materials – domain theory of ferromagnetism – process of domain magnetization – explanation of hysteresis curve based on domain theory – hard and soft magnetic materials, ferrites and spinels- applications.

TOTAL: 45 HOURS

FURTHER READING:

1. Giant magnetoresistance.

COURSE OUTCOMES:

On the Successful completion of the course, Students will be able to

- CO1: Distinguish electrical properties of different kinds of conducting materials.
- CO2: Identify the different types of semiconductors and its applications.
- CO3: Categorize the various polarization mechanisms in dielectrics.
- CO4: Choose the suitable material for the construction of display devices.
- CO5: Select appropriate magnetic materials for magnetic storage devices.

REFERENCES:

1. William D. Callister, “Materials Science and Engineering an Introduction”, John Wiley and Sons, Inc, 2010.
2. S.O. Pillai, “Solid State Physics”, New Age International Publications, New Delhi, 2014.
3. M.N. Avadhanulu and P.G. Kshirsagar, “A Text Book of Engineering Physics”, S. Chand & Company Ltd, New Delhi, 2011.
4. P.K. Palanisamy, “Physics for Engineers”, Scitech Publications (India) Pvt. Ltd, Chennai, 2010.
5. V. Raghavan, “Materials Science and Engineering”, Prentice Hall of India, New Delhi, 2010.
6. R.K.Gaur and S.L.Gupta, “Engineering Physics”, Dhanpet Rai publications, New Delhi, 2010.

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1701CH201

ENVIRONMENTAL STUDIES
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. Realize the interdisciplinary and holistic nature of the environment.
2. Understand how natural resources and environment affect the quality of life and stimulate the quest for sustainable development.
3. Recognize the socio-economic, political and ethical issues in environmental science.

UNIT I ECOSYSTEMS AND BIODIVERSITY

10 Hours

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – hot – spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Documentation of the medicinal plants in your native place.

UNIT II NATURAL RESOURCES

10 Hours

Forest resources: Use and over – exploitation, deforestation, case studies – timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Documentation of the effect of modern Agriculture in your nearby Village.

UNIT III ENVIRONMENTAL POLLUTION

9 Hours

Definition – Source, causes, effects and control measures of: (a) Air pollution – Mitigation procedures – Control of particulate and gaseous emission, Control of SO_x, NO_x, CO and HC) – Technology for capturing CO₂ (metallo- organic frame works) (b) Water pollution – Waste water treatment processes. (c) Soil pollution – soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – role of an individual in prevention of pollution – pollution case studies. Documentation study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

8 Hours

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – environmental ethics: Issues and possible solutions – 12 Principles of green chemistry – consumerism and waste products – environment protection act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments – scheme of labeling of environmentally friendly products (Ecomark) central and state pollution control boards – disaster management: floods, earthquake – Public awareness. Analyze the recent steps taken by government of India to prevent pollution (Green India and Clean India).

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

8 Hours

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – Environmental impact analysis (EIA) – GIS – remote sensing – role of information technology in environment and human health – Case studies. Documentation study of the Human health and the environment in nearby Hospital (Statistical report).

TOTAL: 45 HOURS

FURTHER READING:

Human rights: E – waste and biomedical waste – Identification of adulterants in food materials

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COURSE OUTCOMES:

skilled

On the Successful completion of the course. Students will be able to

- CO1: Describe the importance of ecosystem and its conservation.
- CO2: Differentiate various natural resources and the urgent need to conserve the natural resources.
- CO3: Explain the different types of pollution and its effects.
- CO4: Describe the various environmental protection acts.
- CO5: Explain the major diseases, women, child development and the impacts of population explosion.

REFERENCES:

1. Trivedi. R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media, 3rd edition, BPB publications, 2010.
2. Cunningham, W.P.Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice Hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan. R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.
5. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
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7. Ravikrishnan. A., "Environmental Science and Engineering", Sri Krishna Hi-tech Publishing Company Pvt. Ltd.

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1701GEX01	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
	(Common to B.E. / B.Tech. – CSE, IT, CIVIL & MECH)	3	0	0	3

COURSE OBJECTIVES:

1. To introduce basic electrical terminologies and laws
2. To impart knowledge on solving series and parallel circuits
3. To introduce about the three phase system
4. To explain the working principle of dc and ac machines, power plants
5. To familiarize about basic electronic components, circuits, transducers, digital logic and communication systems

UNIT I DC AND AC CIRCUIT FUNDAMENTALS 9 Hours

Definition of terms - voltage, current, power, energy, active and passive elements; Ohm's law and Kirchhoff's laws; Series and parallel circuits; source transformation; equivalent resistance; star/delta conversion; Concepts of AC circuits - RMS and average values, form and peak factors, real and reactive power, power factor.

UNIT II THREE PHASE SYSTEM 9 Hours

Introduction to three phase circuits; balanced and unbalanced system; phase and line parameters - relations; power measurement - voltmeter and ammeter method, two and three watt meter methods; Components of AC transmission and distributions systems (single line diagram approach).

UNIT III ELECTRICAL MACHINES AND POWER PLANTS 9 Hours

Operating principle, classification and applications of DC generator, DC motor, transformer and induction motor (single phase); Power plants - Thermal power plant, hydroelectric power plant and nuclear power plant (Block diagram approach only).

UNIT IV SEMICONDUCTOR DEVICES AND TRANSDUCERS 9 Hours

Characteristics of PN junction diode and zener diode; Rectifiers- Half wave and full wave rectifiers (qualitative treatment only); BJT – configurations; Amplifiers & Oscillators - definition, classification and applications; Transducers – classification, resistance temperature detector (RTD), linear variable differential transformer (LVDT).

UNIT V DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS 9 Hours

Boolean algebra - Reduction of Boolean expressions; De-Morgan's theorem; Logic gates - Implementation of Boolean expressions; Model of communication system - Analog and digital, Wired and wireless channel; Block diagram of various communication systems - Microwave, satellite, optical fiber and cellular mobile system.

TOTAL: 45 HOURS

FURTHER READING:

1. Working principle and operation of Fax and ISDN
2. LED lightings

COURSE OUTCOMES:

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

- CO1: Remember the basic laws and fundamental concepts related to electrical, electronics and communication engineering
- CO2: Apply basic concepts to solve problems in DC and AC circuits
- CO3: Recall the principle of operation of DC & AC machines and power plants
- CO4: Summarize the Boolean algebra and digital logic gates
- CO5: Elucidate the characteristics of diode, BJT and applications of amplifiers and oscillators
- CO6: Explain the operation of functional blocks of various communication systems

REFERENCES:

1. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, PHI Learning, 2010.
2. R.Muthusubramaniam, S.Salaiyahanan and K.A.Mureledharan, "Basic Electrical Electronics and Computer Engineering", Tata McGraw Hill, 2004.
3. D.P.Kothari and I.J.Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI learning, New Delhi, 2004.
4. J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics", S K Kataria and Sons, Reprint 2012 Edition.
5. R.L.Boylestad and L.Nashelsky, "Electronic Devices and Circuit Theory", Pearson, 11th Edition, 2013.
6. George Kennedy and Bernard Davis, "Kennedy's Electronic communication Systems", McGraw Hill Education, 5th Edition, 2011.
7. Donald P.Leach, Albert Paul Malvino and GoutamSaha, "Digital Principles and Applications", McGraw-Hill Education, 8th Edition, 2014.
8. <http://nptel.ac.in/>

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PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

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1701GEX03

PROGRAMMING IN C
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To prepare students to comprehend the fundamental concepts
2. To demonstrate fine grained operations in number system
3. To gain exposure in programming language using C
4. To develop programming skills using the fundamentals and basics of C Language

UNIT I BASIC CONCEPTS

8 Hours

Organization and Classifications of Computer - Generations of Computers- Number System- Problem Solving Techniques – Algorithm Design– Flowchart– Pseudocode

UNIT II INTRODUCTION TO C LANGUAGE

10 Hours

Overview of C - Constants, Variables and Data Types- Compilation and Linking - Operators and Expressions- Decision Making and Branching – Looping statements

UNIT III ARRAYS AND STRINGS

9 Hours

Arrays-One Dimensional Array- Declaration and Initialization-Two Dimensional Array-Declaration and Initialization- Programs using Arrays- Strings- String Handling Functions, Programs using Strings- Managing I/O Operations

UNIT IV FUNCTIONS & STRUCTURES

10 Hours

Functions-Function Prototypes-Declaring, Defining and Calling Functions-Call by value and Call by Reference-Recursive Functions-Structures- Declaration and Definition -Accessing Structure Members-Arrays of Structures-Unions- Programs using Structures and Unions

UNIT V POINTERS & FILES

8 Hours

Pointers-Dynamic Memory Allocation-Arithmetic Operations using Pointers, Files – File Manipulation-I/O Operations, Preprocessor Directives, Storage Classes

TOTAL: 45 HOURS

FURTHER READING:

Object Oriented Programming Approach.

COURSE OUTCOMES:

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

- CO1: Describe basic concepts of computers
- CO2: Paraphrase the operations of number system
- CO3: Describe about basic concepts of C-Language
- CO4: Understand the code reusability with the help of user defined functions
- CO5: Analyze the structure concept, union, file management and preprocessor in C language

REFERENCES:

1. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education India Private Limited; Seventh Edition, 2017.
2. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
3. Ashok N. Kamthane, "Programming in C", Pearson Education India, 3rd Edition, 2015.
4. Yashavant P. Kanetkar, "Let Us C", BPB Publications, 15th Revised and Updated Edition, 2016.
5. <http://nptel.ac.in/>

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1701GEX51

PROGRAMMING IN C LABORATORY
(Common to all B.E. / B.Tech. Degree Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To prepare students to comprehend the fundamental concepts.
2. To demonstrate fine grained operations in number system.
3. To gain exposure in programming language using C.
4. To develop programming skills using the fundamentals and basics of C Language.

LIST OF EXPERIMENTS:

1. Working with word and style sheets.
2. Write a C program to implement basic concepts.
3. Write a C program to implement Decision Making and Branching statements.
4. Write a C program to implement looping statements.
5. Write a C program to implement Arrays.
6. Write a C program to implement Strings.
7. Write a C program to implement pointers.
8. Write a C program to implement Structures.
9. Write a C program to work with files in C.

TOTAL: 30 HOURS

ADDITIONAL EXPERIMENTS:

1. Write a c program to remove the occurrence of "the" word from entered string.
2. Create two files test1.txt and test2.txt and write a C program to read the file text1.txt character by character on the screen and paste it at the end of test2.txt

COURSE OUTCOMES:

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

- Skilled*
- CO1: Understand basic concepts of computers.
 - CO2: Implement basic concepts of c-language.
 - CO3: Implement arrays, strings and pointers.
 - CO4: Implement the basics of structures, unions, file management and preprocessor in C language.

REFERENCES:

1. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education India Private Limited; Seventh Edition, 2017.
2. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
3. Ashok N. Kamthane, "Programming in C", Pearson Education India, 3rd Edition, 2015.
4. Yashavant P. Kanetkar, "Let Us C", BPB Publications, 15th Revised and Updated Edition, 2016.
5. <http://nptel.ac.in/>

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1701GEX52

COMMUNICATION SKILLS LAB
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

LIST OF EXPERIMENTS: The following course content to conduct the activities is prescribed for the Communication Skills Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation - responding appropriately and relevantly - using the right body language - Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** - General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** - Structure and presentation of different types of writing - letter writing/ Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing - planning for writing - improving one's writing.
4. **Activities on Presentation Skills** - Oral presentations (individual and group) through JAM sessions / seminars / PPTs and written presentations through posters/ projects/ reports/ e-mails/ assignments etc.
5. **Activities on Group Discussion and Interview Skills** - Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conferencing and Mock Interviews.

TOTAL: 30 HOURS

ADDITIONAL EXPERIMENTS:

Phonetics

COURSE OUTCOMES:

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

- CO1: Accomplishment of sound vocabulary and its proper use contextually.
CO2: Flair in Writing and felicity in written expression
CO3: Enhanced job prospects.
CO4: Effective Speaking Abilities.

REFERENCES:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson, 2007. Cengage Learning pvt. Ltd. New Delhi
4. English Vocabulary in Use series, Cambridge University Press 2008.
5. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw Hill 2009.
7. Books on TOFEL/ GRE/ GMAT/ CAT/ IELTS by Barron's/ DELTA/ Cambridge University Press.

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1701HS251

PHYSICS AND CHEMISTRY LABORATORY-II
(Common to all B.E. / B.Tech Degree Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills.
3. To bring confidence and ability to develop and fabricate engineering and technical equipments.
4. To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

PHYSICS

LIST OF EXPERIMENTS:

1. Using lees disc apparatus, determine the coefficient of thermal conductivity of a bad conductor.
2. Find the band gap value of the given semiconductor diode. Based on the band gap value, identify the given semiconductor.
3. With the aid of spectrometer, find the angle of Prism and refractive index of the medium.
4. Determine the wavelengths of polychromatic source in the visible region using spectrometer grating.
5. Find the depression at the midpoint of the given wooden beam subjected to non-uniform bending and determines the Young's modulus of the material of the beam.
6. Find the given unknown resistance using Carey-Foster's Bridge.

CHEMISTRY

LIST OF EXPERIMENTS:

1. Conductometric Precipitation titration of $BaCl_2$ Vs Na_2SO_4
2. Estimation of dissolved oxygen in a water sample/sewage by Winklers method.
3. Estimation of chloride content in water by argentometric method.
4. Conductometric titration of mixture of acids.
5. Comparison of alkalinities of the given water samples.

Additional Experiments:

1. Estimation of heavy metals in the given solution by EDTA method.
2. Determination of concentration of unknown colored solution using spectrophotometer.

TOTAL: 30 HOURS

COURSE OUTCOMES:

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

- CO1 : Realize the concept of properties of matter and apply the same for practical applications.
- CO2 : Identify the suitable laser source for fiber optic communication applications.
- CO3 : Determine the velocity of ultrasonic waves and apply the same for day today applications.
- CO4 : Classify the different types of crystal structures and analyze their properties.
- CO5 : Comprehend the efficacy of quantum equations in modern areas.
- CO6 : Illustrate the EMF of the Redox reaction.
- CO7 : Compare the Alkalinity of given water Sample with their standards.
- CO8 : Identify the Concentration of metal ion present in water sample.
- CO9 : Outline the precipitation titration using Conductivity meter.
- CO10: Interpret the dissolved oxygen present in the water.

REFERENCES:

1. D.S.Mathur, Elements of Properties of matter, 5th edition, S.Chand & Company Ltd., New Delhi, 2012.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, Concepts of Modern Physics, 6th edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
4. B.K. Pandey & S. Chaturvedi, Engineering Physics, 1st edition, Cengage Learning India Pvt. Ltd., New Delhi, 2012.
5. Halliday and Resnick, Fundamentals of Physics, John Wiley and Sons, Inc, 2011.
6. Ian Morison, Introduction to Astronomy and Cosmology, John Wiley and Sons, Ltd, 2013.
7. Laboratory Manual on Engineering Chemistry, S.K. Bhasin, S. Rani, Dhanpat Rai Publishing Company, New Delhi, 2011.
8. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New Yor (2001).
9. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of practical organic chemistry", LBS Singapore (1994).
10. Jeffery G.H., Bassett J., Mendham J. and Denny vogel's R.C., "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
11. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980.

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E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai
Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)
NAGAPATTINAM – 611 002



B.E. Civil Engineering

Full Time Curriculum and Syllabus

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701MA301	Engineering Mathematics III	3	2	0	4	40	60	100
1702CE301	Engineering Surveying I	3	0	0	3	40	60	100
1702CE302	Solid Mechanics I	3	0	0	3	40	60	100
1702CE303	Fluid Mechanics	3	0	0	3	40	60	100
1702CE304	Engineering Geology	3	0	0	3	40	60	100
1702CE305	Building Materials & Resource Planning	3	0	0	3	40	60	100
Laboratory Course								
1702CE351	Surveying Lab I	0	0	4	2	50	50	100
1702CE352	Strength Of Materials Lab	0	0	2	1	50	50	100
1704CE353	Technical Seminar I	0	0	2	1	50	50	100
1704GE351	Life Skills: Soft Skills	0	0	2	0	100	0	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701MA301

ENGINEERING MATHEMATICS III
(Common to B.E - Civil, CSE, EEE, Mech
B.Tech- IT Degree Programmes)

L	T	P	C
3	2	0	4

PREREQUISITE :

1. Engineering Mathematics I
2. Engineering Mathematics II

COURSE OBJECTIVES:

1. To introduce Fourier series analysis and applications in Engineering, apart from its use in solving boundary value problems.
2. To acquaint the student with Fourier transform techniques used in wide variety of situations.
3. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I FOURIER SERIES

12 Hours

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic analysis – Simple Applications

UNIT II FOURIER TRANSFORMS

12 Hours

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity

UNIT III PARTIAL DIFFERENTIAL EQUATIONS

12 Hours

Formation of partial differential equations – Singular integrals — Solutions of standard types of first order partial differential equations – Lagrange's linear equation — Linear partial differential equations of second order with constant coefficients of homogeneous type- Applications

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

12 Hours

Classification of PDE – Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT V Z – TRANSFORMS AND DIFFERENCE EQUATIONS

12 Hours

Z - transforms – Elementary properties – Inverse Z – transform (using partial fraction and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z – transform.

TOTAL: 60 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Linear Algebra
2. Numerical Solution of non-homogeneous partial differential equations

COURSE OUTCOMES:

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

- CO1 Use Fourier series analysis which is central to many applications in engineering
- CO2 Apply Fourier transform techniques used in wide variety of situations
- CO3 Compute the solution of partial differential equations
- CO4 Solve boundary value problem using partial differential equation
- CO5 Apply Z transform techniques for discrete time systems

REFERENCES:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012
2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
3. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd , 2007
4. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company Limited, New Delhi, 2008.
5. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.
6. www.nptelvideos.in/2012/11/mathematics-iii.html

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1702CE301

ENGINEERING SURVEYING I

L	T	P	C
3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering.

COURSE OBJECTIVES:

To introduce the principles of various surveying methods and applications to Civil Engineering projects.

UNIT I INTRODUCTION TO CHAIN SURVEYING

9 Hours

Definition – Objectives and uses of surveying – Chain Surveying – Instrument used for chaining – Chains and tape types – Definition of terms commonly used in chain surveying : survey stations, Base line , check line and tie line – Ranging : Direct and indirect ranging – Chain surveying : Equipments required , field work and recording field work and recording field notes – Errors in Chaining – Obstacles in Chaining : Types and problems – Tape Correction : Simple Problem.

UNIT II COMPASS SURVEYING

9 Hours

Angular measurements – Necessity – Instruments used – Prismatic compass : Construction details functions and Temporary adjustment – Types of meridians – Types of bearings : whole circle and reduced bearings, Fore and Back Bearings – Computation of bearings from included angles – Problems – Local Attraction : Detection, correction and problems – Dip and declination – Compass traversing – Errors in compass surveying.

UNIT III LEVELING

9 Hours

Leveling – Definition – Level – Parts – Functions – Accessories – Types of levels : Dumpy level, Modern Tilting level, Quick setting level, Automatic and laser level – Leveling staff – Types – component parts of Leveling instruments – Definitions of terms used : Level surface, Horizontal and vertical surfaces, Datum Bench marks, Reduced level, Rise, Fall, Line of Collimation, Axis of telescope, Axis of Bubble tube, Station Back site, Fore site, Intermediate site, Change point, Height of instruments – Reduction of levels – Height of collimation and Rise and Fall Method – Missing entry calculation : Problems.

UNIT IV CONDITION LEVELING

9 Hours

Types of Leveling – Check Leveling : Definition, Field Procedure and use – Profile leveling or Longitudinal section(L.S) : Definition, uses, field procedure and plotting the profile – Cross section leveling(C.S) : Definition , Uses, Field procedure and plotting the Cross-section – Specimen Field book for L.S and C.S – Reciprocal leveling : Definition, Uses, and problems on difference in elevation – Curvature and Refraction : Effects, Correction and problems .

UNIT V CONTOUR SURVEYING

9 Hours

Definition – Contour – Contouring – Characteristics of contours – Methods of contouring – Direct and indirect methods – Tacheometric contouring – Interpolation of contours – Different methods – Contouring gradient – Used of contour plan and map – Calculation of capacity of reservoir: Simple problems.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Advanced Surveying Instruments
2. Easy to measure the critical location areas

COURSE OUTCOMES:

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

- CO1 Appreciate the need for accurate and through note taking in field work to serve as a legal record.
- CO2 Gain a basic understanding of the principles and operation of the global position system
- CO3 Gain the ability to measure difference in elevation, draw and utilize contour plots and calculate volumes for earthwork.
- CO4 Improve ability to function as a survey party in completing the assigned field work.
- CO5 Appreciate the need for licensed surveyors to establish positioning information for property and structures.

REFERENCES:

1. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Ha of India, 2004
2. AroraK.R., "Surveying Vol 1 & 2", Standard Book House, 10th Edition 2008
3. Alfred Leick, "GPS satellite surveying", JohnWiley& Sons Inc., 3rd Edition, 2004.
4. GuochengXu, " GPS Theory, Algorithms and Applications", Springer - Berlin, 2003.

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1702CE302

SOLID MECHANICS - I

L	T	P	C
3	2	0	4

PREREQUISITE :

1. Basic Civil and Mechanical Engineering
2. Engineering Mechanics

COURSE OBJECTIVES:

1. To impart knowledge on fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.
2. To acquire the ability to analyze the mechanism of load transfer in beams, the induced stress resultants and deformations.
3. To develop the clear understanding of the effect of torsion on shafts and springs.

UNIT I STRESS AND STRAIN

12 Hours

Stress and strain at a point – Tension, Compression, Shear Stress – Hooke's Law – Relationship among elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses – Thin Cylinders and Shells – Strain Energy due to Axial Force – Resilience – Stresses due to impact and Suddenly Applied Load – Compound Bars.

UNIT II SHEAR AND BENDING IN BEAMS

12 Hours

Beams and Bending- Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions - Flitched Beams.

UNIT III DEFLECTION OF BEAMS

12 Hours

Double integration method-Macaulay's methods-Area moment method-conjugate beam method for computation of slopes and deflections of determinant beams.

UNIT IV TORSION

12 Hours

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – combined bending moment and torsion of shafts - strain energy due to torsion - Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – Leaf Springs – Springs in series and parallel – Design of buffer springs.

UNIT V COMPLEX STRESSES AND PLANE TRUSSES

12 Hours

2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Principal Stresses and Principal Planes – Mohr's circle - Plane trusses: Analysis of plane trusses - method of joints - method of sections

TOTAL: 60 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Analysis of all types of horizontal determinate flexural members.
2. Categorize various materials by virtue of its different strength properties.

COURSE OUTCOMES:

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

- CO1 Understand the fundamental concepts of stress and strain in mechanics of solids and structures.
- CO2 Analyze the determinate beams and trusses to determine shear forces, bending moments and axial forces
- CO3 Compute the maximum deflection of beam.
- CO4 Analyze laminar and turbulent flows in circular pipes and energy losses in pipes
- CO5 Discuss about the Principal Plane and stresses.

REFERENCES:

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.
2. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.
3. Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,1995.
4. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi 1997.
5. Bansal.R.K "Strength of materials", Laxmi Publications (P) Ltd, New Delhi 2014
6. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van NosReinhold, New Delhi1995.

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1702CE303

FLUID MECHANICS

L	T	P	C
3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To impart knowledge on the basic properties of the fluid
2. To impart knowledge in the area of fluid kinematics and fluid dynamics
3. To analyze and appreciate the complexities involved in solving the fluid flow problems

UNIT I FLUID STATICS

9 Hours

Definitions - Continuum concept – Units and dimensions - Fluid Properties – Classification of fluids - Fluid Pressure and its measurements (manometers) - forces on immersed plane and curved surfaces – buoyancy – Meta centric height – fluid mass under relative equilibrium – Micro fluidics.

UNIT II KINEMATICS OF FLUIDS

9 Hours

Lagrangian and Eulerian methods – Classification of fluids - Streamlines, path lines and streak lines - Continuity equation - Velocity potential and Stream function – Flow nets.

UNIT III FLUID DYNAMICS

9 Hours

Euler and Bernoulli's equation – Application of Bernoulli's equation – Flow measurement – Laminar flow through parallel plates and pipes – Darcy-Weishbach friction factor – Turbulent flow.

UNIT IV PROBLEMS IN PIPE FLOW

9 Hours

Major and minor losses in pipe flows – Pipes in series and parallel – Pipe networks – Concept of Boundary Layer Theory

UNIT V DIMENSIONAL ANALYSIS

9 Hours

Rayleigh's method – Buckingham's Pi-theorem – model study and similitude – Practical applications.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. To analyze and create a solution for Fluid flow issues.
2. To minimize the losses in conveyance of fluids

COURSE OUTCOMES:

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

- EMPLOYABILITY
- CO1 Understand the basic properties of fluids, and apply Newton's Law of Viscosity in solving practical problems
 - CO2 Understand the principles of kinematics with specific emphasis on application of continuity equation, stream function etc
 - CO3 Apply the principles of Bernoulli's equation in measurement of discharge in pipes, and in other pipe flow problems.
 - CO4 Apply fundamental concepts of fluid mechanics in solving fluid flow problems in pipes, design of pipe, and analysis of pipe networks.
 - CO5 Understand the fundamentals of dimensional analysis and application of Buckingham π -theorem in fluid flow problem

REFERENCES:

1. Bansal, R.K., Mechanics of Fluids, Laxmi Publications, Pvt. Ltd, New Delhi, 1st Edition, 2005.
2. Rama Durgaiah, D., Fluid Mechanics and Machinery, New Age International Publishers, New Delhi, 1st Edition, Reprint, 2006.
3. Jain A.K "fluid mechanics" khanna publishers, 2010
4. White f.m "fluid mechanics" tatamcgraw hill 5th edition, new 2000
5. K.L.kumar "fluidmechanichs" Eurasia publishing house(P)LTD. S.CHAND and company limited

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1702CE304

ENGINEERING GEOLOGY

L	T	P	C
3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To summarize the origin, development and ultimate fate of various surface features of the earth.
2. To impart the understanding of rock forming minerals, their properties and classifications of rocks.
3. To analyze the geological structures and their effects due to geological factors.

UNIT I GENERAL GEOLOGY

9 Hours

Geology in civil engineering – Branches of geology – Earth structures and composition –Elementary knowledge on continental drift and plate tectonics - Earth processes –Weathering – Geological work of rivers, wind and sea - Engineering importance – Earthquake belts in India - Groundwater – Mode of occurrence – Prospecting – Importance in civil engineering.

UNIT II MINERALOGY

9 Hours

Introduction – Crystallography – Elements – Symmetry – Axes – Forms – Systems –Properties - physical - optical – Study of rock forming minerals - Felspar group - Orthoclase, microcline, albite, anorthite - pyroxenogroup - Enstatite, augite - Amphibole group - Anthophyllite, hornblende - Mica group – Muscovite, biotite - Oxide minerals - Quartz, corundum - Carbonate minerals – Calcite, dolomite, magnesite - Coal and petroleum – Origin and occurrence in India.

UNIT III PETROLOGY

9 Hours

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks- Occurrence, engineering properties and distribution - Igneous rocks– Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt- sedimentary rocks - Sandstone, limestone, shale, conglomerate and breccia-Metamorphic rocks- quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD

9 Hours

Introduction – Basic terminologies – Study of structural features – Folds, faults and joints -Engineering considerations - Geophysical investigations- Seismic and electrical.

UNIT V GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING

9 Hours

Geological conditions necessary for construction of dams, tunnels, buildings, road cuttings- Landslides – Causes and preventions- improvement of sites.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS/ SEMINAR :

Geo Technical Engineering and Structural geology

COURSE OUTCOMES:

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

- CO1 Understand weathering process and mass movement
- CO2 Identify the available minerals by their properties and behavior.
- CO3 Differentiate three important major rock types based on their origin, occurrence, engineering properties and uses.
- CO4 Describe the geological structures fold, fault, joints etc, and identify the subsurface geological formations.
- CO5 Describe the applications of geological concepts in civil engineering projects.

REFERENCES:

1. Parbin Singh, “Engineering and General Geology”, S. K. Kataria & Sons, 2008.
2. Marland P.Billings, “Structural Geology”, PHI Learning Pvt. Ltd. New Delhi, 2012
3. F.G.Bell, “Engineering Geology”, Butterworth –Heinemann (An Imprint of Elsevier), 2007.
4. F.G.H. Blyth and M.H.de Freitas, “A Geology for Engineers”, Butterworth –Heinemann (An Imprint of Elsevier), 2006

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1702CE305

BUILDING MATERIALS & RESOURCE PLANNING

L	T	P	C
3	0	0	3

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To give students an understanding of typical and potential application of Building materials.
2. To ensure that students know about the manufacturing process of Building materials and mix designing procedure of concrete.
3. Give students an appreciation of the effective use of common and modern materials in construction.

UNIT I STONES – BRICKS – CONCRETE BLOCKS 9 Hours

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Cement, Concrete blocks – Lightweight concrete blocks.

UNIT II LIME – CEMENT – AGGREGATES – MORTAR 9 Hours

Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness – Soundness and consistency – Setting time – Industrial byproducts – Fly ash – Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking.

UNIT III CONCRETE 9 Hours

Concrete – Ingredients – Manufacturing Process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction Factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete – Other types of Concrete – Durability of Concrete.

UNIT IV TIMBER 9 Hours

Timber – Market forms – Industrial timber – Plywood – Veneer – Thermacole – Panels of laminates – Steel Aluminium composite panel – Uses – Paints – Varnishes – Distempers – Bitumens.

UNIT V MODERN MATERIALS 9 Hours

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Fibre textiles – Geo membranes and Geo textiles for earth reinforcement.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

On completion of this course the students will be able to Compare the properties of most common and advanced building materials and understand the typical and potential applications of these materials

COURSE OUTCOMES:

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

- CO1 Summarize the most common and advanced materials used for construction.
- CO2 Explain the manufacturing process of various building materials
- CO3 Explain the properties of fresh and hardened concrete and performance of other types of concrete.
- CO4 Illustrate the usage of timber, plywood and aluminum, composite material, paints and distemper
- CO5 Choose the appropriate modern materials for construction

REFERENCES:

1. Varghese. P. C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Rajput. R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Shetty. M. S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd., 2008.
4. Gambhir M. L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
5. Duggal. S. K., "Building Materials", 4th Edition, New Age International, 2008.

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1702CE351

SURVEYING LAB 1

L	T	P	C
0	0	4	2

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

To introduce the principles of various surveying methods and using the survey instrument to Civil Engineering projects.

LIST OF EXPERIMENTS:

1. Study about Chain and accessories
2. Aligning, Ranging and chaining
3. Compass Traversing
4. Plane table surveying : Radiation
5. Plane table surveying : Intersection
6. Plane table surveying : Two point Problem
7. Fly leveling using Dumpy level
8. Check Leveling
9. LS and CS
10. Study of Theodolite

TOTAL: 45 HOURS

ADDITIONAL EXPERIMENTS / INNOVATIVE EXPERIMENTS :

1. Using in the field for taking leveling checking and measurements.
2. Electronic instrument

COURSE OUTCOMES:

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

- Employability*
- CO1 On completion of this course student shall be able to understand the Surveying of the Lands and Pots use various method.
- CO2 Understanding the working principle.
- CO3 Understanding the methods of using the proper instrument for the method.

REFERENCES:

1. G. Brancato, S. Macchia, M. Murgia, M. Signore, G. Simeoni - Italian National Institute of Statistics, ISTAT
2. K. Blanke, T. Körner, A. Nimmergut - Federal Statistical Office Germany, FSO
3. P. Lima, R. Paulino - National Statistical Institute of Portugal, INE
4. J.H.P. Hoffmeyer-Zlotnik - German Center for Survey Research and Methodology, ZUMA

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1702CE352

STRENGTH OF MATERIALS LABORATORY

L	T	P	C
0	0	4	2

PREREQUISITE :

Basic Civil and Mechanical Engineering

COURSE OBJECTIVES:

1. To find the strength properties of different construction materials like steel, concrete, brick and timber.
2. To evaluate stiffness properties of springs and to find the hardness properties of various metals.

LIST OF EXPERIMENTS:

1. Tension test on Mild steel rod
2. Tension test on tor steel rod
3. Torsion test on MS bar
4. Tension and compression test on springs
5. Compression test on bricks and concrete cubes
6. Water absorption test on bricks
7. Brinell and Rockwell Hardness test
8. Compression and bending test on wood specimens
9. Charpy and Izod Impact Test
10. Double shear test
11. Test on cement

TOTAL: 45 HOURS

ADDITIONAL EXPERIMENTS / INNOVATIVE EXPERIMENTS :

COURSE OUTCOMES:

Employability

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

- CO1 The experimental works involved in this laboratory make the student to determine the properties of different structural elements.
- CO2 The student should be able to obtain the strength of the material and stiffness properties of structural elements.

REFERENCES:

1. Strength of Materials Laboratory Manual, Anna University, Chennai - 600 025.
2. IS1786-2008, Specification for cold worked steel high strength deformed bars for concrete reinforcement, 2008.

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1704CE353

TECHNICAL SEMINAR I

L T P C
0 0 2 0

PREREQUISITE :

COURSE OBJECTIVES:

1. To develop self-learning skills of utilizing various technical resources to make a technical presentation.
2. To promote the technical presentation and communication skills.
3. To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
4. To promote the ability for Interacting and sharing attitude.
5. To encourage the commitment-attitude to complete tasks.

The students are expected to make two presentations on advanced topics (recent trends) related to II year/ III semester subjects. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as power point presentation and demonstrative models.

TOTAL: 30 HOURS

COURSE OUTCOMES:

Entomology

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

- CO1 Identify and utilize various technical resources available from multiple field.
- CO2 Improve the technical presentation and communication skills.
- CO3 Improve communicative competence.
- CO4 Interact and share their technical knowledge.
- CO5 Understand and adhere to deadlines and commitment to complete the assignments.

EVALUATION SCHEME:

Continuous Assessment (100 Marks)

Distribution of Marks for Continuous Assessment	Marks
Presentation I	40
Report	10
Presentation II	40
Report	10
Total	100

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1704GE351

LIFE SKILLS : SOFT SKILLS
(Common to all B.E / B.Tech Degree Programmes)

L	T	P	C
0	0	2	0

PREREQUISITE :

1. Technical English
2. Communicative English

COURSE OBJECTIVES:

1. To develop the students basic soft skills and enable them to get a job.
2. To develop the students' interpersonal skills and to enable them to respond effectively.
3. To develop the students selling skills and to enable them to apply in their interview process.
4. To develop the students' Corporate Etiquettes and enable them to respond effectively.
5. To develop the students' learning by practice of giving different situations.

UNIT I INTRODUCTION TO SOFT SKILLS

6 Hours

Soft Skills an Overview - Basics of Communication – Body Language – Positive attitude –Improving Perception and forming values – Communicating with others.

UNIT II TEAM Vs TRUST

6 Hours

Interpersonal skills – Understanding others – Art of Listening - Group Dynamics – Networking - Individual and group presentations - Group interactions – Improved work Relationship .

UNIT III SELLING ONESELF

6 Hours

How to brand oneself – social media – job hunting – Resume writing – Group Discussion – Mock G.D - .Interview skills – Mock Interview

UNIT IV CORPORATE ETIQUETTES

6 Hours

What is Etiquette – Key Factors – Greetings – Meeting etiquettes – Telephone etiquettes – email etiquettes – Dining etiquettes – Dressing etiquettes – Rest room etiquettes – Life etiquettes.

UNIT V LEARNING BY PRACTICE

6 Hours

1. My family. Myself. 2. Meeting people. Making Contacts. 3. A city. Getting about town. 4. Our flat. Home life.5. Travelling. Going abroad. 6. Going through Customs. 7. At a hotel. 8. Shopping. 9. Eating out. 10. Making a phone call. 11. A modern office.12 Discussing business.

TOTAL: 30 HOURS

ASSESSMENT PATTERN

1. Two assignments (2 x 25 marks = 50 marks)
2. Pragmatic assessment (50 marks)

COURSE OUTCOMES:

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

- CO1 Communicate effectively in their business environment.
- CO2 Improve their interpersonal skills which are mandatory in a corporate world.
- CO3 Brand themselves to acquire a job.
- CO4 Involve in corporate etiquettes.
- CO5 Survive in the different situations.

REFERENCES:

1. Dr.K.Alex, 'Soft Skills' Third Edition, S.Chand & Publishing Pvt Limited, 2009
2. Aruna Koneru, 'Professional Communication' Second Edition, Tata McGraw-Hill Education, 2008
3. D.K.Sarma, 'You & Your Career' First Edition, Wheeler Publishing & Co Ltd, 1999
4. Shiv Khera 'You Can Win' Third Edition, Mac Millan Publisher India Pvt Limited, 2005

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E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai
Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)
NAGAPATTINAM – 611 002



B.E. CIVIL ENGINEERING

Second Year – Fourth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702MA403	Numerical Methods and Statistics	3	2	0	4	40	60	100
1702CE401	Engineering Surveying II	3	0	0	3	40	60	100
1702CE402	Solid Mechanics II	3	1	0	4	40	60	100
1702CE403	Applied Hydraulic Engineering	3	0	0	3	40	60	100
1702CE404	Geotechnical Engineering I	3	0	0	3	40	60	100
1702CE405	Transportation Engineering	3	0	0	3	40	60	100
Laboratory Course								
1702CE451	Hydraulic Engineering Lab	0	0	4	2	50	50	100
1702CE452	Geotechnical Engineering Lab	0	0	4	2	50	50	100
1702CE453	Surveying Lab II	0	0	4	2	50	50	100
1704CE454	Technical Seminar II	0	0	2	0	100	-	100
1704GE451	Life Skills: Verbal Ability	0	0	2	0	100	-	100

1702MA403	NUMERICAL METHODS AND STATISTICS (Common to B.E - Civil, EEE and Mech.)	L	T	P	C
		3	2	0	4

PREREQUISITE:

1. Engineering Mathematics I
2. Engineering Mathematics II
3. Engineering Mathematics III

COURSE OBJECTIVES:

1. To solve the engineering problem, by use of numerical tools
2. To understand the concept of interpolation
3. To analyze the population and samples using statistics techniques

UNIT I INTERPOLATION AND APPROXIMATION 12 Hours

Interpolation with unequal intervals - Lagrange's interpolation - Newton's divided difference interpolation - Interpolation with equal intervals - Newton's forward and backward difference formulae.

UNIT II NUMERICAL DIFFERENTIATION 12 Hours

Approximation of derivatives using interpolation polynomials-Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations

Unit III NUMERICAL INTEGRATION 12 Hours

Numerical integration using Trapezoidal, Simpson's 1/3 rule - Romberg's method - Two point and three Point Gaussian quadrature formulae - Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 12 Hours

Solution of algebraic and transcendental equations - Newton Raphson method- Solution of linear system of equations - Gauss elimination method - Gauss Jordan method - Iterative methods of Gauss Jacobi and Gauss Seidel

UNIT V TESTING OF HYPOTHESIS 12 Hours

Large sample test based on Normal distribution for single mean and difference of means - Tests based on t and F distributions for testing means and variances - Contingency table (Test for Independency) - Goodness of fit

TOTAL: 60 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Finding Eigen value using power method
2. Cubic Spline

COURSE OUTCOMES:

After completion of the course, Students will be able to

- CO1: To find the intermediate values, when huge amounts of experimental data are involved.
CO2: To solve first order differential equation using Numerical methods
CO3: To perform Integration using Numerical methods
CO4: To solve algebraic and transcendental Equations numerically
CO5: Analyses the statistical data

REFERENCES:

1. Johnson R.A.Gupta C. B, Miller and Friends Probability and statistics for Engineers, 7th edition ,Pearson Education,2007
2. Grewal B.S and Grewal J.S, Numerical methods in Engineering and Science, 6th edition, Khanna Puplichers,2004
3. Walpole R.E. Myers S.L ,Ye.K, Probability and statistics for Engg and scientists, 8th edition Pearson education,2007
4. Gerald C.F Wheatley P.O, Applied Numerical Analysis, 6th edition ,Pearson education Asia 2006
5. Nptel.ac.in/courses/111105035, www.nptelvideos.in/2012/11/Mathematics.html
6. www.learnerstv.com/Free-maths-video lectures - ltv348-page1.html
7. www.indiastudychannel.com

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1702CE401

ENGINEERING SURVEYING II

L	T	P	C
3	0	0	3

PREREQUISITE:

1. Students Known about the Basic knowledge of chain surveying.
2. Students known about the knowledge of Levelling.
3. Knowledge about the Marking.

COURSE OBJECTIVES:

1. This subject deals with geodetic measurements and control survey method
2. The student is also exposed to the Modern Surveying

UNIT I CONTROL SURVEYING 9 Hours

Horizontal and vertical Controlsurveying – Instrument and Accessories – Corrections – Trigonometrical leveling – single and reciprocal observation traversing.

UNIT II SURVEYING ADJUSTMENT 9 Hours

Errors Sources- classification of errors – true and most probable Values- weighed observations – method of equal shifts –principle of least squares – Normal Equation – correlates

UNIT III CURVES 9 Hours

Introduction – Types of curves – Designation of curves – Elements of simple circular curve –simple problems – Transition curves – vertical curves.

UNIT IV GPS SURVEYING 9 Hours

Basic concept – Different segment - -Space, Control and user segments – satellite configuration – signal structure – Hand held and geodetic receivers.

UNIT V TOTAL STATION SURVEYING 9 Hours

Basic Principle – Classification – Measuring principle, Working principle, Sources of errors – Infrared and Laser Total station instruments. Care and maintenances of total station instruments.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Building Marking in the construction field using Total station
2. Levelling work in the Highways Railways and Airways using Total station

COURSE OUTCOMES:

After completion of the course, Student will be able to

- Employability*
- CO1: Completion of this course students shall be able to understand the advantages
 - CO2: Electronic surveying over conventional surveying methods
 - CO3: Understand the working principle of GPS, its components, signal structure, and error sources
 - CO4: Understand various GPS surveying methods and processing techniques used in GPS observations
 - CO5: Improve ability to function as a survey party in completing the assigned field work
 - CO6: Appreciate the need for licensed surveyors to establish positioning information for property and structures.

REFERENCES:

1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, "GPS Theory, Algorithms and Applications", Springer - Berlin, 2003.
3. Satheesh Gopi, rasathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Ha of India, 2004.
5. Arora K.R., "Surveying Vol 1 & 2", Standard Book House, 10th Edition 2008.

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1702CE402

SOLID MECHANICS - II

L	T	P	C
3	1	0	4

PREREQUISITE:

Solids Mechanics -I

COURSE OBJECTIVES:

1. To impart knowledge on Energy principles, stress, Strain and deformation of solids with applications to beams, cylinders and unsymmetrical sections.
2. To acquire the ability to analyze the mechanism of load transfer in columns
3. To develop the clear understanding of the shear force and bending moment in indeterminate beams.

UNIT I ENERGY PRINCIPLES

9 Hours

Strain energy and strain energy density – strain energy due to axial load, shear, flexure and torsion – Castigliano's theorems – Principle of virtual work – application of energy theorems for computing deflections in beams and trusses

UNIT II INDETERMINATE BEAMS

9 Hours

Concept of Analysis - Propped cantilever and fixed beams-fixed end moments and reactions – Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

UNIT III COLUMNS AND CYLINDER

9 Hours

Euler's theory of long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns – middle third rule – core section – Thick cylinders.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS

9 Hours

Determination of principal stresses and principal planes – Volumetric strain – Theories of failure – Principal stress - Principal strain – shear stress – Strain energy and distortion energy theories – application in analysis of stress, load carrying capacity.

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS

9 Hours

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Shear Centre

TOTAL: 45+15 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Analysis of all types of flexural members
2. Approaching the flexural members with different kinds of stress analysis

COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Identify the deflection in beams and frames using energy theorems
- CO2: Explain the indeterminate beams like continuous beams and fixed beams in structures.
- CO3: Illustrate the load carrying capacity of columns
- CO4: Calculate the stresses in thick cylinders.
- CO5: Compute the state of stress in three dimensions
- CO6: Apply the stresses due to unsymmetrical bending.

REFERENCES:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2010.
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012
3. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003
4. William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2007
5. Punmia B.C. "Theory of Structures" (SMTS) Vol 1&II, Laxmi Publishing Pvt Ltd, New Delhi 2004.
6. Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.
7. Bansal.R.K "Strength of materials", Laxmi Publications (P) Ltd, New Delhi 2014.

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1702CE403

APPLIED HYDRAULIC ENGINEERING

L	T	P	C
3	0	0	3

PREREQUISITE:

1. Knowledge about fluid properties and equations on fluid flow

COURSE OBJECTIVES:

1. To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines
2. To relate the theory and practice of problems in hydraulic engineering

UNIT I UNIFORM FLOW

12 Hours

Open channel – Differences between pipe flow and open channel flow - Types of flow – Properties of open channel - velocity distribution – Chezy's equation – Empirical formulae for Chezy's constant - Most economical section - specific energy concept

UNIT II GRADUALLY VARIED FLOW

8 Hours

Dynamic equations of GVF – Classification of flow profiles – Computation of GVF profiles – Direct Step Method and Standard Step Method.

UNIT III RAPIDLY VARIED FLOW

7 Hours

Momentum equation for RVF - Hydraulic jumps - Classification of Jumps – Surges

UNIT IV TURBINES

9 Hours

Classifications of turbine – velocity triangle diagram for Pelton, Francis and Kaplan Turbine – Specific speed - Characteristics curves for turbines – Draft tube.

UNIT V PUMPS

9 Hours

Classification of pumps – Centrifugal pump – minimum speed to start the pump – NPSH – operating characteristics – Multistage pumps – Reciprocating pump – Negative slip - indicator diagrams – air vessels

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Field visit on irrigation structures

COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Apply the Chezy's & Manning's equation for finding the most economical section of a channel for uniform flow
- CO2: Describe the specific energy concepts in open channel flow
- CO3: Discover the type of water surface profile based on Gradually varied flow equation
- CO4: Apply the Rapidly varied flow equations for hydraulic jump and surges
- CO5: Identify the turbines based on their efficiencies for hydroelectric projects
- CO6: Identify the required pumps for the hydraulic projects

REFERENCES:

1. Modi, P.N., & Seth, S.M., Hydraulics and Fluid Mechanics including Fluid Machines Standard Book House, New Delhi, 2000
2. Rama Durgaiah, D., Fluid Mechanics and Machinery, New Age International Publishers, New Delhi, 1st Edition, Reprint, 2006.
3. Chow, V.T., Open Channel Hydraulics, Blackburn Press, 2nd Edition, Reprint, 2009
4. JAINA.K "Fluid Mechanics" Khanna Publishers, New Delhi.
5. Bansal.R.K., Fluid Mechanics and Hydraulic Machines, Laxmi Publication (P) Ltd., New Delhi, 2018

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1702CE404

GEOTECHNICAL ENGINEERING I

L	T	P	C
3	0	0	3

PREREQUISITE:

- 1.Knowledge about engineering behavior of fluid properties
- 2.Knowledge about mechanical properties of solids.

COURSE OBJECTIVES:

1. Provide the description, classification and to know about properties of soil.
2. Familiarize the students an understanding of permeability and seepage of soils
3. To know about the consolidation and compaction effect on soil in lab and field.

UNIT I INTRODUCTION

9 Hours

Definition of soil and soil mechanics – Formation of soil – types of soil – Three phase system of soil and their relationships – Specific gravity – Definition – Determination – Field density - sand replacement and core cutter method.

UNIT II INDEX PROPERTIES

9 Hours

Classification of soil – Grain size analysis – Stoke's law and hydrometer analysis– Consistency of soils – Atterberg's limit - Liquid limit, Plastic limit and Shrinkage limit – Determination - plasticity index, liquidity index , consistency index ,shrinkage ratio, flow index and toughness index – Classification of coarse grained and fine grained soil as per BIS.

UNIT III PERMEABILITY AND SEEPAGE

9 Hours

Permeability –Definition – Assumption - one dimensional flow through soil – Darcy's law – Limitations - Discharge velocity and seepage velocity – factors affecting the permeability – permeability determination - lab and field methods – permeability in stratified soil deposits – Introduction of flow net and its properties - application of flow net.

UNIT IV COMPACTION AND CONSOLIDATION

9 Hours

Compaction – field and lab methods – Proctor's test – factors affecting the compaction – California Bearing Ratio (CBR) test – effect of compaction in soil properties – Consolidation – Terzaghi's theory of one dimensional consolidation - partial differential equation (no analytical solution) – Lab method - coefficient of consolidation – Determination - \sqrt{t} and $\log t$ methods.

UNIT V STRESS DISTRIBUTION AND SHEAR STRENGTH

9 Hours

Introduction – stresses in soil – concept of effective and neutral stresses – stress distribution in soil media – Boussinesq and Westergaard's analysis – Point load , Uniformly distributed load , line load – rectangular load - pressure bulb –Newmark's chart – Introduction. Shear strength – shear strength of cohesive and cohesion less soils – Mohr coulomb's theory –Direct shear, Triaxial, unconfined shear strength – Lab and field vane shear test - factors affecting the shear strength.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Discuss the relationship of three phases of soil
- CO2: Describe the various properties of soil and its classification.
- CO3: Calculate the permeability of water in soil.
- CO4: Explain compaction and consolidation of soil
- CO5: Interpret the shear strength of the soil
- CO6: Explain the various types of stress distribution in soil media.

REFERENCES:

1. Raju .K.V.B and Ravichandran .P.T, "Mechanics of Soils", Ayyappa Publications, 2000.
2. Punmia .B.C, "Soil Mechanics and Foundations", Laxmi Publications Pvt.Ltd., 2005.
3. Gopal Ranjan and Rao .A.S.R, "Basic and Applied Soil Mechanics", New age international (p) Ltd., 2007.
4. Terzaghi .K and Peck .R.B, "Soil Mechanics in Engineering Practice", JohnWiley Ltd., 1996
5. Arora .K.R, "Soil Mechanics and Foundation Engineering", Standard Publication Distributors, 2011.

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1702CE405

TRANSPORTATION ENGINEERING

L	T	P	C
3	0	0	3

PREREQUISITE:

1. Basic engineering & fundamental knowledge on materials

COURSE OBJECTIVES:

1. To understand the importance of transportation and characteristics of road transport
2. To know about the history of highway development, surveys and classification of road
3. To study about the geometric design of highways
4. To study about traffic characteristics and design of intersections
5. To know about the pavement materials and design

UNIT I HIGHWAY GEOMETRY

9 Hours

Importance Road transportation, Highway alignment – Requirement, Engineering surveys for Highway location. Maps & drawings to be prepared. Geometric design – Cross section element, width, camber, design – speed, sight distances, requirements and design of horizontal and vertical alignments.

UNIT II HIGHWAY MATERIALS

9 Hours

Highway materials – Properties of sub-grade pavement component materials – Tests on aggregates, Sub-grade soil & bituminous materials. Different material-Glass, Fiber, Plastic, Geo-Textiles, Geo-membrane

UNIT III CONSTRUCTION AND MAINTENANCE

9 Hours

Pavement construction techniques – Types of pavements – Construction of bituminous pavements and rigid pavements. Pavement failures and their remedies. Pavement evaluation

UNIT IV PAVEMENT DESIGN

9 Hours

Design principles – pavement components and their role - Design practice for flexible and rigid Pavements (IRC methods only) - Embankments.

UNIT V TRAFFIC PLANNING AND DESIGN

9 Hours

Road Characteristics, Road user and vehicle characteristics, -, Intersections: at grade intersections, grade separated, intersections, channelized intersections and rotary, new work pedestrian facilities & cycle tracks.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. They can get the knowledge in transportation system

COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Explain geometric design of horizontal and vertical alignments of roads rural and urban
- CO2: Summarize the desirable properties of highway materials for constructions
- CO3: Explain the pavement construction technique for flexible and rigid pavement
- CO4: Explain the design of flexible and rigid pavements using IRC methods.
- CO5: Interpret the flow speed, density based on road user and vehicle characteristic
- CO6: Illustrate various methods of traffic control measures in urban area

REFERENCES:

1. Veeraragavan.A, Khanna. S.K., Ceg Justo, Highway Engineering, Nem Chand & Brothers, 2014
2. Sharma, S.K. “ Principles Practice and Design of Highway Engineering ”, S. Chand & Co Ltd, 2013
3. Gupta B.L and Amith Gupta, Highway and Bridge Engg., Standard publishers, and Distributor, 2010
4. ParthaChakroborthy and Animesh Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2013.
5. LrKadiyali, LrKadyali, NbLal, “ Principles and practice of highway engineering ”, Khanna Publishers.2013
6. Rangwala.S.C, Highway Engineering, Charotar Book Distributors, 2013

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1702CE451

HYDRAULICS ENGINEERING LAB

L	T	P	C
0	0	4	2

PREREQUISITE :

1. Fluid properties,
2. Applied hydraulics engineering

COURSE OBJECTIVES:

1. To acquire knowledge about properties of fluid
2. To understand knowledge about the losses in pipes
3. To understand knowledge about the characteristics of pumps and turbines

LIST OF EXPERIMENTS:

1. Calibration of Rotometer
2. Flow through Venturimeter Orifice meter
3. Flow through variable duct area - Bernoulli's Experiment
4. Flow through Orifice meter Mouthpiece and Notches
5. Determination of friction coefficient in pipes
6. Determination of loss coefficients for pipe fittings
7. Characteristics of Centrifugal pumps
8. Characteristics of Gear pump
9. Characteristics of Submersible pump
10. Characteristics of Reciprocating pump
11. Characteristics of Pelton wheel turbine
12. Characteristics of Francis turbine
13. Characteristics of Kaplan turbine

TOTAL:45 HOURS

ADDITIONAL EXPERIMENTS/ INNOVATIVE EXPERIMENTS:

1. Characteristics of multi stage Centrifugal pumps
2. Characteristics of jet on vane

COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Measure the flow properties of fluid.
- CO2: Conduct the experiment to find the losses in pipes
- CO3: Conduct experiment to find characteristics curves of various pumps
- CO4: Conduct experiment to find characteristics curves of various turbines

REFERENCES:

1. Sarbjit Singh. "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009
2. Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
3. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
4. Subramanya K. "Flow in open channels", Tata McGraw Hill Publishing. Company, 2001

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1702CE452

GEOTECHNICAL ENGINEERING LAB

L	T	P	C
0	0	4	2

PREREQUISITE:

COURSE OBJECTIVES:

- 1.To provide exposure to the students with hands on experience about classification of the soil.
- 2.To grant knowledge about field density of the soil.
- 3.To impart the knowledge about basic bearing capacity of the soil.
- 4.To attains adequate knowledge in assessing both Physical and Engineering behavior of soils through laboratory testing procedures.

LIST OF EXPERIMENTS:

1. Determination of specific gravity
2. Determination of grain size distribution of Sieve Analysis
3. Determination of grain size by Hydrometer
4. Determination of Liquid limit and Plastic of the soil
5. Determination of Shrinkage limit of the soil
6. Determination of Dry density by Standard Proctor Compaction test
7. Determination of Field density by Core cutter method
8. Determination of Field density by Sand Replacement method
9. Determination of Permeability Coefficient using Constant head method
10. Determination of Permeability Coefficient using Variable head method
11. Determination of shear strength by using Direct Shear test
12. Determination of compression strength by using Unconfined compressive strength test

TOTAL : 45 HOURS

ADDITIONAL EXPERIMENTS/ INNOVATIVE EXPERIMENTS:

- 1.Consolidation Test
- 2.Triaxial Test

COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Develop experience to classify the soil
- CO2: Identify the concept of optimum moisture content of the soil.
- CO3: Recognize the concept of field density of the soil.
- CO4: Practice of the concept to do performance test on Compressive and shear strength
- CO5: Apply the techniques to determine index properties and engineering properties by conducting appropriate tests.

REFERENCES:

- 1.Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2007
- 2.GopalRanjan and Rao A.S.R. "Basic and Applied soil mechanics", Wiley Eastern Ltd, New Delhi 3.(India), 2000.
- 4.Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New 5.Delhi, 2002.
- 6.Soil Engineering Laboratory Instruction Manual" published by Engineering College Co- operative Society, Anna University, Chennai, 1996.
- 7.Saibaba Reddy, E. Ramasastry, K. "Measurement of Engineering Properties of Soils", New age International (P) Limited Publishers, New Delhi, 2002
- 8.Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1990.

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1702CE453

SURVEYING LAB II

L	T	P	C
0	0	4	2

PREREQUISITE:

1. Surveying I
2. Surveying Lab I

COURSE OBJECTIVES:

1. This subject deals with Electronic Survey method. The student is also exposed to the Modern Surveying.

LIST OF EXPERIMENTS:

1. Study of the odolite
2. Determination of Horizontal Angles by Reiteration method
3. Determination of Horizontal Angles by Repetition method
4. Determination of Vertical Angles
5. Theodolite survey - Traversing method
6. Determination of Height and distance of the object
7. Tacheometry Tangential system
8. Setting out work – Foundation Marking and Simple curve
9. Study of Total station

TOTAL : 45 HOURS

ADDITIONAL EXPERIMENTS/ INNOVATIVE EXPERIMENTS:

1. Building Marking
2. Road Alignment

COURSE OUTCOMES:

- After completion of the course, Student will be able to
- CO1: On completion of this course student shall be able to understand the advantages of the Electronic instrument and working in the field.
- CO2: Understanding the methods of using the proper instrument for the method.

REFERENCES:

1. G. Brancato, S. Macchia, M. Murgia, M. Signore, G. Simeoni - Italian National Institute of Statistics, ISTAT
2. K. Blanke, T. Körner, A. Nimmergut - Federal Statistical Office Germany, FSO
3. P. Lima, R. Paulino - National Statistical Institute of Portugal, INE
4. J.H.P. Hoffmeyer-Zlotnik - German Center for Survey Research and Methodology, ZUMA

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1704CE454

TECHNICAL SEMINAR II

L T P C
0 0 2 0

COURSE OBJECTIVES:

1. To develop self-learning skills of utilizing various technical resources to make a technical presentation.
2. To promote the technical presentation and communication skills.
3. To impart the knowledge on intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.
4. To promote the ability for Interacting and sharing attitude.
5. To encourage the commitment-attitude to complete tasks.

The students are expected to make two presentations on advanced topics (recent trends) related to II year/ III semester subjects. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Students are encouraged to use various teaching aids such as power point presentation and demonstrative models.

TOTAL: 30 HOURS

COURSE OUTCOMES:

Entrepreneurship

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

- CO1 Identify and utilize various technical resources available from multiple field.
- CO2 Improve the technical presentation and communication skills.
- CO3 Improve communicative competence.
- CO4 Interact and share their technical knowledge.
- CO5 Understand and adhere to deadlines and commitment to complete the assignments.

EVALUATION SCHEME:

Continuous Assessment (100 Marks)

Distribution of Marks for Continuous Assessment	Marks
Presentation I	40
Report	10
Presentation II	40
Report	10
Total	100

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1704GE451

LIFE SKILLS: VERBAL ABILITY

L	T	P	C
0	0	2	0

PREREQUISITE:

Technical English – I and II

COURSE OBJECTIVES:

1. To help students comprehend and use vocabulary words in their day to day communication.
2. To apply appropriate reading strategies for interpreting technical and non-technical documents used in job-related settings.
3. To ensure students will be able to use targeted grammatical structures meaningfully and appropriately in oral and written production.
4. To enable the students to arrange the sentences in meaningful unit and to determine whether constructions rely on active or passive voice.
5. To apply the principles of effective business writing to hone communication skills.

UNIT I VOCABULARY USAGE

6 Hours

Introduction - Synonyms and Antonyms based on Technical terms – Single word Substitution – Newspaper, Audio and video listening activity.

UNIT II COMPREHENSION ABILITY

6 Hours

Skimming and Scanning – Social Science passages – Business and Economics passages – latest political and current event based passages – Theme detection – Deriving conclusion from passages.

UNIT III BASIC GRAMMAR AND ERROR DETECTION

6 Hours

Parallelism – Redundancy – Ambiguity – Concord - Common Errors – Spotting Errors – Sentence improvement – Error Detection FAQ in Competitive exams.

UNIT IV REARRANGEMENT AND GENERAL USAGE

6 Hours

Jumble Sentences – Cloze Test - Idioms and Phrases – Active and passive voice – Spelling test.

UNIT V APPLICATION OF VERBAL ABILITY

6 Hours

Business Writing - Business Vocabulary - Delivering Good / Bad News - Media Communication - Email Etiquette – Report Writing - Proposal writing – Essay writing – Indexing – Market surveying.

Total: 30 Hours

ASSESSMENT PATTERN

1. Two assignments (2 x 25 marks = 50 marks)
2. Pragmatic assessment (50 marks)

COURSE OUTCOMES:

After completion of the course, Student will be able to

- CO1: Use new words in their day to day communication.
- CO2: Gather information swiftly while reading passages.
- CO3: Students are proficient during their oral and written communication.
- CO4: Rearrange the sentences and able to identify the voice of the sentence.
- CO5: Students use their knowledge of the best practices to craft effective business documents

REFERENCES:

1. Arun Sharma and Meenakshi Upadhyav, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGrawHill Publication, Seventh Edition 2017.
2. R S Aggarwal and Vikas Aggarwal , Quick Learning Objective General English, S.Chand Publishing House, 2017.
3. Dr.K.Alex , Soft Skills, S.Chand Publishing House, Third Revise Edition, 2014.
4. Raymond Murphy, Essential English Grammar in Use, Cambridge University press, New Delhi, Third Edition, 2007.

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NAGAPATTINAM – 611 002



M.E. ENVIRONMENTAL ENGINEERING

Full Time Curriculum and Syllabus

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701EV101	Statistics For Environmental Engineers	3	2	0	4	40	60	100
1702EV102	Environmental Chemistry	3	0	0	3	40	60	100
1702EV103	Environmental Microbiology	3	0	0	3	40	60	100
1702EV104	Transport of Water and Waste Water	3	0	0	3	40	60	100
1702EV105	Principles and Design of Physico-Chemical Treatment Systems	3	0	0	3	40	60	100
	Elective-I	3	0	0	3	40	60	100
Laboratory Course								
1704EV106	Environmental Chemistry Laboratory	0	0	2	1	50	50	100
1704EV107	Environmental Microbiology Laboratory	0	0	2	1	50	50	100
1704EV108	Communication Skills Lab I	0	0	2	1	100	0	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701EV101	STATISTICS FOR ENVIRONMENTAL ENGINEERS	L	T	P	C
		3	2	0	4

COURSE OBJECTIVES:

1. To introduce the basic concept of Stochastic Processes
2. To enable the students in handling Estimation and Testing of Hypothesis
3. To learn the Application of Statistics in Engineering Decision Making

UNIT I PROBABILITY AND RANDOM VARIABLE 9 + 3 Hours

Probability concepts – Random Variables – Moment generating function – Standard distributions - Binomial - Poisson - rectangular or Uniform – Normal - Exponential distributions - Functions of random variables – Two dimensional random variables.

UNIT II STOCHASTIC PROCESSES 9 + 3 Hours

Classification – Stationary and Random process – Markov process – Markov chains – Transition probability – Classification of Markov chain – Limiting distribution – First passage time – Poisson process – Birth and death process.

UNIT III ESTIMATION THEORY 9 + 3 Hours

Estimation: Point and Interval estimates for population parameters of large sample and small samples, determining the sample size- unbiased Estimators- Maximum Likelihood Estimation- Curve Fitting by Principle of Least square

UNIT IV TESTING OF HYPOTHESIS- PARAMETRIC TESTS 9 + 3 Hours

Hypothesis testing: one sample and two sample tests for means and proportions of large samples z-test, one sample and two sample tests for means of small sample t-test, F-test for two sample standard deviations. ANOVA one and two way classification.

UNIT V NON PARAMETRIC TESTS 9 + 3 Hours

Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit. Sign test for paired data. Rank sum test. Comparing two populations. Mann – Whitney U test and Kruskal Wallis test.

TOTAL: 45 + 15 HOURS

COURSE OUTCOMES:

Skilled

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

- CO1: To acquire knowledge in basic concepts of Probability
- CO2: To characterize phenomenon which evolve with respect to time in a probabilistic manner
- CO3: To estimate the sample size and prediction of unknown values
- CO4: To solve Parametric and non - parametric statistical problem
- CO5: To apply statistical techniques for solving Engineering problems

REFERENCES:

1. Jay L. Devore, "Probability and Statistics For Engineering and the Sciences", Thomson and Duxbury, 2002.
2. Richard Johnson. "Miller & Freund's Probability and Statistics for Engineer", Prentice – Hall, Seventh Edition, 2007.
3. Gupta S.C. and Kapoor V.K. "Fundamentals of Mathematical Statistics", Sultan an Sons, 2001.
4. Dallas E Johnson , "Applied Multivariate Methods for Data Analysis", Thomson an Duxbury press, 1998.
5. Jay L. Devore, "Probability and Statistics For Engineering and the Sciences", Thomson and Duxbury, 2002.

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1702EV102

ENVIRONMENTAL CHEMISTRY

L T P C
3 0 0 3

COURSE OBJECTIVES:

1. To educate the students about water chemistry
2. To impart knowledge in the area of air and soil chemistry
3. To impart knowledge on the transformation of chemicals in the environment

UNIT I INTRODUCTION

9 Hours

Stoichiometry and mass balance-Chemical equilibria, acid base, solubility product(K_{sp}) ,heavy metal precipitation, amphoteric hydroxides, CO_2 solubility in water and species distribution – Chemical kinetics , First order- 12 Principles of green chemistry.

UNIT II AQUATIC CHEMISTRY

11 Hours

Water quality parameters- environmental significance and determination; Fate of chemicals in aquatic environment, volatilization, partitioning, hydrolysis, photochemical transformation– Degradation of synthetic chemicals-Metals, complex formation, oxidation and reduction , pE – pH diagrams, redox zones – sorption- Colloids, electrical properties, double layer theory, environmental significance of colloids, coagulation.

UNIT III ATMOSPHERIC CHEMISTRY

7 Hours

Atmospheric structure –chemical and photochemical reactions – photochemical smog. Ozone layer depletion – greenhouse gases and global warming, CO_2 capture and sequestration – Acid rain- origin and composition of particulates. Air quality parameters-effects and determination.

UNIT IV SOIL CHEMISTRY

9 Hours

Nature and composition of soil-Clays- cation exchange capacity-acid base and ion-exchange reactions in soil – Agricultural chemicals in soil-Reclamation of contaminated land; salt by leaching-Heavy metals by electrokinetic remediation.

UNIT V ENVIRONMENTAL CHEMICALS

9 Hours

Heavy metals-Chemical speciation –Speciation of Hg &As- Organic chemicals- Pesticides, Dioxins, PCBs, PAHs and endocrine disruptors and their Toxicity- Nano materials, CNT, titania, composites, environmental applications.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

- CO1: Solve environmental issues of chemicals based Pollution
- CO2: Determine chemicals need calculations for treatment purpose
- CO3: Identify contaminating chemicals

REFERENCES:

1. Sawyer,C.N., MacCarty, P.L. and Parkin, G.F., Chemistry for Environmental Engineering and Science, Tata McGraw – Hill, Fifth edition, New Delhi 2003.
3. Colin Baird „Environmental Chemistry“, Freeman and company, New York, 1997.
4. Manahan, S.E., Environmental Chemistry, Eighth Edition, CRC press, 2005.
5. Ronbald A. Hites ,Elements of Environmental Chemistry, Wiley, 2007.

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1702EV103

ENVIRONMENTAL MICROBIOLOGY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To Understand the microbiology relevant to environmental engineering
2. The morphology, behavior and biochemistry of bacteria, fungi, protozoa, viruses, and algae
3. The microbiology of wastewater, sewage sludge and solid waste treatment processes
4. An exposure to toxicology due to industrial products and byproducts
5. Aspects on nutrient removal and the transmission of disease causing organisms

UNIT I CLASSIFICATION AND CHARACTERISTICS 5 Hours

Classification of microorganisms – prokaryotic, eukaryotic, cell structure, characteristics, Preservation of microorganisms, DNA, RNA, replication, Recombinant DNA technology.

UNIT II MICROBES AND NUTRIENT CYCLES 10 Hours

Distribution of microorganisms – Distribution / diversity of Microorganisms – fresh and marine, terrestrial – microbes in surface soil, Air – outdoor and Indoor, aerosols, biosafety in Laboratory – Extreme Environment – archaeobacteria – Significance in water supplies – problems and control. Transmissible diseases. Biogeochemical cycles----Hydrological - Nitrogen, Carbon, Phosphorus, Sulphur, Cycle – Role of Micro Organism in nutrient cycle.

UNIT III METABOLISM OF MICROORGANISMS 10 Hours

Nutrition and metabolism in microorganisms, growth phases, carbohydrate, protein, lipid metabolism – respiration, aerobic and anaerobic-fermentation, glycolysis, Kreb's cycle, hexose monophosphate pathway, electron transport system, oxidative phosphorylation, environmental factors, enzymes, Bioenergetics.

UNIT IV PATHOGENS IN WASTEWATER 10 Hours

Introduction to Water Borne pathogens and Parasites and their effects on Human, Animal and Plant health, Transmission of pathogens – Bacterial, Viral, Protozoan, and Helminths, Indicator organisms of water – Coliforms- total coliforms, E-coli, Streptococcus, Clostridium, Concentration and detection of virus. Control of microorganisms; Microbiology of biological treatment processes – aerobic and anaerobic, α -oxidation, β -oxidation, nitrification and de-nitrification, eutrophication. Nutrients Removal – BOD, Nitrogen, Phosphate. Microbiology of Sewage Sludge.

UNIT V TOXICOLOGY 10 Hours

Ecotoxicology – toxicants and toxicity, Factors influencing toxicity. Effects – acute, chronic, Test organisms – toxicity testing, Bioconcentration – Bioaccumulation, biomagnification, bioassay, biomonitoring, bioleaching.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

- CO1: Understand the basics of microbiology and their diversity and on the genetic material in the living cell.
- CO2: Understand and describe the type of microorganisms in the environment and the role of microorganisms in the cycling of nutrients in an ecosystem.
- CO3: Understand the role microbial metabolism in a wastewater treatment plant.
- CO4: Know the role of microorganisms in contaminated water and the diseases caused.
- CO5: Conduct and test the toxicity due to various natural and synthetic products in the environment.

References:

1. S.C.Bhatia, Hand Book of Environmental Microbiology, Part 1 and 2, Atlantic Publisher
2. Gabriel Bitton, Wastewater Microbiology, 2nd Edition ,
3. Raina M. Maier, Ian L. Pepper, Charles P. Gerba, Environmental Microbiology, Academic Press.
4. SVS. Rana, Essentials of Ecology and Environmental Science, 3rd Edition, Prentice Hall of India Private Limited
5. Stanley E. Manahan, Environmental Science and Technology, Lewis Publishers.
6. Hurst, C.J. (2002) Manual of Environmental Microbiology. 2nd Ed. ASM PRESS, Washington, D.C. ISBN 1-55581 - 199 - X.
7. Frank C. Lu and Sam Kacew, LU's Basic Toxicology, Taylor & Francis, London (4th Ed), 2002

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1702EV104	TRANSPORT OF WATER AND WASTEWATER	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To educate the students in detailed design concepts related to water transmission mains, water distribution system, sewer networks and storm water drain
2. To educate the students in computer application on design.

UNIT I GENERAL HYDRAULICS AND FLOW MEASUREMENT 8 Hours

Fluid properties; fluid flow – continuity principle, energy principle and momentum principle; frictional head loss in free and pressure flow, minor heads losses, Carrying Capacity–Flow measurement.

UNIT II WATER TRANSMISSION AND DISTRIBUTION 10 Hours

Need for Transport of water and wastewater-Planning of Water System –Selection of pipe materials, Water transmission main design- gravity and pumping main; Selection of Pumps- characteristics-economics; Specials, Jointing, laying and maintenance, water hammer analysis; water distribution pipe networks Design, analysis and optimization – appurtenances – corrosion prevention – minimization of water losses – leak detection Storage reservoirs.

UNIT III WASTEWATER COLLECTION AND CONVEYANCE 10 Hours

Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewer design; Wastewater pumps and pumping stations- sewer appurtenances; material, construction, inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance of corrosive wastewaters.

UNIT IV STORM WATER DRAINAGE 7 Hours

Necessity- - combined and separate system; Estimation of storm water run-off Formulation of rainfall intensity duration and frequency relationships- Rational methods.

UNIT V CASE STUDIES AND SOFTWARE APPLICATIONS 10 Hours

Use of computer software in water transmission, water distribution and sewer design – EPANET 2.0, LOOP version 4.0, SEWER, BRANCH, Canal ++ and GIS based softwares.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

- CO1: Select various pipe materials for water supply main, distribution network and sewer
- CO2: Design water supply main, distribution network and sewer for various field conditions
- CO3: Troubleshooting in water and sewage transmission be able to use various computer software for the design of water and sewage network

REFERENCES:

1. Bajwa, G.S. Practical Handbook on Public Health Engineering, Deep Publishers, Shimla, 2003
2. “Manual on water supply and Treatment”, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. “Manual on Sewerage and Sewage Treatment”, CPHEEO, Ministry of Urban

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1702EV105	PRINCIPLES AND DESIGN OF PHYSICO-CHEMICAL TREATMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To educate the students on the principles and process designs of various treatment systems for water and wastewater.
2. To educate the students on design of treatment systems and the components comprising such systems, leading to the selection of specific process.

UNIT I INTRODUCTION 5 Hours

Pollutants in water and wastewater – characteristics, Standards for performance - Significance of physico-chemical treatment – Selection criteria-types of reactor- reactor selection-batch- continuous type-kinetics

UNIT II TREATMENT PRINCIPLES 10 Hours

Physical treatment - Screening – Mixing, Equalization – Sedimentation – Filtration – Evaporation – Incineration – gas transfer – mass transfer coefficient Adsorption – Isotherms – Membrane separation, Reverse Osmosis, nano filtration, ultra filtration and hyper filtration electro dialysis, distillation – stripping and crystallization – Recent Advances. Principles of Chemical treatment – Coagulation flocculation – Precipitation – flotation solidification and stabilization – Disinfection, Ion exchange, Electrolytic methods, Solvent extraction – advanced oxidation /reduction – Recent Trends

UNIT III DESIGN OF MUNICIPAL WATER TREATMENT PLANTS 10 Hours

Selection of Treatment – Design of municipal water treatment plant units – Aerators – chemical feeding – Flocculation – clarifier – tube settling – filters – Rapid sand filters, slow sand filter, pressure filter, dual media Disinfection - Displacement and gaseous type - Flow charts – Layouts – Hydraulic Profile, PID - construction and O&M aspects – case studies, Residue management – Upgradation of existing plants – Recent Trends.

UNIT IV DESIGN OF INDUSTRIAL WATER TREATMENT PLANTS 10Hours

Design of Industrial Water Treatment Units- Selection of process – Design of softeners – Demineralisers – Reverse osmosis plants –Flow charts – Layouts –Hydraulic Profile, PID - construction and O&M aspects – case studies, Residue management – Upgradation of existing plants – Recent Trends.

UNIT V DESIGN OF WASTEWATER TREATMENT PLANTS 10 Hours

Design of municipal wastewater treatment units-screens-detritors-grit chamber-settling tanks- sludge thickening-sludge dewatering systems-sludge drying beds - Design of Industrial Wastewater Treatment Units-Equalization- Neutralization-Chemical Feeding Devices-mixers- floatation units-oil skimmer Flow charts – Layouts –Hydraulic Profile, PID, construction and O&M aspects – case studies, Retrofitting - Residue management – Upgradation of existing plants – Recent Trends.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1: Develop conceptual schematics required for the treatment of water and wastewater

CO2: Translate pertinent forcing criteria into physical and chemical treatment system.

REFERENCES:

1. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse, Tata McGraw Hill, New Delhi, 2003.
2. Qasim, S.R., Motley, E.M. and Zhu.G. Water works Engineering – Planning, Design and Operation, Prentice Hall, New Delhi, 2002.
3. Lee, C.C. and Shun dar Lin, Handbook of Environmental Engineering Calculations, Mc Graw Hill, New York, 1999.

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1704EV106	ENVIRONMENTAL CHEMISTRY LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To train in the analysis of physical parameters of water and waste water
2. To train in the analysis of chemical parameters of water and waste water

LIST OF EXPERIMENTS:

1. Good Laboratory Practices, Quality control, Calibration of Glassware
2. Sampling and Analysis of water (pH, alkalinity, hardness chloride, Sulphate, turbidity EC, TDS, nitrate, fluoride)
3. Wastewater analysis (BOD, COD, Phosphate, TKN, Oil & Grease, Surfactant and heavy metals).
4. Sampling and analysis of air pollutants Ambient & Stack (RSPM, SO₂ and NO_x)
5. Sampling and characterization of soil (CEC & SAR, pH and K).

TOTAL:45 HOURS

COURSE OUTCOMES:

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

CO1: Assess quality of environment

CO2: Conduct analysis on characteristics of water and waste water

REFERENCES:

1. APHA, Standard Methods for the Examination of Water and Wastewater, 21st Ed. Washington, 2005.
2. Laboratory Manual for the Examination of water, wastewater soil Rump, H.H. and Krist, H. Second Edition, VCH, Germany, 1992.
3. Methods of air sampling & analysis, James P. Lodge Jr(Editor) 3rd Edition, Lewis publishers, Inc, USA, 1989.

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1704EV107	ENVIRONMENTAL MICROBIOLOGY LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To train in the analysis of physical parameters of water and waste water
2. To train in the analysis of chemical parameters of water and waste water

LIST OF EXPERIMENTS:

1. Preparation of culture media
2. Isolation, culturing and Identification of Microorganisms
3. Microorganisms from polluted habitats (soil, water and air)
4. Measurement of growth of microorganisms, Assay of enzymes involved in biotransformation
5. Biodegradation of organic matter in waste water Analysis of air borne microorganisms
6. Staining of bacteria
7. Effect of pH, temperature on microbial growth
8. Pollutant removal using microbes from industrial effluent.
9. Effect of pesticides on soil microorganisms
10. Bacteriological analysis of wastewater (Coliforms, E.coli, Streptococcus) – MPN
11. Bacteriological analysis of wastewater (Coliforms, Streptococcus) - MF techniques
12. Effect of Heavy metals on microbial growth
13. Detection of Anaerobic bacteria (Clostridium sp.)
14. Bioreactors

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

- CO1: Field oriented testing of water, wastewater and solid waste for microbial contamination.
- CO2: Perform toxicity test.

REFERENCES:

1. Standard methods for the examination of water and wastewater, American Public Health Association (21st edition) 2005.
2. Charles Gerba, Environmental Microbiology: A laboratory manual, Elsevier Publications, 2012.
3. Christon J. Hurst, Ronald L. Crawford, Jay L. Garland, David A. Lipson, Aaron L. Mills, and Linda D. Stetzenbach, Manual of Environmental Microbiology, 3rd Edition, ASM Press, 2007.

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1704EV108

COMMUNICATION SKILLS LAB I
(Common to all M.E Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To acquire skills for using English in workplace effectively.
2. To communicate for essential business needs.
3. To prepare students for taking BEC Vantage level examination which is an International Benchmark for English language proficiency of Cambridge English Language Assessment

LIST OF EXPERIMENTS:

1. GRAMMAR AND VOCABULARY

Forming asking complex questions – expressing purpose and function – modal verbs – impersonal passive voice– Reported speech – cause and effect – relative pronouns – expressions followed by – *ing* forms– acronyms – marketing terms / vocabulary – financial terms – collocations – discourse markers

2. LISTENING

Purposes of listening – features of listening texts – potential barriers to listening – specific listening skills – strategies to use when listening– distinguishing relevant from irrelevant information – gap filling exercise – multiple-choice options – note completion – matching and multiple choice questions – listening for specific information, gist, topic, context and function.

3. SPEAKING

Word and sentence stress – clear individual sounds – turn taking – initiating and responding - intonation patterns – pronunciation – mother tongue intrusion– conversation practice – turn-taking and sustaining the interaction by initiating and responding appropriately- Public Speech – Lectures.

4. READING

Purposes of reading – potential barriers to reading – paraphrasing – identifying facts and ideas – skimming and scanning for information – matching statements with texts– spotting reference words – understanding text structure – understanding the ideas in a text – distinguishing between the correct answer and the distracter – understanding cohesion in a text – deciphering contextual meaning of words and phrases – cloze – proof reading - transcoding.

5. WRITING

Paragraphing a text – using appropriate connectives – editing practice –Longer Documents: writing a proposal & Reports, Agenda – Minutes – Circular

TOTAL: 30 HOURS

ADDITIONAL EXPERIMENTS:

1. Body Language: Kinesics, Proxemics, Para linguistic, Nuances of Speech Delivery
2. Personality Development: Building self esteem
3. Team work

COURSE OUTCOMES:

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

CO1: To enable students to get International recognition for work and study.

CO2: To use English confidently in the International business environments.

CO3: To be able to take part in business discussion, read company literature, write formal and informal business correspondences and listen and understand business conversations

REFERENCES:

1. Guy Brook-Hart, “BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student’s Book”, 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Cambridge Examinations Publishing, “Cambridge BEC VANTAGE – Self-study Edition”, Cambridge University Press, UK, 2005.
3. Swets, Paul. W. 1983. The Art of Talking So That People Will Listen: Getting
4. The Process of Writing: Planning and Research, Writing, Drafting and Revising

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NAGAPATTINAM – 611 002



M.E. ENVIRONMENTAL ENGINEERING

Full Time Curriculum and Syllabus

First Year – Second Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1701EV201	Principles and Design of Biological Treatment Systems	3	2	0	4	40	60	100
1702EV202	Air Pollution Monitoring and Control	3	0	0	3	40	60	100
1702EV203	Industrial Waste Management	3	0	0	3	40	60	100
1702EV204	Solid and Hazardous Waste Management	3	0	0	3	40	60	100
1702EV205	Environmental Impact Assessment	3	0	0	3	40	60	100
	Elective-I	3	0	0	3	40	60	100
Laboratory Course								
1704EV206	Unit Operations and Processes Laboratory	0	0	2	1	50	50	100
1704EV207	Technical Seminar	0	0	2	1	100	-	100
1704EV208	Communication Skills Lab II	0	0	2	1	100	-	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1701EV201	PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEMS	L	T	P	C
	(Common to Full time and Part Time)	3	0	0	3

COURSE OBJECTIVES:

1. To educate the students on the principles and process designs of various treatment systems for water and wastewater and students should gain competency in the process employed in design of treatment systems and the components comprising such systems, leading to the selection of specific process.

UNIT I INTRODUCTION 10 Hours

Objectives of biological treatment – significance – Principles of aerobic and anaerobic treatment - kinetics of biological growth – Factors affecting growth – attached and suspended growth - Determination of Kinetic coefficients for organics removal – Biodegradability assessment -selection of process- reactors-batch-continuous type.

UNIT II AEROBIC TREATMENT OF WASTEWATER 10 Hours

Design of sewage treatment plant units –Activated Sludge process and variations, Sequencing Batch reactors, Membrane Biological Reactors-Trickling Filters-Bio Tower-RBC-Moving Bed Reactors-fluidized bed reactors, aerated lagoons, waste stabilization ponds – nutrient removal systems – natural treatment systems, constructed wet land – Disinfection – disposal options – reclamation and reuse – Flow charts, layout, PID, hydraulic profile, recent trends.

UNIT III ANAEROBIC TREATMENT OF WASTEWATER 10 Hours

Attached and suspended growth, Design of units – UASB, up flow filters, Fluidized beds MBR, septic tank and disposal – Nutrient removal systems – Flow chart, Layout and Hydraulic profile – Recent trends.

UNIT IV SLUDGE TREATMENT AND DISPOSAL 5 Hours

Design of sludge management facilities, sludge thickening, sludge digestion, biogas generation, sludge dewatering (mechanical and gravity) Layout, PID, hydraulics profile – upgrading existing plants – ultimate residue disposal – recent advances.

UNIT V CONSTRUCTION OPERATIONS AND MAINTENANCE ASPECTS 10 Hours

Construction and Operational Maintenance problems – Trouble shooting – Planning, Organizing and controlling of plant operations – capacity building - Retrofitting Case studies – sewage treatment plants – sludge management facilities.

Total: 45 Hours

Course Outcomes:

After completion of the course, Student will be able to

1. Develop conceptual schematics required for biological treatment of wastewater
2. Translate pertinent criteria into system requirements.

References:

1. Arceivala, S.J., Wastewater Treatment for Pollution Control, TMH, New Delhi, Second Edition, 2000.
2. Manual on “Sewerage and Sewage Treatment” CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. Metcalf & Eddy, INC, „Wastewater Engineering – Treatment and Reuse, Fourth Edition, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2003.
4. F.R. Spellman, Hand Book of Water and Wastewater Treatment Plant operations, CRC Press, New York (2009).

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1702EV202	AIR POLLUTION MONITORING AND CONTROL (Common to Full time and Part Time)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To impart knowledge on the principles and design of control of indoor/particulate/gaseous air pollutant and its emerging trends.

UNIT I INTRODUCTION **7 Hours**

Structure and composition of Atmosphere – Sources and classification of air pollutants - Effects of air pollutants on human health, vegetation & animals, Materials & Structures – Effects of air Pollutants on the atmosphere, Soil & Water bodies – Long- term effects on the planet – Global Climate Change, Ozone Holes – Ambient Air Quality and Emission Standards – Air Pollution Indices – Emission Inventories – Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II AIR POLLUTION MODELLING **5 Hours**

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Transport & Dispersion of Air Pollutants – Modeling Techniques - Air Pollution Climatology.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS **11 Hours**

Factors affecting Selection of Control Equipment – Gas Particle Interaction, – Working principle, Design and performance equations of Gravity Separators (cyclone) , Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations - Process Control and Monitoring – Costing of APC equipment – Case studies for stationary and mobile sources.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS **11 Hours**

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations - Costing of APC Equipment – Case studies for stationary and mobile sources.

UNIT V INDOOR AIR QUALITY MANAGEMENT **11 Hours**

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control – Membrane process - UV photolysis – Internal Combustion Engines - Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

Total: 45 Hours

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Apply sampling techniques
2. Apply modelling techniques
3. Suggest suitable air pollution prevention equipment's and techniques for various gaseous and particulate pollutants to Industries. Discuss the emission standards

REFERENCES:

1. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004.
2. Noel de Nevers, Air Pollution Control Engg., Mc Graw Hill, New York, 1995.
3. David H.F. Liu, Bela G. Liptak „Air Pollution“, Lweis Publishers, 2000.
4. Anjaneyulu. Y, „Air Pollution & Control Technologies“ Allied Publishers (P) Ltd., India, 2002.
5. Arthur C.Stern, „Air Pollution (Vol.I – Vol.VIII)“, Academic Press, 2006.
6. Wayne T.Davis, „Air Pollution Engineering Manual“, John Wiley & Sons,Inc.,2000.
7. Daniel Vallero “Fundamentals of Air Pollution”, Fourth Edition,2008.

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1702EV203

INDUSTRIAL WASTE MANAGEMENT
(Common to Full time and Part Time)

L T P C
3 0 0 3

COURSE OBJECTIVES:

To impart knowledge on the concept and application of Industrial pollution prevention, cleaner technologies, industrial wastewater treatment and residue management.

UNIT I INTRODUCTION

8 Hours

Industrial scenario in India– Industrial activity and Environment - Uses of Water by industry – Sources and types of industrial wastewater – Nature and Origin of Pollutants - Industrial wastewater and environmental impacts – Regulatory requirements for treatment of industrial wastewater – Industrial waste survey – Industrial wastewater monitoring and sampling -generation rates, characterization and variables –Toxicity of industrial effluents and Bioassay tests – Major issues on water quality management.

UNIT II INDUSTRIAL POLLUTION PREVENTION & WASTE MINIMISATION

8 Hours

Prevention vis a vis Control of Industrial Pollution – Benefits and Barriers – Waste management Hierarchy - Source reduction techniques – Periodic Waste Minimisation Assessments – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay-back period – Implementing & Promoting Pollution Prevention Programs in Industries.

UNIT III INDUSTRIAL WASTEWATER TREATMENT

10 Hours

Flow and Load Equalisation – Solids Separation – Removal of Fats, Oil & Grease- Neutralisation – Removal of Inorganic Constituents – Precipitation, Heavy metal removal , Nitrogen & Phosphorous removal, Ion exchange, Adsorption, Membrane Filtration, Eletrodialysis & Evaporation – Removal of Organic Constituents – Biological treatment Processes, Chemical Oxidation Processes, Advanced Oxidation processes – Treatability Studies.

UNIT IV WASTEWATER REUSE AND RESIDUAL MANAGEMENT

9 Hours

Individual and Common Effluent Treatment Plants – Joint treatment of industrial and domestic wastewater - Zero effluent discharge systems - Quality requirements for Wastewater reuse – Industrial reuse , Present status and issues - Disposal on water and land – Residuals of industrial wastewater treatment – Quantification and characteristics of Sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge – Management of RO rejects.

UNIT V CASE STUDIES

10 Hours

Industrial manufacturing process description, wastewater characteristics, source reduction options and waste treatment flow sheet for Textiles – Tanneries – Pulp and paper – metal finishing – Oil Refining – Pharmaceuticals – Sugar and Distilleries.

Total: 45 Hours

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Define the Principles of pollution prevention and mechanism of oxidation processes.
2. Suggest the suitable technologies for the treatment of wastewater.
3. Discuss about the wastewater characteristics
4. Design the treatment systems

REFERENCES:

1. Industrial wastewater management, treatment & disposal, Water Environment
2. Lawrence K. Wang, Yung . Tse Hung, Howard H.Lo and Constantine Yapijakis, “ handbook of Industrial and Hazardous waste Treatment”, Second Edition, 2004.
3. Metcalf & Eddy/ AECOM, water reuse Issues, Technologies and Applications, The Mc Graw- Hill companies, 2007.
4. Nelson Leonard Nemerow, “industrial waste Treatment”, Elsevier, 2007.
5. W.Wesley Eckenfelder, “Industrial Water Pollution Control”, Second Edition, Mc Graw Hill, 1989.
6. Paul L. Bishop, „Pollution Prevention: - Fundamentals and Practice“, Mc-Graw Hill International, Boston, 2000.

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1702EV204	SOLID AND HAZARDOUS WASTE MANAGEMENT (Common to Full time and Part Time)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

I. To impart knowledge and skills in the collection, storage, transport, treatment, disposal and recycling options for solid wastes including the related engineering principles, design criteria, methods and equipment.

UNIT I SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK 9 Hours

Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management — Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, nuclear wastes - lead acid batteries, electronic wastes , plastics and fly ash – Elements of integrated waste management and roles of stakeholders - Financing and Public Private Participation for waste management.

UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION 8 Hours

Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse.

UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES 9 Hours

Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation–compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport.

UNIT IV WASTE PROCESSING TECHNOLOGIES 10 Hours

Objectives of waste processing – material separation and processing technologies – biological and chemical conversion technologies – methods and controls of Composting - thermal conversion technologies and energy recovery – incineration – solidification and stabilization of hazardous wastes - treatment of biomedical wastes - Health considerations in the context of operation of facilities, handling of materials and impact of outputs on the environment.

UNIT V WASTE DISPOSAL 9 Hours

Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation.

Total: 45 Hours

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Understand the characteristics of different types of solid and hazardous wastes and the factors affecting variation
2. Define and explain important concepts in the field of solid waste management and suggest suitable technical solutions for treatment of municipal and industrial waste
3. Understand the role legislation and policy drivers play in stakeholders' response to the waste and apply the basic scientific principles for solving practical waste management challenges

REFERENCES:

1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc-Graw Hill International edition, New York, 1993.
2. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.
3. CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2000.
4. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002.
5. Paul T Williams, Waste Treatment and Disposal, Wiley, 2005

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1702EV205	ENVIRONMENTAL IMPACT ASSESSMENT (Common to Full time and Part Time)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1. To expose the students to the need, methodology, documentation and usefulness of environmental impact assessment and to develop the skill to prepare environmental management plan.
2. To provide knowledge related to the broad field of environmental risk assessment, important processes that control contaminant transport and tools that can be used in predicting and managing human health risks.

UNIT I INTRODUCTION 8 Hours

Historical development of Environmental Impact Assessment (EIA). EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA – EIA process- screening – scoping - setting – analysis – mitigation. Cross sectoral issues and terms of reference in EIA – Public Participation in EIA.

UNIT II IMPACT IDENTIFICATION AND PREDICTION 10 Hours

Matrices – Networks – Checklists – Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological – Cumulative Impact Assessment.

UNIT III SOCIAL IMPACT ASSESSMENT AND EIA DOCUMENTATION 8 Hours

Social impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 7 Hours

Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies.

UNIT V ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT 12 Hours

Environmental risk assessment framework-Hazard identification -Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment- HAZOP and FEMA methods – Event tree and fault tree analysis – Multimedia and multipathway exposure modeling of contaminant- Risk Characterization Risk communication - Emergency Preparedness Plans – Design of risk management programs.

TOTAL: 45 HOURS

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Understand the necessity to study the impacts and risks that will be caused by projects or industries and the methods to overcome these impacts.
2. Know about the legal requirements of Environmental and Risk Assessment for projects.

REFERENCES:

1. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996
2. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003 World Bank –Source book on EIA
3. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff “Risk Assessment and Management Handbook”, McGraw Hill Inc., New York, 1996.
5. K. V. Raghavan and A A. Khan, Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990.
6. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

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1704EV206	UNIT OPERATIONS AND PROCESSES LABORATORY (Common to Full time and Part Time)	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

1. To develop the skill for conducting Treatability studies of water and wastewater treatment by various Unit Operations and Processes using laboratory scale models.
2. To develop the skill for conducting Treatability studies of water and wastewater treatment by various Unit Operations and Processes using laboratory scale models.

LIST OF EXPERIMENTS:

1. Coagulation and Flocculation
2. Batch studies on settling
3. Studies on Filtration- Characteristics of Filter media
4. Water softening
5. Adsorption studies/Kinetics
6. Reverse Osmosis- Silt Density Index
7. Kinetics of suspended growth process (activated sludge process)- Sludge volume Index
8. Anaerobic Reactor systems / kinetics (Demonstration)
9. Advanced Oxidation Processes – (Ozonation, Photocatalysis)
10. Disinfection for Drinking water

Employability **Total: 45 Hours**

COURSE OUTCOMES:

After completion of the course, Student will be able to

1. Conduct treatability studies for water and waste water treatment.
2. Design laboratory models for various unit operations and processes.

REFERENCES:

1. Metcalf and Eddy. Inc. „Wastewater Engineering, Treatment, Disposal and Reuse, Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. Lee, C.C. and Shun dar Lin. Handbook of Environmental Engineering Calculations, Mc Graw Hill, New York, 1999.
3. Casey T.J., Unit Treatment Processes in Water and Wastewater Engineering, John Wileys Sons, London, 1993.
4. David W.Hendricks, „Water Treatment Unit Processes: Physical and Chemical“, CRC Press, Boca Raton, 2006.

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1704EV208

COMMUNICATION SKILLS LAB II
(Common to all M.E Programmes)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To prepare students for taking BEC Vantage level examination conducted by the Cambridge English Language Assessment (CELA).
2. To communicate appropriately in business contexts.
3. To acquire skills for using English in business environment.

LIST OF EXPERIMENTS:

UNIT I SPEAKING

Non-verbal communication – agreeing / disagreeing, reaching decisions, giving and supporting opinions – making mini presentations – extending on conversations – collaborative task – tongue twisters.

UNIT II WRITING

Business letters – fax – Shorter Documents: e-mail - memo – message - note – report writing – formal / informal styles.

Skills

TOTAL: 30 HOURS

COURSE OUTCOMES:

- On the successful completion of the course, students will be able to
- CO1: Enable students to acquire business terms for communication.
 - CO2: Use English confidently in the business contexts.
 - CO3: Take part in business discussion and write formal and informal business correspondences.

REFERENCES:

1. Guy Brook-Hart, BEC VANTAGE: BUSINESS BENCHMARK Upper-Intermediate – Student's Book, 1st Edition, Cambridge University Press, New Delhi, 2006.
2. Cambridge Examinations Publishing, Cambridge BEC VANTAGE – Self-study Edition, Cambridge University Press, UK, 2005.

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E.G.S. PILLAY ENGINEERING COLLEGE

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NAGAPATTINAM – 611 002



M.E. ENVIRONMENTAL ENGINEERING

Full Time Curriculum and Syllabus

Second Year – Third Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1703EV008	Elective III- Membrane Technologies For Water And Waste Water Treatment	2	2	0	3	40	60	100
1703EV009	Elective IV- Remote Sensing and GIS Applications In Environmental Management	3	0	0	3	40	60	100
1703MF021	Elective V- Project Management	3	0	0	3	40	60	100
Laboratory Course								
1704EV301	Project Work Phase-I	0	0	12	6	50	50	100
Open Electives								
1703EV016	Air Pollution Monitoring and Control	3	0	0	3	40	60	100
1703EV017	Industrial Waste Management	3	0	0	3	40	60	100
1703EV018	Environmental Instrumentation	3	0	0	3	40	60	100
1703EV019	Cleaner Production and Environmental Management	3	0	0	3	40	60	100
1703EV020	Environmental Engineering And Pollution Control	3	0	0	3	40	60	100

L – Lecture | T – Tutorial | P – Practical | C – Credit | CA – Continuous Assessment | ES – End Semester

1703EV008	MEMBRANE TECHNOLOGIES FOR WATER AND WASTE WATER TREATMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

Principles and design of physic-chemical treatment systems.

COURSE OBJECTIVES:

1. To impart knowledge on the membrane filtration process.
2. To educate the students about the advanced membrane systems and design of bioreactors.
3. To develop the pretreatment and membrane treatment units.

UNIT I MEMBRANE FILTRATION PROCESSES 10 Hours

Solid Liquid separation systems- Theory of Membrane separation – mass Transport Characteristics- Cross Flow filtration - Membrane Filtration- Flux and Pressure drop -Types and choice of membranes, porous, non-porous, symmetric and asymmetric – Plate and Frame, spiral wound and hollow fibre membranes – Liquid Membranes.

UNIT II MEMBRANE SYSTEMS 10 Hours

Microfiltration principles and applications – Ultra filtration principles and applications - Nano Filtration principles and applications – Reverse Osmosis: Theory and design of modules, assembly, plant process control and applications – Electro dialysis : Ion exchange membranes, process design- Pervaporation – Liquid membrane – Liquid Pertraction – Supported Liquid Membrane and Emulsion Liquid membrane - Membrane manufactures – Membrane Module/Element designs – Membrane System components – Design of Membrane systems - pump types and Pump selection– Plant operations – Economics of Membrane systems.

UNIT III MEMBRANE BIOREACTORS 9 Hours

Introduction and Historical Perspective of MBRs, Biotreatment Fundamentals, Biomass Separation MBR Principles, Fouling and Fouling Control, MBR Design Principles, Design Assignment, Alternative MBR Configurations, Commercial Technologies, Case Studies.

UNIT IV PRETREATMENT SYSTEMS 8 Hours

Membrane Fouling – Control of Fouling and Concentration Polarisation-Pretreatment methods and strategies – monitoring of Pretreatment – Langlier Index, Silt Density Index, Chemical cleaning , Biofoulant control.

UNIT V CASE STUDIES 8 Hours

Case studies on the design of membrane based water and wastewater treatment systems – zero Liquid effluent discharge Plants – Desalination of brackish water.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

Analyzing and developing the existing membrane systems with the help of recent technologies

COURSE OUTCOMES:

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

- CO1 Familiar with main membrane processes, principles, separation mechanisms, and applications.
- CO2 Understand the selection criteria for different membrane processes.
- CO3 Know the principle of the most common membrane applications.
- CO4 Analyze and design the pretreatment systems.
- CO5 Carry out design of project for a particular membrane technology application.

REFERENCES:

1. Anthony Wachinski, Membrane Processes for water reuse, McGraw-Hill, USA, 2013
2. Baker, R.W., "Membrane technology and applications", 2nd., John Wiley 2004
3. Jorgen Wagner, "Membrane Filtration handbook, Practical Tips and Hints, 2nd Edition, Revision2, Osmonics Inc., 2001.
4. Noble, R.D. and Stern, S.A., "Membrane Applications", Elsevier, Netherlands, 1995.
5. Symon Jud, MBR Book – "Principles and application of MBR in water and wastewater treatment", Elsevier, 2006.

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1703EV009	REMOTE SENSING AND GIS APPLICATIONS IN ENVIRONMENTAL MANAGEMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

Basics on remote sensing and GIS applications

COURSE OBJECTIVES:

1. To educate the students on aspects of Remote Sensing.
2. Develop the different remote sensing technique.
3. To educate the students on aspects of GIS and data management.
4. Develop the GIS Applications for monitoring and management of environment.

UNIT I REMOTE SENSING ELEMENTS 8 Hours

Historical Perspective, Principles of remote sensing, components of Remote Sensing, Energy source and electromagnetic radiation, Electromagnetic spectrum, Energy interaction, Spectral response pattern of earth surface features, Energy recording technology.

UNIT II REMOTE SENSING TECHNOLOGY 9 Hours

Classification of Remote Sensing Systems, Aerial photographs, Photographic systems – Across track and along track scanning, Multispectral remote sensing, Thermal remote sensing, Microwave remote sensing – Active and passive sensors, RADAR, LIDAR

UNIT III SOCIAL IMPACT ASSESSMENT AND EIA DOCUMENTATION 9 Hours

Social impact assessment - Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Communities in transition Documentation of EIA findings – planning – organization of information and visual display materials – Report preparation.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 10 Hours

Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment- Case Studies.

UNIT V ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT 9 Hours

Environmental risk assessment framework-Hazard identification -Dose Response Evaluation – Exposure Assessment – Exposure Factors, Tools for Environmental Risk Assessment– HAZOP and FEMA methods – Event tree and fault tree analysis – Multimedia and multipathway exposure modeling of contaminant- Risk Characterization Risk communication - Emergency Preparedness Plans –Design of risk management programs.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

Case studies on environmental risk assessment using Remote sensing and GIS applications.

COURSE OUTCOMES:

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

- CO1 Understand the principles of basic elements of remote sensing
- CO2 Know about the various the remote sensing techniques
- CO3 Prepare EIA documentations with the help of GIS applications
- CO4 Know about the legal requirements of Environmental and Risk Assessment for projects.
- CO5 Understand the necessity to study the impacts and risks that will be caused by projects or industries and the methods to overcome these impacts.

REFERENCES:

1. Canter, L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996
2. Lawrence, D.P., Environmental Impact Assessment – Practical solutions to recurrent problems, Wiley-Interscience, New Jersey. 2003 World Bank –Source book on EIA
3. Cutter, S.L., Environmental Risk and Hazards, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff “Risk Assessment and Management Handbook”, McGraw Hill Inc., New York,1996.
5. K. V. Raghavan and A A. Khan, Methodologies in Hazard Identification and Risk Assessment, Manual by CLRI, 1990.
6. Sam Mannan, Lees' Loss Prevention in the Process Industries, Hazard Identification, Assessment and Control, 4th Edition, Butterworth Heineman, 2012.

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1703MF021	PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

PREREQUISITE :

1. Total Quality Management
2. Professional Ethics

COURSE OBJECTIVES:

1. To make the students to have on methods for project identification & appraisal.
2. To make the students to understand the Define and plan a project within the constraints of the environment
3. To make the students to have on Develop & analyze quantitative models for project selection & scheduling

UNIT I INTRODUCTION 9 Hours

Introduction - Project Management: An Overview – Types, Characteristics of Projects – Project life cycle. Identification of investment opportunities - Screening and Selection, Project Appraisal.

UNIT II TECHNICAL ANALYSIS 9 Hours

Market and demand analysis- market survey-demand forecasting methods-Technical analysis – manufacturing process, materials-product mix, plant location-project charts and layouts.

UNIT III FINANCIAL ANALYSIS 9 Hours

Financial analysis – cash flows for project appraisal- Investment evaluation using capital budgeting techniques - net present value, profitability index internal rate of return, payback period, accounting rate of return.

UNIT IV NETWORK MANAGEMENT 9 Hours

Mathematical Techniques for project evaluation – Linear programming, goal programming, Network technique for Project Management – CPM, PERT, Multiple projects and constraints, scheduling.

UNIT V PROJECT MANAGEMENT 9 Hours

Organization systems for project implementation- Work Breakdown-coordination and control- Project Management Software's.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Software for project management.
2. Software for financial analysis.
3. Project management for automotive industry.

COURSE OUTCOMES:

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

- CO1 Explain the methods for project identification & appraisal.
- CO2 Define and plan a project within the constraints of the environment
- CO3 Develop & analyze quantitative models for project selection & scheduling.
- CO4 Analyse network techniques using CPM and PRT.
- CO5 Organise the system for project implementation.

REFERENCES:

1. Prasanna Chandra, "Projects – Planning, Analysis, Financing, Implementation and Review", Tata McGraw Hill, 4th Ed, 1997
2. S.Choudry "Project Management", Tata McGraw Hill, 27th Edition, 2006.
3. John M Nicholas, "Project Management for Business and Technology", 2nd Edition, Pearson Education Asia, 2001

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