ACADEMIC REGULATIONS

COURSE STRUCTURE AND SYLLABUS

B.TECH.

CIVIL ENGINEERING

Effective for the B.Tech. Students admitted into first year For The academic year

2020-2021

PRAGNANAM BRAHMA
ANITS
(AUTONOMOUS)

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (AUTONOMOUS)
Approved by AICTE & Affiliated to Andhra University
SANGIVALASA-531162, BHEEMUNIPATNAM MANDAL, VISAKHAPATNAM DISTRICT

Institute Vision

ANITS envisions to emerge as a world-class technical institution whose products represent a good blend of technological excellence and the best of human values.

Institute Mission

To train young men and women into competent and confident engineers with excellent communicational skills, to face the challenges of future technology changes, by imparting holistic technical education using the best of infrastructure, outstanding technical and teaching expertise and an exemplary work culture, besides molding them into good citizens.

Quality Policy

ANITS is engaged in imparting quality technical education. It constantly strives towards achieving high standards of teaching, training and development of human resources by encouraging its faculty and staff to work as a team and to update their knowledge and skills continually to match the needs of industry.

Department of Civil Engineering

Vision

Our Vision is to be among the preeminent Civil Engineering Departments of the Country and the World for building future Civil Engineers characterized by technological excellence and human values.

Mission

Our Mission is Education. We achieve this mission through teaching, research, and consultancy in Civil Engineering with creativity, quality, sustainability, service and values as the foundational hall marks.

Programme Educational Objectives

1. The Program is expected to enable the students, within 3 to 5 years of their graduation, to: engage successfully in the practice of civil engineering profession within industry, government, or through private practice, post-graduate studies or alternate career paths
2. analyze, design and build safe, sustainable and economical civil engineering structures by applying their knowledge in one or more of the major areas of civil engineering, including environmental, geotechnical, structural, transportation, and water resources
3. apply the knowledge of mathematics, basic science, core and civil engineering to the formulation and solution of complex engineering problems as members of multidisciplinary teams.
4. develop their communication skills and leadership skills and become competent, ethical and responsible professionals
5. engage in life-long learning and service to their profession for betterment of society and environment

Program Outcomes

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

Program Specific Outcomes

1. Civil Engineering Knowledge: Analyse & design solutions to complex problems by applying fundamentals of sciences and civil engineering in one or more of its major areas such as structural, geo-technical, water resources, transportation and environmental engineering.

2. Conduct investigations of complex civil engineering problems: Use modern techniques and tools to design and conduct experiments, prepare and interpret plans and reports with valid conclusions and recommendations.

3. Civil engineer and society: Develop civil engineering solutions based on societal, health, safety, legal, cultural and environmental considerations for sustainable development.

CIVIL ENGINEERING (4 Year B.Tech Programme) - COURSE CURRICULUM R-20

I Year Course structure

Semester - I

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV111	EngineeringMathematics – I	BS	3	0	0	1	6	10	40	60	100	3
CIV112	Engineering Physics	BS	3	0	0	1	4	8	40	60	100	3
CIV113	Engineering Chemistry	BS	3	0	0	1	4	8	40	60	100	3
CIV114	Building Technology	PC	2	1	0	1	2	6	40	60	100	3
CIV115	Engineering Drawing	ES	2	0	3	1	4	10	40	60	100	3.5
CIV116	Engineering Physics Lab	BS	0	0	3	0	1	4	50	50	100	1.5
CIV117	Engineering Chemistry Lab	BS	0	0	3	0	1	4	50	50	100	1.5
CIV118	Engineering Workshop	ES	0	0	3	0	1	4	50	50	100	1.5
CIV119	Human Values and Professional Ethics(Mandatory non-credit course)	MC	3	0	0	0	1	4	50	0	50	-
Total			**16**	**1**	**12**	**5**	**24**	**58**	**400**	**450**	**850**	**20**

Semester - II

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV121	EngineeringMathematics – II	BS	3	0	0	1	6	10	40	60	100	3
CIV122	Communicative English	HSS	3	0	0	0	2	5	40	60	100	3
CIV123	Engineering Geology	BS	2	0	1	1	2	6	40	60	100	3
CIV124	Engineering Mechanics	ES	2	1	0	1	4	8	40	60	100	3
CIV125	Problem solving with C	ES	3	0	0	1	3	7	40	60	100	3
CIV126	English Language Lab	HSS	0	0	3	0	1	4	50	50	100	1.5
CIV127	Problem solving with C– lab	ES	0	0	3	0	1	4	50	50	100	1.5
CIV128	Environmental Science (Mandatory non-credit course)	MC	3	0	0	0	1	4	50	0	50	-
Total			**16**	**1**	**7**	**4**	**20**	**48**	**350**	**400**	**750**	**18**

II Year Course structure

Semester - I

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV211	Engineering Mathematics - III	BS	2	1	0	1	2	6	40	60	100	3
CIV212	Building Planning & Design	SOC	2	0	2	1	2	7	40	60	100	3
CIV213	Environmental Engineering-I	PC	2	1	0	1	2	6	40	60	100	3
CIV214	Strength of Materials	ES	2	1	0	2	3	8	40	60	100	3
CIV215	Surveying & Geomatics	ES	3	1	0	1	2	7	40	60	100	4
CIV216	Surveying Field Work	SOC	0	0	3	0	1	4	50	50	100	1.5
CIV217	Strength of Materials Lab	PC	0	0	3	0	1	4	50	50	100	1.5
CIV218	Environmental Engineering Lab	PC	0	0	3	0	1	4	50	50	100	1.5
Total			**11**	**4**	**11**	**6**	**14**	**40**	**340**	**460**	**800**	**20.5**

Semester - II

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV221	Environmental Engineering-II	PC	2	1	0	2	2	7	40	60	100	3
CIV222	Fluid Mechanics-I	PC	2	1	0	2	3	8	40	60	100	3
CIV223	Concrete Technology	PC	3	0	0	1	2	6	40	60	100	3
CIV224	Geotechnical Engineering – I	PC	2	1	0	2	2	7	40	60	100	3
CIV225	Structural Analysis – I	PC	2	1	0	2	3	8	40	60	100	3
CIV226	Building Architecture with Revit	SOC	0	0	3	0	1	4	50	50	100	1.5
CIV227	Concrete Technology Lab	PC	0	0	3	0	1	4	50	50	100	1.5
CIV228	Geotechnical Engineering Lab	PC	0	0	3	0	1	4	50	50	100	1.5
CIV229	Summer Internship-I*	PR	0	0	0	0	4	4	-	-	-	-
Total			**11**	**4**	**9**	**9**	**19**	**52**	**350**	**450**	**800**	**19.5**

* Summer internship-I to be conducted after II year-II semester and evaluated in III year-I semester

III Year Course structure

Semester - I

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV311	Open Elective-I#	OE	2	1	0	1	2	6	40	60	100	3
CIV312	Fluid Mechanics-II	PC	2	1	0	2	4	9	40	60	100	3
CIV313	Geotechnical Engineering – II	PC	2	1	0	2	3	8	40	60	100	4
CIV314	Reinforced Concrete Structures-I	PC	2	1	0	2	2	7	40	60	100	3
CIV315	Structural Analysis – II	PC	2	1	0	2	3	8	40	60	100	3
CIV316	Computer Applications in Civil Engineering Lab	SOC	0	0	3	0	1	4	50	50	100	1.5
CIV317	Fluid Mechanics Lab	PC	0	0	3	0	1	4	50	50	100	1.5
CIV318	Technical Seminar	PR	0	0	3	0	1	4	100	-	100	2
CIV319	Quantitative Aptitude-I & Verbal Aptitude-I	HSS	0	0	3	1	3	7	100	0	100	1.5
CIV3110	Summer Internship-I*	PR	0	0	0	0	4	4	100	-	100	1.5
Total			**10**	**5**	**12**	**10**	**24**	**61**	**600**	**400**	**1000**	**24**

Semester - II

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV321	Open Elective-II#	OE	2	1	0	1	2	6	40	60	100	3
CIV322	Professional Elective – I	PE	3	0	0	1	2	6	40	60	100	3
CIV323	Steel Structures	PC	2	1	0	2	3	8	40	60	100	3
CIV324	Reinforced Concrete Structures-II	PC	2	1	0	2	3	8	40	60	100	4
CIV325	Highway Engineering	PC	2	1	0	1	2	6	40	60	100	4
CIV326	Irrigation Engineering	PC	2	1	0	2	2	7	40	60	100	4
CIV327	Structural Analysis & Design using Staad Pro	SOC	0	0	3	0	2	5	50	50	100	1.5
CIV328	Transportation Engineering Lab	PC	0	0	3	0	1	4	50	50	100	1.5
CIV329	Quantitative Aptitude-II & Soft Skills	HSS	0	0	3	2	3	8	100	0	100	1.5
CIV3210	Summer Internship-II*	PR	0	0	0	0	4	4	-	-	-	-
Total			**13**	**5**	**9**	**11**	**24**	**62**	**440**	**460**	**900**	**25.5**

 # Open Electives can be either interdisciplinary subjects/emerging subject/MOOCs as decided by the Department.

*** Summer Intership-II** *to be conducted after III year-II semester and evaluated in IV year-I semester*

IV Year Course structure

Semester - I

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV411	Open Elective-III#	OE	2	1	0	1	2	6	40	60	100	3
CIV412	Estimation & Costing	PC	2	1	0	2	3	8	40	60	100	3
CIV413	Professional Elective – II	PE	3	0	0	1	2	6	40	60	100	3
CIV414	Professional Elective – III	PE	3	0	0	1	2	6	40	60	100	3
CIV415	Professional Elective – IV	PE	2	1	0	2	3	8	40	60	100	3
CIV416	Project work-I	PR	0	0	6	0	6	12	100	-	100	2
CIV417	Summer Internship-II*	PR	0	0	0	0	4	4	100	-	100	1.5
Total			**12**	**3**	**6**	**7**	**22**	**50**	**400**	**300**	**700**	**18.5**

Semester - II

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV421	Open Elective - IV# (MOOCs)	OE	2	1	0	1	2	6	40	60	100	3
CIV422	Professional Elective – V(MOOCs)	PE	2	1	0	1	2	6	40	60	100	3
CIV423	Project Work –II	PR	0	0	9	0	9	18	50	50	100	8
Total			**4**	**2**	**9**	**2**	**13**	**30**	**130**	**170**	**300**	**14**

*** Summer Intership-II** *to be conducted after III year-II semester and evaluated in IV year-I semester*

 # Open Electives can be either interdisciplinary subjects/emerging subject/MOOCs as decided by the Department.

ENGINEERING MATHEMATICS-I

MATRIX ALGEBRA & MULTIVARIABLE CALCULUS
Common to all branches

Course Code - Category: CIV 111 - BS **Credits:3**

L	**T**	**P**	**E**	**O**	Sessional Marks:40
3	**0**	**0**	**1**	**6**	
End Exam: 3 Hours					End Exam Marks:60

Course Objective:

- To provide the students with sufficient knowledge in calculus and matrix algebra, this can be used in their respective fields.

Course outcomes:

The students will be able to

CO1	Apply elementary transformations to reduce the matrix into the echelon form and normal form to determine its rank and interpret the various solutions of system of linear equations
CO2	Identify the special properties of a matrix such as the eigen value, eigen vector, employ orthogonal transformations to express the matrix into diagonal form, quadratic form and canonical form
CO3	Equip themselves familiar with the functions of several variables and mean value theorems
CO4	Evaluate double and triple integrals techniques over a region in two dimensional and three dimensional geometry
CO5	Familiarize with special functions to evaluate some proper and improper integrals using beta and gamma functions

SYLLABUS

UNIT – I 10 Periods

LINEAR EQUATIONS:

Rank of matrix, normal form of a matrix, PAQ form, Gauss Jordan Method of finding the inverse, consistency of linear system of equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve the system of equations using the rank.

UNIT – II 14 Periods

LINEAR TRANSFORMATIONS AND QUADRATIC FORMS

Linear transformations, orthogonal transformations, vectors (linearly independent & dependent), eigen values, eigen vectors, properties of eigen values, Cayley - Hamilton theorem (without proof), reduction to diagonal form, reduction of Quadratic form to Canonical form, nature of the Quadratic form.

Learning outcome:

At the end of this unit, student will be able to

- Identify the special properties of a matrix such as the eigen values, eigen vectors, diagonal form and nature of the quadratic forms.

UNIT – III 12 Periods

SINGLE AND MULTIVARIABLE CALCULUS

Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (All theorems without proof). Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, Taylor's series expansion of two variable function, maxima and minima of functions of two variables, method of Lagrange's multipliers.

Learning outcome:

At the end of the unit, student will be able to

- Analyze the behavior of functions by using mean value theorems.
- Estimate the maxima and minima of multivariable functions.

UNIT – IV 14 Periods

MULTIPLE INTEGRALS

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves, evaluation of triple integrals, volumes of solids, change of variables between cartesia, cylindrical and spherical polar coordinates, calculation of mass, center of gravity

Learning outcome:

At the end of the unit, the student will be able to

- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates.
- Apply double and triple integration techniques in evaluating areas and volumes bounded by a region.

UNIT -V 10 Periods

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, valuation of double and triple integrals by using Beta and Gamma functions, error function.

Learning outcome:

At the end of this unit, the student will be able to

- Conclude the use of special functions in multiple integrals.

Textbooks:

1. **B. S. Grewal**, "*Higher Engineering Mathematics"*, 44/e, Khanna Publishers, 2017.
2. **Erwin Kreyszig**, "*Advanced Engineering Mathematics"*, 10/e, John Wiley& Sons, 2011.

References:

1. **N. P. Bali**, "*Engineering Mathematics"*, Lakshmi Publications.
2. **George B. Thomas, Maurice D. Weir and Joel Hass**, "*Thomas Calculus"*, 13/e, Pearson Publishers, 2013.
3. **H. K. Dass**, "Advanced Engineering Mathematics", S. Chand and complany Pvt. Ltd.

4. **Michael Greenberg**, "*Advanced Engineering Mathematics"*, Pearson, Second Edition.

ENGINEERING PHYSICS (THEORY)

Course Code - Category: CIV 112 - BS **Credits:3**

L	T	P	E	O	
3	**0**	**1**	**4**	**3**	Sessional Marks:40
End Exam: 3 Hours					End Exam Marks:60

(COMMON TO ALL BRANCHES)

Course Objectives

- To impart knowledge in basic concepts of physics relevant to engineering applications
- To introduce advances in technology for engineering applications

Course Outcomes

The students will be able to

CO-1	Interpret the relation between heat, work and entropy with thermodynamic laws.
CO-2	Explain and analyze the relation between electric current and magnetic fields, production and applications of ultrasonics.
CO-3	Apply the optical phenomena like Interference, Diffraction and Polarization to various fields.
CO-4	Explain the working principle and applications of lasers and fiber optics.
CO-5	Interpret the microscopic behavior of matter with quantum mechanics.

SYLLABUS

UNIT-I **10 Periods**

THERMODYNAMICS:

Heat and work, first law of thermodynamics and its applications, reversible and irreversible processes, heat engine, Carnot cycle and its efficiency, Carnot's theorem, second law of thermodynamics, entropy – entropy change in reversible and irreversible processes, entropy and second law, entropy and disorder, entropy and probability, third law of thermodynamics.

A text book of Engineering Physics -- M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:

The students will be able to

- Explain the relation between heat and work.
- Recognize how much heat is converted into work.
- Identify the relation between entropy and different thermodynamic phenomena.

UNIT-II **10Periods**

ELECTROMAGNETISM:

Faraday's law of induction , Lenz's law, Integral and differential forms of Faraday's law , self-inductance, energy stored in electric and magnetic fields, Poynting vector, displacement current, Maxwell's equations in integral form (no derivation), wave equation, propagation of electromagnetic waves in free space.

Physics - Resnick & Halliday Volume II Wiley India Publications

Ultrasonics: Properties of ultrasonic waves, production of ultrasonic waves by magnetostriction and piezoelectric methods, applications of ultrasonics.

A text book of Engineering Physics -- M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:

The students will be able to

- Explain how to generate electric current by electromagnetic induction Phenomena.
- Evaluate maxwells displacement current and correction in ampere's law.
- Assess electromagnetic wave propagation in free space and its power.
- Recognize the properties and production of ultrasoncs.
- Identify the use of ultrasonics in different fields.

UNIT–III **10 Periods**

OPTICS

Interference: Introduction, principle of superposition, coherence, Young's double slit experiment, conditions for interference, interference in thin films by reflection, wedge shaped film and Newton's rings

Diffraction: Introduction, Fresnel and Fraunhofer diffraction, diffraction at a single slit

Polarisation: Introduction, types of polarized light, double refraction in uniaxial crystals, Nicol's prism, quarter and half-wave plate, production and detection of plane, circular and elliptically polarized light.

A text book of Engineering Physics M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications.

Learning Outcomes:

The students will be able to

- Explain various types of coherent sources.
- Outline the conditions for sustained interference.
- Aanalyze the differences between interference and diffraction.
- Illustrate the concept of polarization of light and its applications.
- Classify the production and detection of different polarized light.

UNIT–IV **10 periods**

LASERS: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, semiconductor laser, applications of lasers

Fibre optics: Introduction to optical fibers, principle of propagation of light in optical fibers,, acceptance angle and acceptance cone, numerical aperture, types of optical fibers, modes of propagation and refractive index profiles, attenuation in optical fibers, advantages of optical fibers in communications, fiber optics communication system, applications of optical fibers, fiber optic sensors

Modern Engineering Physics - S.L.Gupta & Sanjeev Gupta, Dhanpat Rai Publications

Learning Outcomes:

The students will be able to

- Explain the working principle and properties of lasers
- Analyze the production and applications of lasers.
- Explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation.
- Identify the applications of optical fibers in medical, communication and other fields.

UNIT–V 10 periods

QUANTUM MECHANICS:

Planck's hypothesis, wave-particle duality, introduction to quantum theory, de-Broglie concept of matter waves, Heisenberg's uncertainty principle, Schrodinger's time independent and time dependent wave equations, physical significance and properties of the wave function ψ , application of Schrodinger wave equation for a particle in one dimensional well – Eigen wave functions and energy Eigen values of the particle

Elements of Statistical mechanics: Elementary concepts of Maxwell-Boltzman , Bose-Einstein and Fermi-Dirac statistics (no derivation)

Modern Engineering Physics -- S.L.Gupta & Sanjeev Gupta, Dhanpat Rai Publications

Engineering Physics -- M.N.Avadhanulu & P.G.Kshirasagar, S.Chand Publications

Learning Outcomes:

The students will be able to

- Explain the dual nature of radiation and matter.
- Realize de Broglie concept of matter waves and Heisenberg uncertain principle.
- Identify Schrodinger wave equation to solve the problems.
- Explain the importance of fundamentals of statistical mechanics.

Text Books :

1. M.N.Avadhanulu & P.G.Kshirasagar, "A Text Book of Engineering Physics" – IX Edition, S.Chand Publications, 2014.
2. S.L.Gupta & Sanjeev Gupta, "Modern Engineering Physics" -- Dhanpat Rai Publications, 2011.

Reference Books:

1. V. Rajendran, "Engineering Physics" , McGrawHill Education Private Ltd,2011.
2. S.O.Pilai, Sivakami , "Engineering Physics" – IV Edition, New Age International Publishers , 2011.
3. Young & Freedman, "University Physics" – XI Edition, Pearson Education, 2004.
4. A.Marikani, "Engineering Physics" - PHI Learning Private Limited, 2009.
5. Resnick & Halliday, "Physics" Volume II – VI Edition,WileyIndia Publications 2001.

6. R K Gaur, S L Gupta, “Engineering Physics” – VIII Edtion, Dhanpat Rai Publications, 2001
7. D.K.Bhattacharya, Poonam Tandon, “Engineering Physics” – Oxford University Press, 2010.

ENGINEERING CHEMISTRY

Common for all branches

Course Code - Category: CIV 113 - BS **Credits:3**

L	**T**	**P**	**E**	**O**	Sessional Marks:40
3	**0**	**0**	**1**	**4**	
End Exam: 3 Hours					End Exam Marks:60

Course Objectives:

- To familiarize Engineering Chemistry and its applications
- To provide knowledge on problem associated with impure water and various treatment technologies
- To train the students on the principles and applications of electrochemistry,
- To introduce nano, smart and composite materials

Course Outcomes:

By the end of the semester, the student will be able to:	
CO1	**Identify** the problems associated with raw water in various applications and can **adopt** suitable technologies for domestic and industrial feed waters.
CO2	**Understand** the concepts of electro chemistry for **design** of suitable batteries and solar energy in view of environmental protection.
CO3	**Select and design** of suitable materials to prevent corrosion and to protect various parts from corrosion.
CO4	**Generalize** the properties of semiconducting and ceramic materials, can **select** suitable materials for specific applications.
CO5	**Analyze** the importance of nano, composite and smart materials.

SYLLABUS

UNIT I **12 Periods**

WATER CHEMISTRY: Introduction- Impurities in water; Hardness of water – types of Hardness, units and calcium carbonate equivalents, problems, disadvantages of hard water; Boiler troubles- Scale & Sludge formation, prevention- Internal treatment - (Phosphate, Carbonate and Calgon conditioning) ,Caustic embrittlement

Water treatment techniques: Softening of water by ion exchange method- Principle, Process, advantages; Desalination of water – Reverse Osmosis and Eelectrodialysis; WHO standards for drinking water, Municipal water treatment - Sedimentation, Coagulation, Chlorination-Break point chlorination.

Learning Outcomes:

At the end of this unit the student will be able to

- **List** the differences between temporary and permanent hardness of water (L1)
- **Illustrate** the problems associated with hard water (L2)
- **Explain** the principles of reverse osmosis, electrodialysis and municipal water treatment processes (L2)

- **Solve** problems associated with hard water - scale and sludge (L3)

UNIT-II **10 Periods**

ELECTROCHEMICAL CELLS: Electrode potential, Nernst equation, reference electrodes- SHE and Calomel electrode, Electrochemical series, Electrochemical cell, Cell potential; Primary cells – Dry cell, alkaline battery, hydrogen-oxygen, methanol fuel cells – working of the cells; Secondary cells – lead acid, lithium ion batteries- working of the batteries including cell reactions.

Solar Energy: Photovoltaic cell -Working & applications, Photo galvanic cells with specific examples

Learning Outcomes:

At the end of this unit the student will be able to

- **Apply** Nernst equation for calculating electrode and cell potentials (L3)
- **Explain** the theory and construction of battery and fuel cells (L2)
- **Identify** the applications of solar energy (L2)
- **Construct** different cells (L3)

UNIT – III **10 Periods**

Corrosion Chemistry: Definition, Theories of corrosion-Chemical corrosion, metal oxide formation, Pilling Bedworth rule, Electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion; Factors affecting corrosion

Prevention and control: Protection- cathodic protection, Corrosion inhibitors, electroplating of Copper and electroless plating of Nickel, organic coatings-paint and varnish

Learning Outcome:

At the end of this unit the student will be able to

- **Apply** Pilling Bedworth rule for corrosion and corrosion prevention (L3)
- **Demonstrate** the corrosion prevention methods and factors affecting corrosion (L2)
- **Develop** the corrosion resistant materials for industrial and marine applications (L5)
- **Identify** different organic coatings (L3)

UNIT IV **10 Periods**

Semiconducting Materials: Band theory of solids – band diagrams for conductors, semiconductors and insulators, Role of doping on band structures. Organic semiconductors and applications.

Ceramic Materials: Cement – raw materials, Manufacturing process, Setting and hardening of cement (hydration and hydrolysis equations); Refractories- classification; engineering applications of ceramics

Learning Outcome:

At the end of this unit the student will be able to

- **Explain** the manufacturing of portland cement (L2)
- **Enumerate** the reactions at different temperatures in the manufacture of cement (L2)
- **Describe** the mechanism of conduction in conducting polymers (L2)
- **List out** the applications of ceramics (L2)

UNIT V **10 Periods**

Nanomaterials: Introduction to Nanomaterial- nanoparticles, nanocluster, carbon nanotube (CNT); Chemical synthesis of nanomaterials- sol-gel method; Characterization- Principle and

applications of Scanning electron microscope (SEM) and Transmission electron microscope (TEM).

Polymer Composites: Definition, constituents of composites, types - Fiber Reinforced Plastics, Particulate composites, Layer composites, engineering applications of composites;

Smart polymers: Introduction, types of smart polymers and applications

Learning Outcome:

At the end of this unit the student will be able to

- **Classify** nanomaterials (L2)
- **Explain** the synthesis and characterisation of nanomaterials (L2)
- **Explain** the different types of composites and their applications (L2)
- **Identify** different types of smart materials (L2)

Text Book

1. **P.C. Jain and M. Jain** *"Engineering Chemistry"* 16th edition, - DhanapathiRai& Sons, Delhi. 2015.
2. **S.S. Dara** "*A text book of Engineering Chemistry*" 15 th edition, S. Chand& Co. New Delhi, 2014**.**

Reference books

1. **O.G.Palanna** "*Engineering Chemistry*" Tata McGraw Hill Education pvt ltd, New Delhi, 2009.
2. **V.Raghavan** "*A Material Science and Engineering*" 5th edition, Printice Hall India Ltd, 2011.

BUILDING TECHNOLOGY

CIV 114 **Credits : 3**

Instruction : 2 Lecture & 1 Tutorial / week Sessional Marks : 40

End Exam : 3 Hours End Exam Marks : 60

Course Objectives:

The objective of the course is to prepare the student to

- Learn about building byelaws laid by planning authorities
- Understand about masonry types in brick and stone construction
- Learn about building components and foundations

Course Outcomes:

At the end of the course the student will be able to

1. Suggest the suitability of stones, bricks and timber based on their characteristics.
2. Identify the various types of metals, glasses& plastics.
3. Learn about masonry types in brick and stone construction and their application in construction of various building components.
4. Understand about Building components like Floors, Floor & surface finishes (Painting & distempering).
5. Learn about various types of foundation and importance of formwork & scaffolding.

Mapping of course outcomes with program outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**		2		2		2	2				1	1	2	2	2
	2		2				2	2				1	1	2		2
	3					1	2	2				1	1			2
	4					2	2	2				1	1		2	2
	5					2	2	2				1	1		2	2

SYLLABUS

UNIT - I 12 Periods

Stones: Quarrying & dressing of stones; Characteristics of good building stones, Common building stones, Uses in Civil Engineering

Clay Bricks: Ingredients of good brick earth; Harmful substances, Additives; Manufacture of bricks (IS: 2117); Characteristics of good bricks; Classification of bricks; defects of bricks; Tests on bricks: compressive strength, water absorption, Efflorescence (IS: 3495); Uses of bricks

Timber: Characteristics of good timber; defects in timber, Decay of timber, Seasoning and preservation, properties, uses of timber; Commercial forms of timber products in Civil Engineering.

UNIT - II 12 Periods

Metals: Ferrous metals: Properties & uses of different types of iron; non-ferrous metals: Aluminium & Lead, properties, uses in civil engineering

Glass: Classification & Commercial forms of glasses, uses in civil engineering

Plastics: Types of plastics, properties, uses in civil engineering, Fibre glass Reinforced plastics, Properties & Applications.

UNIT – III 12 Periods

Stone Masonry: Classification of walls; Technical terms - Stone masonry construction - types and rules- Arches and lintels

Stone Masonry: Brick masonry walls - bonds and rules - cavity wall construction - Hollow concrete block masonry - Lightweight wall construction - Prefabricated brick panel for walls – reinforced masonry - composite masonry

UNIT - IV 12 Periods

Floors: Terminology; Materials – Types of floors – suitability (Industrial, Indoor, and Stilt & Terrace Floors) and construction; Concrete, mosaic, terrazzo, tiled, stone & synthetic floors and floor finish

Surface Finishes: Plastering - Pointing - Paints: Characteristics of good paint; Ingredients of oil-borne paint; Types of paints; Defects in painting;

Distempers: Properties & ingredients; Process of distempering; Wall Paper; White wash; Colour wash.Pebble dash – Dado/Skirting, Tiles etc.

UNIT - V 12 Periods

Foundations: Need for foundation - types of foundation - open foundation - Shallow foundations – Spread, combined- strap and raft foundation - deep foundations - pile foundation - well foundations and caissons - Factors affecting selection of foundations; setting out of foundations - excavations for foundation trenches and base.

Form Work, Scaffolding: Form work, Types of formwork; Centering - scaffolding - Types of scaffolding.

TEXT BOOKS

1. Rangwala, Engineering Materials, 41st Edition: 2014, Charotar Publishing House Pvt. Ltd.
2. The Text Book Of Building Construction by S.P. Arora, S.P. Bindra, Dhanpatrai Publications.
3. Building Construction by B.C. Punmia, Laxmi Publications (p) Ltd.

REFERENCES

1. S.K.Duggal, Building Materials, New Age International Publishers
2. D.N. Ghose, Materials of construction, Tata-McGraw-Hill Publishing Company Limited.
3. National Building Code of India, SP 7 (1): 1983, First Revision 1992, Bureau of Indian Standards
4. Building Construction by Sushil Kumar, Standard publishers' distributors
5. Relevant NPTEL Courses.

ENGINERING DRAWING

(Common for all branches)

Course Code - Category: CIV 115 - ES **Credits:3.5**

L	T	P	E	O
2	0	3	1	4

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Course Objectives:

- The course is designed to introduce fundamentals of engineering drawing and apply the principles to draw engineering curves, orthographic projections and isometric projections.

Course Outcomes:

By the end of the course, the student will be able to:	
CO	Draw conic sections by different methods and construct cycloidal and involute
CO	Project orthographically the points and lines in various positions.
CO	Produce orthographic projections of plane surfaces
CO	Draw orthographic projections of solids in various orientations.
CO	Construct isometric views and isometric projections of simple solids.

SYLLABUS

UNIT I

Introduction to Engineering drawing & basics of geometrical construction. General Construction of conic sections, Ellipse - concentric circle and arcs of circle method, Parabola- rectangle and tangential method Hyperbola - Rectangle hyperbola, Construction of cycloidal curves (cycloid, epicycloid, and hypocycloid), Involute(thread length equal to circumference/ perimeter) - circle and regular polygon.

UNIT II

Orthographic projections – projections of points – projections of straight lines (lines parallel to both HP&VP, lines parallel to one and inclined to other, lines inclined to both the planes)

UNIT III

Projections of regular polygon planes – inclined to one plane, inclined to both the planes.

UNIT IV

Projection of solids: Prisms – Cylinder– Pyramids &Cones –simple positions & axis inclined to one plane, inclined to both the planes.

UNIT V

Isometric projections –Isometric scale, Isometric view & projection of prisms, pyramids, cone, cylinder, sphere, and their combination.

TEXT BOOK:

1.**N. D. Bhatt** "*Engineering Drawing"* Charotar Publishing House Pvt.Ltd, 53rd Edition : 2014

REFERENCE BOOKS:

1. **K. L. Narayana& P. Kanniah** "*Engineering Drawing"*
2. **R. B. Choudary** "*Engineering Graphics* with Auto CAD"
3. **TrymbakaMurty** "*Computer Aided Engineering Drawing"*

ENGINEERING PHYSICS LAB

Course Code - Category: CIV 116 - BS **Credits:1.5**

L	T	P	E	O
0	0	3	1	1

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Course Objectives

- To enable the students to acquire skill, technique and utilization of the Instruments

Course Outcomes	
1	Ability to design and conduct experiments as well as to analyze and interpret
2	Ability to apply experimental skills to determine the physical quantities related to Heat, Electromagnetism and Optics.

List of experiment (any eight to ten experiments have to be completed)

1. Determination of coefficient of thermal conductivity of a bad conductor- Lee's method.
2. Determination of radius of curvature of a convex lens - Newton's rings.
3. Determination of wavelengths of spectral lines in mercury spectrum-using diffraction grating in normal incidence position.
4. Determination of Cauchy's constants of the material of the prism using spectrometer.
5. Determination of thickness of a thin paper by forming parallel interference fringes-Wedge method.
6. Study of variation of magnetic field along the axis of a current carrying circular coil – Stewart and Gee's apparatus
7. Calibration of a low-range voltmeter using potentiometer.
8. Verification of laws of resistance and determination of specific resistance of wire by using Carey- Foster's bridge.
9. Determination of refractive indices o-ray and e-ray in quartz crystal (double refraction)
10. Determination of the frequency of an electrically maintained tuning fork - Melde's experiment.
11. Determination of Rydberg constant using hydrogen discharge tube.
12. Determination of band gap of semiconductor.
13. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
14. Determination of the velocity of ultrasound in liquids by using the phenomenon of diffraction of light by ultrasound
15. Determination of the particle size of micro particles (lycopodium powder) using laser diffracting grating.

Learning Outcomes:

The students will be able to

- **handle** optical instruments like microscope and spectrometer
- **determine** thickness of a hair/paper with the concept of interference
- **estimate** the wavelength and resolving power of different colors using diffraction grating
- **plot** the intensity of the magnetic field of circular coil carrying current with varying distance
- **determine** the band gap of a given semiconductor
- **determine** thermal conductivity of good and bad conductors
- **evaluate** the acceptance angle of an optical fiber and numerical aperture
- **determine** resistance and resistivity of the given material
- **plot** the accuracy / correction of low range voltmeter using potentiometer
- **evaluate** the refractive index using double refraction phenomena
- **determine** frequency of electrically maintained tuning fork

Prescribed Book

Physics Laboratory Manual Prepared by Department of Physics ANITS

Reference books

1. D.P Siva Ramaiah and V. Krishna Murthy, “Practical Physics”, Marutibook Depot, 2000.
2. A.R Vegi, “Comprehensive Practical Physics”, Vegi Publishers Pvt.Ltd., 2004.

ENGINEERING CHEMISTRY LAB

Common for all branches

Course Code - Category: CIV 117 – BS **Credits:1.5**

L	**T**	**P**	**E**	**O**
0	**0**	**3**	**0**	**1**

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Course Objectives:

- To improve skills in analyzing samples through titration procedures
- To get an idea over instrumental methods of analysis for more accuracy

At the end of this course, the students will be able to	
CO1	Apply experimental skills in analysing samples through titration procedures
CO2	Select and use a suitable instrumental technique for the quantitative analysis for more accuracy

List of Experiments (any ten experiments)

1. i) Preperation of primary standard solution.
   ii) Preparation and Standardization of Hydrochloric acid solution.
2. Determination of total Hardness present in the given water sample.
3. Estimation of Iron(II) by permonganate.
4. Estimation of amount of calcium present in the Portland cement by titrimetrically.
5. Estimation of amount of Zinc by EDTA.
6. Estimation of amount of Copper by using Sodium thiosulphate.
7. Determine the strength of acid (lead acid battery) by titrating with strong base using **pH meter**.
8. Estimate the individual strength of acids present in the acid mixture by titrating with strong base using **conductivity meter.**
9. Estimate the amount of Mohr's salt present in the given solution by titrating with potassium dichromate using **potentiometer.**
10. To determine the viscosity of liquid by Ostwald viscometre
11. **Spectrophotometric** estimation of Fe (III) by Potassium thiocyanate.

Demo Experiments

1. Thin layer chromotography and Gas chromatography
2. Preperation of Bakelite
3. Particle size distribution by PSD analyser(Demo-Outsource)
4. Elemental analysis by ICPMS (Demo-Outsource)
5. Introduction of Reaction colourimetry (for Chemical Engineering)

Learning Outcomes:

1. Measure the strength of an acid present in secondary batteries
2. Calculate the hardness of water sample
3. Determine the Potential and conductance of solutions
4. Analyse the cement for Iron and Calcium contents
5. Prepare polymer materials

Prescribed Books

1. **S.K. Bhasin and SudhaRani** "*Laboratory manual on Engineering chemistry*" third edition; DhanpatRai Publishing Company.

Reference Books

1. **S.S. Dara "***Experiments and calculations in Engineering chemistry*" 9th edition; S. Chand & Company ltd.

ENGINEERING WORKSHOP

Common for all branches except for ECE

Course Code - Category: CIV 118 - ES **Credits:1.5**

L	T	P	E	O
0	0	3	0	1

Sessional Marks:50

End Exam: 3 Hours

End Exam Marks:50

Course Objectives:

- To provide training and hands on experience to the students on basic Engineering related skills like carpentry, fitting, tin smithy, house wiring and soldering.

Course Outcomes:

By the end of the course, student will be able to:	
CO1	Make different carpentry joints.
CO2	Make simple fitting jobs.
CO3	Make simple jobs like funnel, elbow etc. using sheet metal.
CO4	Understand and build circuits for different types of applications like stair case wiring, godown wiring.
CO5	Make simple circuits on bread board using soldering kit

LIST OF EXPERIMENTS

Minimum of two exercises has to be conducted from each trade.

Trade:

Carpentry
1. Cross Lap Joint
2. Dovetail Joint
3. Mortise and Tennon Joint
4. Briddle Joint

Fitting
1. V Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Tin Smithy
1. Taper Tray
2. Square Box without lid
3. Elbow
4. Funnel

House Wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Godown wiring

Soldering
1. LED bulb
2. Dc motor with pot
3. De soldering PCB

Reference book:

S.K.Hajra Choudhury "*Elements of Workshop Technology" Vol I Manufacturing Processes*, ISBN: 8185099146(2017)

Human Values & Professional Ethics

Common to all branches

Course Code - Category: CIV 119 - MC **Credits: -**

L	T	P	E	O	
3	**0**	**0**	**0**	**1**	Sessional Marks:50

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk

Course outcomes:

BBy the end of the semester, the student will be able to:	
CO1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
CO2	Identify the multiple ethical interests at stake in a real-world situation or practice
CO3	Articulate what makes a particular course of action ethically defensible
CO4	Assess their own ethical values and the social context of problems
CO5	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment
CO6	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

Unit I: HUMAN VALUES:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation–Commitment –Empathy –Self Confidence Character –Spirituality-Case Study.

LEARNING OUTCOMES:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. develop commitment
4. learn how to live peacefully

Unit II: ENGINEERING ETHICS:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas –Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of

professional roles-Theories about right action-Self interest -Customs and religion –Uses of Ethical theories –Valuing time –Co operation –Commitment-Case Study

LEARNING OUTCOMES:

1. learn about the ethical responsibilities of the engineers.
2. create awareness about the customs and religions.
3. learn time management
4. learn about the different professional roles.

Unit III: ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering As Social Experimentation –Framing the problem –Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons-Case study

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LEARNING OUTCOMES:

1. demonstrate knowledge to become a social experimenter.
2. provide depth knowledge on framing of the problem and determining the facts.
3. provide depth knowledge on codes of ethics.
4. develop utilitarian thinking

UNIT IV: ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights(IPR)-.

LEARNING OUTCOMES:

1. create awareness about safety, risk & risk benefit analysis.
2. engineer's design practices for providing safety.
3. provide knowledge on Intellectual Property Rights.

UINIT V: GLOBAL ISSUES

Globalization –Cross culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research- Case Study

LEARNING OUTCOMES:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Text Books:

1. **M.Govindarajan, S.Natarajananad, V.S.SenthilKumar** "*Engineering Ethics includes Human Values*" -PHI Learning Pvt. Ltd-2009
2. **Harris, Pritchard and Rabins** "*Engineering Ethics*", CENGAGE Learning, India Edition, 2009.

3. **Mike W. Martin and Roland Schinzinger** "*Ethics in Engineering*" Tata McGraw-Hill–2003.
4. **Prof.A.R.Aryasri, DharanikotaSuyodhana** "*Professional Ethics and Morals*" Maruthi Publications.
5. **A.Alavudeen, R.KalilRahman and M.Jayakumaran** "*Professional Ethics and Human Values*" -LaxmiPublications.
6. **Prof.D.R.Kiran** "*Professional Ethics and Human Values*"
7. **PSR Murthy** "*Indian Culture, Values and Professional Ethics*" BS Publication

ENGINEERING MATHEMATICS-II

Ordinary Differential Equations & Numerical Methods

Common for all branches

Course Code - Category: CIV 121 - BS **Credits:3**

L	**T**	**P**	**E**	**O**	Sessional Marks:40
3	**0**	**0**	**1**	**6**	
End Exam: 3 Hours					End Exam Marks:60

Course Objective:

Create and analyze mathematical models using first and higher order differential equations to solve application problems such as electrical circuits, orthogonal trajectories and Newton's law of cooling and also familiarize the student in various topics in numerical analysis such as interpolation, numerical differentiation, integration and direct methods for solving linear system of equations

Course outcome:

By the end of the semester, the student will be able to:	
CO1	Demonstrate solutions to first order differential equations by various methods and solve basic application problem related to electrical circuits, orthogonal trajectors and Newton's law of cooling.
CO2	Discriminate among the structure and procedure of solving a higher order differential equations with constant coefficients and variable coefficients
CO3	Apply various numerical methods to solve linear and non-linear equations
CO4	Familiar with numerical integration and differentiation
CO5	Understand Laplace transforms and its properties and finding the solution of ordinary differential equations

Unit - I: Ordinary Differential equations of first order and its applications 12Periods

First order linear differential equations, Bernoulli's equations, exact differential equations, equations reducible to exact equations, orthogonal trajectories, simple electric circuits (L –R circuit problems), Newton's law of cooling.

Learning outcome: At the end of this unit, the student will be able to

- Solve the first order differential equations and solve basic application problems described by first order differential equations

Unit - II: Higher order Linear Differential Equations and its applications 10Periods

Definitions, rules for finding the complementary function, rules for finding the particular integral, method of variation of parameters, equations reducible to linear equations with constant

coefficient, Cauchy's homogeneous linear equation, Legendre's linear equation. Applications: L – C – R circuit problems.

Learning outcome: At the end of this unit, the student will be able to

- Solve the complete solution of linear differential equations with constant coefficient
- Solve basic application problems described by second order linear differential equations with constant coefficients.

Unit - III: Numerical solutions of algebraic and transcendental equations 10 Periods

Solution of algebraic equation by Bisection method, Newton-Raphson, Regula-Falsi methods. Solution of simultaneous linear algebraic equations, Gauss elimination, Gauss Jordan, Gauss Seidel.

Learning outcome: At the end of this unit, the student will be able to

- Find numerical solution to a system of equations by using different methods.

Unit - IV: Interpolation, Numerical Differentiation & Integration 12 Periods

Interpolation, Newton forward and backward interpolation formula, Lagrange's formula for unequal intervals. Numerical differentiation - Newton's forward and backward differences to compute first and second derivatives. Numerical integration - Trapezoidal rule, Simpson's one third rule and three eighth rules.

Learning outcome: At the end of this unit, the student will be able to

- Find derivative and integral of a function by using different numerical methods.

Unit - V: Laplace transforms and its application 16 Periods

Introduction, definitions, transforms of elementary functions, properties of Laplace transforms, transforms of periodic functions, transforms of derivatives, transforms of integrals, Multiplication by t, division by t, evaluation of integrals by Laplace transforms. Inverse Laplace transforms – other methods of finding inverse transforms (excluding residue method), Convolution theorem (without proof), application's to differential equations, unit step function (without proof) and unit Impulsive functions (without proof).

Learning outcome: At the end of this unit, the student will be able to

- Examine the properties of Laplace transformation.
- Apply the Laplace and inverse Laplace transformations for different types of functions.
- Evaluate ordinary differential equations by using Laplace transformation technique.

Textbooks:

1. **B. S. Grewal** "*Higher Engineering Mathematics*" 44/e, Khanna Publishers, 2017.
2. **Erwin Kreyszig "**Advanced Engineering Mathematics" 10/e, John Wiley& Sons, 2011.

References:

1. **R. K. Jain and S. R. K. Iyengar** "Advanced Engineering Mathematics" 3/e, Alpha Science International Ltd., 2002.
2. **George B. Thomas, Maurice D. Weir and Joel Hass, Thomas** "Calculus" 13/e, Pearson Publishers, 2013.

COMMUNICATIVE ENGLISH

Common for all branches

Course Code - Category: CIV 122- HS **Credits:3**

L	T	P	E	O
3	0	0	0	2

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Prerequisites:

Basic English language skills- LSRW at (10+2) / Intermediate Level

Course Objectives

- To focus on appropriate reading strategies for comprehension of various forms of texts.
- To instruct effectives strategies for good writing and exhibit the same in writing well organized passages, reports and other forms of business communication
- Provide knowledge of grammatical structures and vocabulary to be used appropriately in their writing.

Course Outcomes

By the end of the course, the student will be able to:	
CO1	Comprehend, interpret and analyze text and answer questions based on passages.
CO2	Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence.
CO3	Construct grammatically correct sentences and apply proper vocabulary in speech and writing.

UNIT- I **10 Periods**

Reading: 1. Skimming and Scanning to get the main idea of a text and look for specific information-On the Conduct of Life: *William Hazlitt* 2. If- *Rudyard Kipling* –**CO1**

Writing: Paragraph writing (specific topics) using suitable cohesive devices – Unity, logical order, coherence, opening and closing statements. **CO2**

Grammar: Clauses and Sentences: Sentence structures, use of phrases and clauses in sentences **CO3**

Vocabulary: The concept of word formation, Acquaintance with prefixes and suffixes **CO3**

UNIT –II **10 Periods**

Reading: 1. Reading for inferential comprehension- The Brook: *Alfred Tennyson* 2. How I Became a Public Speaker: *George Bernard Shaw* **CO1**

Writing: Formal letter writing. Letters of complaint, enquiry, report, invite, placing orders, acknowledgment and follow-up letters. **CO2**

Grammar: Punctuation: importance of proper punctuation in texts, Articles **CO3**

Vocabulary: Word building using foreign roots **CO3**

UNIT – III **10 Periods**

Reading: 1. Comprehend complex texts identifying the author's purpose-
The Death Trap: *Saki* 2. On Saving Time: *Seneca* **CO1**

Writing :: Reports (Structure and content of a project report) **CO2**

Grammar : Noun-Pronoun Agreement, Subject –Verb agreement, Tenses **CO3**

Vocabulary: Idiomatic expressions **CO3**

UNIT –IV **10 Periods**

Reading: 1. Identifying claims, evidences, views, opinions and stance/position.- Chindu Yellama 2. Muhammad Yunus **CO1**

Writing Skills: 1.Writing structured essays (persuasive and argumentative) using suitable claims and evidences CO2

Grammar: Misplaced Modifiers, adjectives, adverbs **CO3**

Vocabulary: Synonyms & Antonyms **CO3**

UNIT –V **12 Periods**

Reading: Developing advanced reading skills for deeper understanding of the text Politics and the English Language: *George Orwell* 2.The Dancer with a White Parasol: *Ranjana Dave* **CO1**

Writing : Précis writing (Summarizing-identifying main idea and rephrasing the text), Applying for internship/Writing job applications: Resume and C.V with cover letter **CO2**

Grammar: Prepositions, correction of sentences. **CO3**

Vocabulary: Phrasal verbs **CO3**

Prescribed book:

Board of Editors "*Language and Life*" 1st edition, Oriental Black Swan 2018.

Reference Books:

1. **Sanjay Kumar and Pushpa lata** *"Communication skills*" Oxford University Press. 2011

2. **Meenakshi Raman and Sangeetha Sharma "***Technical communication*" Oxford University Press.

3. **Kulbushan Kumar "***Effective communication skills*" Khanna Publishing House, Delhi.

ENGINEERING GEOLOGY

Course Code - Category: CIV 123 - PC **Credits:3**

L	T	P	E	O
2	0	1	1	2

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Course Objectives:

The objective of the course is to prepare the students

1. To identify & classify different minerals and map the geological structures present in subsurface.
2. Investigate the selected project site to obtain data and determine the favourable considerations in study area.
3. Measure earthquakes and landslides to classify the hazardous zones and interpret geological maps.

Course Outcomes:

CO1	Classify different branches of Geology and understand the concept weathering.
CO2	Identify and classify different rocks and soils based on their geological genesis.
CO3	Identify and classify the minerals and geological structuresof different types of rocks based on their geological genesis.
CO3	Identify and classify the minerals and geological structuresof different types of rocks based on their geological genesis.
CO4	Analysethe ground conditions through geophysical exploration and interpret from available data to determine the favourable geological considerations (i.e., Lithological structural and ground water) in the study area for theconstruction civil engineering projects.
CO5	Understand the concepts and importance of study of earthquakes, landslides & tsunamis.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	1					1	2			1		1	1		2
	2	1					1	2			1		1	1		2
	3	1					1	2			1		1	1		2
	4	2	1	1			1	2			1	1	1	1		2
	5	1				1	1	1			1		1	1		1

SYLLABUS

UNIT - I **12 Periods**

Introduction: Definition of Geology and Engineering Geology, Branches of Geology, Scope and importance of geology from Civil Engineering point of view.Brief study of case histories of failure of some civil engineering constructions due to geological draw backs. Role of engineering geologist in planning, design and construction stages in Civil Engineering works

Earth: Internal structure of the Earth and its composition, Elementary knowledge on isostasy, continental drift, plate tectonics and sea floor spreading.

Geological Cycle: Weathering, Effect of Weathering over the properties of rocks, Importance of Weathering with reference to civil engineering constructions like dams, reservoirs and tunnels.

Learning outcomes:
At the end of this unit the student will be able to

- **Enumerate** various branches of Geology
- **Understand** elementary knowledge on isostasy
- **Comprehend** the concept of weathering and its effects

UNIT - II **12 Periods**

Petrology: Definition of rock, Civil Engineering importance – Geological classification of rocks –Rock cycle, Formation, Structure, texture and mineralogical composition of igneous, sedimentary and metamorphic rocks, Study of physical properties of different types of igneous, sedimentary and metamorphic rocks. Igneous rocks: Granite, synite, dolerite, gabro, diorite, basalt. Sedimentary rocks, dykes and sills: Breccia, conglomerate, Sandstone, Shale, limestone. Metamorphic rocks: Gneiss, khondalite, schist, slate, marble, quartzite, charnokite. Engineering properties of rocks.

Soils: Soil formation, Soil profile, – Geological classification – Engineering classification and description of Indian soils; Soil erosion and conservation.

Learning outcomes:
At the end of this unit the student will be able to

- **Explain** the rock cycle
- **Identify** the properties of various rocks
- **Comprehend** the process of soil formation

UNIT - III **12 Periods**

Minerology: Definition of mineral, Importance of study of minerals, Different methods of study of minerals, Study of physical properties of different rock forming minerals: Silicate structures,

Quartz, feldspars, pyroxenes, amphiboles, micas and clays, Introductory knowledge on Chemical and optical properties of minerals.

Structural Geology: Elements of structural geology:Strike, dip, outcrop, plunge – Study of folds, faults, joints, unconformities, Classification of folds, faults and joints. and their importance in Civil Engineering works.

Learning outcomes:
At the end of this unit the student will be able to

- **Understand** the importance of minerology
- **Gain** elementary knowledge on chemical and optical properties of minerals
- **Depict** the structural geology and their classifications

UNIT - IV **12 Periods**

Geophysical Exploration: Electrical, Seismic, Gravity and Magnetic methods. Principle of Resistivity method and configurations. Principles of Seismic refraction and reflections methods.

Geological Applications in Civil Engineering: Geological investigations for Civil Engineering Projects. Favourable Geological considerations for construction of Dams, Reservoir, Tunnels and Road Cuttings. Underground water in relation to Engineering Works.

Learning outcomes:
At the end of this unit the student will be able to

- **Conduct** geophysical exploration methods for sub-surface exploration.
- **Understand** the importance of Geological applications in civil engineering

UNIT - V **12 Periods**

Earthquakes: Terminology, Causes and effects, Classification, Earthquake waves, Seismograph, Locating Epicenter, Determination of depth of focus, Intensity, Magnitude, Mercalli & Richter scales, Prediction, Effects, Seismic belts, Shield areas – Seismic zones of India – Civil Engineering considerations in seismic areas – Precautions of building constructions in seismic areas. Safety measures for buildings and dams – Reservoir induced seismicity.

Landslides: Causes, effects, methods of mitigating impact of landslides.

Tsunamis: Meaning of Tsunami, causes & Effects of Tsunami, warning and mitigation.

Learning outcomes:
At the end of this unit the student will be able to

- **Understand**the concept of earthquakes, landslides and tsunamis.
- **Classify**the earthquake zones based seismic activity

TEXT BOOKS

1. **D.Venkata Reddy "***Engineering Geology"* Vikas Publishing House Pvt Ltd. 2011.
2. **N.ChennaKesavulu** "*Text book of Engineering Geology"* MacMillan India Ltd, Hyderabad, 2014

REFERENCES

1. **SubinoyGangopadhyay** "*Engineering Geology"* Oxford University Press. 2013.
2. **F.G. Bell** "*Fundamental of Engineering Geology*" Butterworth Publications, New Delhi, 1992.
3. **David George Price** *Engineering Geology Principles and Practice* Springer, 2009.
4. **KVGK Gokhale** *"Principles of Engineering Geology*" B.S.Publications-2005
5. **Parbin Singh, K Kataria& Sons** *Engineering and General Geology*, New Delhi, 2009
6. **P.C. Varghese** *"Engineering Geology for Civil Engineers"*, PHI learning pvt. Ltd., 2012

Relevant NPTEL Courses.

ENGINEERING MECHANICS

Course Code - Category : CIV 124 - ES **Credits:3**

L	**T**	**P**	**E**	**O**	
2	**1**	**0**	**1**	**4**	Sessional Marks:40
End Exam: 3 Hours					End Exam Marks:60

Course Objectives:

The objective of the course is to enable the student

- To develop logical thinking approach to engineering problems.
- Learn about the basic concepts of force, moment, resultant forces.
- Learn aboutcentroid&centre of gravity, static analysis of simple plane trusses, area moment of inertia,

Course Outcomes:

By the end of the course, student will be able to:	
CO1	Analyze a given physical problem into a suitable forces and moments.
CO2	Identify the centroid of a given plane area and find its area/ mass moment of inertia
CO3	Apply the concept of friction to simple engineering problems
CO4	Calculate the displacement, velocity and acceleration of a moving particle
CO5	Apply the work-energy, D ALEMBERTS principle to particles and connected systems

Mapping of course outcomes with program outcomes:

		PO												**PSO**		
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO	**1**	3	3	2	1									3	1	
	2	3	2	1	1									2	1	
	3	3	3		2									3	2	
	4	3	3	2	2								1	3	2	
	5	3	3	2	2								1	3	2	

SYLLABUS

UNIT – I **12 Periods**

Basic Concepts: Introduction to Engineering Mechanics – Scalar and Vector quantities – Forces – Characteristics of a force – Definitions and examples of various types of force systems – Definition of resultant – Composition and resolution of forces – Moment of a force – Principles of moments of force – Couples – characteristics of a couple – on Transformations of a couple – Resolution of a force into a force and couple. Resultants of Force Systems, possible resultants of different types of force systems.

UNIT – II **12 Periods**

Equilibrium Analysis: Free body diagrams – Equations of equilibrium for a concurrent coplanar force system – Equilibrium of Bodies acted on by two or three forces – Equilibrium of bodies acted on by non-concurrent coplanar force system – Equilibrium of bodies acted on by parallel, non-coplanar force system – Equilibrium of non-concurrent, non-coplanar non-parallel force system.

Analysis of trusses:Method of joints,Method of sections and tension coefficient method.

UNIT – III **12 Periods**

Friction: Nature of friction – Laws of friction – Coefficient of friction – Angle of friction – Cone of friction – Problems involving frictional forces – Frictional forces on flexible bands and belts – Rolling friction – Thrust bearing.

Centroid and Centre of Gravity: Centre of gravity of parallel forces in a plane – Centre of gravity of parallel forces in space – centroids and centres of gravity of composite bodies – Theorems of Pappus.

UNIT – IV **12 Periods**

Moments of Inertia: Definition – Parallel axis theorm for areas – Second moments of areas by integration – Radius of gyration of areas – Moments of inertia of composite areas.

Kinematics: Absolute Motion: Introduction –basic terminology of mechanics – Newton's Laws – Introduction to Kinematics of Absolute Motion – Rectilinear motion of a particle – Angular motion of a line.

UNIT – V **12 Periods**

Kinetics: Introduction to kinetics – Force, mass and acceleration approach, Newton's laws of motion - D Alembert's principle – Work - Energy principle – Work done by a force – Work done by a varying force – Work done by a force system – Energy – Power –Work Energy equation for translation – Work done by a Spring – Principle of conservation of energy.

TEXT BOOKS

1. **SS Bavikatti and Rajasekharappa** "*Engineering Mechanics"* New Age International Pvt. Ltd.
2. **I.B. Prasad "***Applied Mechanics*" by Khanna Publishers.

REFERENCES

1. **S. Timoshenko and D.H. Young** "*Engineering Mechanics*" Pearson Prentice publication.
2. **Basudeb Bhattacharyya**, "*Engineering Mechanics*" Oxford University Press.
3. **F.L. Singer** "*Engineering Mechanics*" Harper Collins Publishers.

4. **E. Nelson, Charles Best, W.G. McLean, Merle Potter** "*Schaum's outline of Engineering Mechanics: Statics"*
5. **F.P. Beer and E.R. JhonstonJr** "*Vector Mechanics & Statics"* McGraw Hill.
6. **J.L. Meriam and L.G. Kraige "**Engineering Mechanics: Statics" Wiley India Ltd.
7. Relevant NPTEL Courses.

PROBLEM SOLVING WITH C

(Common to all branches)

Course Code - Category : CIV 125 - ES **Credits: 3**

L	**T**	**P**	**E**	**O**
3	**0**	**0**	**1**	**3**

Sessional Marks:40

End Exam: 3 Hours

End Exam Marks:60

Prerequisite: No specific prerequisites are needed

Course Objectives:

- This course aims to provide exposure to problem-solving through programming in C. It aims to train the student, the concepts of C-Programming Language. This course involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outcomes:

After completion of this course, a student will be able to:	
CO 1	Gain knowledge in problem solving and steps in Program development.
CO2	Apply the basic concepts of C
CO 3	Implement different operations on arrays and string to solve any given problem.
CO 4	Demonstrate pointers and modularization
CO 5	Apply structures and unions and Implement file Operations in C programming for any given

SYLLABUS

UNIT I **10 Periods**

Introduction to Computer Problem-solving: Introduction, The Problem-solving Aspect, Top-Down Design, Implementation of Algorithms, Program Verification **(Text Book 3 Page 1-29 or Reference material 1)**

Computer Science as a Career Path : Why Computer Science May be the Right Field for You, The College Experience: Computer Disciplines and Majors to Choose From Career Opportunities.

Electronic Computers Then and Now, Computer Hardware, Computer Software, The Software Development Method, Applying the Software Development Method, Professional Ethics for Computer Programmers. **(Text Book 2 Page 1-39)**

Computer Languages, Writing Editing compiling and linking programs, Program Execution, System Development, Flowcharting, Introduction to C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Coding Constants, Formatted Input / Output.

(Text Book 1)

Learning Outcomes: At the end of this Unit the student will be able

- To gain knowledge in the concepts of problem solving
- Identify the steps in Program development
- Learn number system.

UNIT II **10 Periods**

Number systems-Binary, Decimal, Hexadecimal and Transformations, storing integers and floats. Program – expressions, precedence and Associativity, Side effects, evaluating expressions, mixed type expressions, statements.

Selection –Making Decisions – Logical data and operators, Bitwise Operators- logical bitwise operators, shift operators, bitwise use, Two way selection, Multi way selection

Repetition – concept of a loop, pretest and posttest loops, initialization and updating, event controlled and counter controlled loops, loops in C, loop examples, other statements related to looping, looping applications **(Text Book 1)**

Learning Outcomes: At the end of this Unit the student will be able to

- Apply decision making in c programming for problem solving
- Apply controlled structures in c programming for problem solving

UNIT III **10 Periods**

Arrays – Concepts, using arrays in C, array applications, linear search, and Bubble sort, two – dimensional arrays, multidimensional arrays .

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions **(Text Book 1)**

Learning Outcomes: At the end of this Unit the student will be able to

- Implement different operations on arrays
- Use string functions
- Apply string manipulation operations for problem solving.

UNIT IV **10 Periods**

Functions-Designing Structured Programs, Functions in C, user defined functions, standard library functions, scope, Recursion

Storage classes-auto, register, static, extern

Pointers – Pointer Applications – Arrays and Pointers, pointer arithmetic and arrays, passing an array to a function, understanding complex declarations, memory allocation functions, array of pointers, programming application selection sort.**(Text Book 1)**

Learning Outcome : At the end of this Unit the student will be able to

- Know what a pointer is
- How to modularize a program

- Parameter passing techniques
- Write a recursive functions

UNIT V **10 Periods**

Derived Types Enumerated, Structure and Union Types – The Type Definition (typedef), Enumerated types, Structures, accessing structures, Complex structures, arrays of structures, structures and functions ,unions

Text Files – Concept of a file, files and streams, input / output functions, formatting input/output functions, character input/output functions, character input/output examples

Binary files – classification of files, using binary files, standard library functions for files, converting file type, file program examples. **(Text Book 1)**

Learning Outcome: At the end of this Unit the student will be able to

- Write a structure and union
- Create and manage a file
- Use structure and union in files

Text Books:

(1) **B. A. Forouzan and R. F. Gilberg** "*Cengage Learning , Computer Science: A Structured Programming Approach Using C*" Third Edition.

(2) **Jeri R. Hanly , Elliot B .Koffman** , "*Problem solving and program Design in C*" , 7th Edition

(3) **R.G.Dromey** , "*How to solve it by computer, Prentice-Hall International Series in Computer Science*" C.A.R. Hoare Series Editor

Reference Books:

(1) *"An Introduction to Computer Science and problem solving*" - IT Department Material

(2) **"Dietal & Deital**" , "*C How to Program 7/E"* ,PHI Publications

(3) **Yashavant Kanetkar** , "*Let Us C"*, 16th Edition

(4) **Brian W. Kernighan and Dennis M.Ritchie**, "*The C Programming Language"*, Prentice Hall of India

ENGLISH LANGUAGE LAB

Course Code - Category: CIV 126 – HS **Credits:1.5**

L	T	P	E	O
0	0	3	0	1

Sessional Marks:50

End Exam Marks:50

End Exam: 3 Hours

Prerequisites:

Basic English language skills- LSRW at Intermediate Level

Course Objectives

1. To improve fluency in spoken English and to practice correct pronunciation.
2. To introduce the techniques of presentation skills
3. Help improve speaking skills through participation in activities such as role plays, discussions, and structured talks/ oral presentations

Course Outcomes

By the end of the course, the student will be able to:	
CO1	Speak English with proper pronunciation and intonation
CO2	Make effective oral presentations by interpreting and analysing data, pictures and videos and participate in Group Discussion on general topics
CO3	Make meaningful conversations and follow logical flow of thought; answer questions on key concepts after listening to extended passages.

Syllabus

Module- I

The sounds of English CO1

1. Practicing correct Pronunciation through IPA, Stress, Intonation, Rhythm

Module –II

Group Discussions CO2

1. Purpose, Different roles for participants, Etiquette in a structured GD - Practice GDs

Module –III

Interpersonal Skills CO3 (Role plays)

1. Introduction of self and others, making announcements
2. Getting Someone's Attention, and Interrupting Conversations
3. Making Requests and Responding to them, asking for directions

Module –IV

Listening Skills CO3

1. Listening to unknown passages – for global understanding, identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Module –V

Presentation skills CO2

1. Oral Presentations (JAMs) 2. Describing and analysing videos and pictures.3. Interpreting and analysing data from graphs and charts

Prescribed book:

Oriental Black Swan. "*Language and Life*" 1st edition, 2018 Board of Editors. .

Reference Books:

1. **J.K. Gangal.** "*A Practical Course in Effective English Speaking Skills"*. Prentice Hall India Learning Private Limited 2012.

Problem Solving with 'C'Lab

(Common to all branches)

Course Code - Category: CIV 127 - ES **Credits:1.5**

L	T	P	E	O
0	0	3	0	1

Sessional Marks:50

End Exam: 3 Hours End Exam Marks:50

Prerequisite: Concepts of Problem Solving & Computer Programming in C

CourseObjective:

- The course aims at translating given algorithms to a working and valid program

CourseOutcomes:

After completion of this course, student will be able to:	
CO1	Develop C programs using operators
CO2	Write C programs using conditional structures
CO3	Write C programs using iterative structure arrays and strings
CO4	Inscribe C programs that use Pointers toand functions
CO5	Develop a c program for implementing user defined types and file processing

SYLLABUS

MINIMUM SET OF SAMPLE PROGRAMS

1. CONVERTING MILES TO KILOMETERS

PROBLEMSTATEMENT: Your summer surveying job requires you to study some maps that give distances in kilometers and some that use miles. You and your coworkers prefer to deal in metricmeasurements. Write a program that performs the necessary conversion.

Problem Input: miles /* the distance in miles*/
Problem Output: kms /* the distance in kilometers */
Relevant Formula: *1 mile = 1.609 kilometers*
Design algorithm , flow chart ,program using the above data requirements for the given problem.
Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	10	16.09
Test case 2	2	3.218

2. SUPERMARKET COIN PROCESSOR

PROBLEM STATEMENT : You are drafting software for the machines placed at the front of supermarkets to convert change to personalized credit slips. In this draft, the user will manuallyenter the number of each kind of coin in the collection, but in the final version,these counts will be provided by code that interfaces with the counting devices inthe machine.

Problem Inputs

char first, middle, last /* a customer's initials */
int dollars /* number of dollars */
int quarters /* number of quarters */
int dimes /* number of dimes */
int nickels /* number of nickels */
int pennies /* number of pennies */

Problem Outputs

inttotal_dollars /* total dollar value */
int change /* leftover change */

Additional Program Variables

inttotal_cents /* total value in cents */

Design algorithm, flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

TESTING TIP :

To test this program, try running it with a combination of coins that yield an exactdollar amount with no leftover change. For example, 1 dollar, 8 quarters, 0 dimes,35 nickels, and 25 pennies should yield a value of 5 dollars and 0 cents. Thenincrease and decrease the quantity of pennies by 1 (26 and 24 pennies) to make surethat these cases are also handled properly.

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	Type in your 3 initials and press return> JRH JRH, please enter your coin information. Number of $ coins > 2 Number of quarters> 14 Number of dimes > 12 Number of nickels > 25 Number of pennies > 131	JRH Coin Credit Dollars: 9 Change: 26 cents
Test case 2	Type in your 3 initials and press return> JRH JRH, please enter your coin information. Number of $ coins > 3 Number of quarters> 12 Number of dimes > 14 Number of nickels > 50 Number of pennies > 175	JRH Coin Credit Dollars: 11 Change: 26 cents

3.WATER BILL PROBLEM

PROBLEM STATEMENT : Write a program that computes a customer's water bill. The bill includes a $35 water demand charge plus a consumption (use) charge of $1.10 for every thousand gallonsused. Consumption is figured from meter readings (in thousands of gallons) takenrecently and at the end of the previous quarter. If the customer's unpaid balance isgreater than zero, a $2 late charge is assessed as well.

Problem Constants

DEMAND_CHG 35.00 /* basic water demand charge */
PER_1000_CHG 1.10 /* charge per thousand gallons used */

LATE_CHG 2.00 /* surcharge on an unpaid balance */

Problem Inputs

int previous /* meter reading from previous quarter in thousands of gallons */
int current /* meter reading from current quarter */
double unpaid /* unpaid balance of previous bill */

Problem Outputs

double bill /* water bill */
doubleuse_charge /* charge for actual water use */
doublelate_charge /* charge for nonpayment of part of previous balance */

Relevant Formulas

water bill = demand charge + use charge + unpaid balance+ applicable late charge

Design algorithm , flow chart ,program using the above data requirements for the given problem
Try the sample test cases given below :

SAMPLE TEST CASES	**INPUT**	**OUPUT**
Test case 1	This program figures a water bill based on the demand charge ($35.00) and a $1.10 per 1000 gallons use charge. A $2.00 surcharge is added to accounts with an unpaid balance. Enter unpaid balance, previous and current meter readings on separate lines after the prompts. Press <return> or <enter> after typing each number. Enter unpaid balance> $71.50 Enter previous meter reading> 4198 Enter current meter reading> 4238	Bill includes $2.00 late charge on unpaid balance of $71.50 Total due = $152.50
Test case 2	This program figures a water bill based on the demand charge ($35.00) and a $1.10 per 1000 gallons use charge. A $2.00 surcharge is added to accounts with an unpaid balance. Enter unpaid balance, previous and current meter readings on separate lines after the prompts. Press <return> or <enter> after typing each number. Enter unpaid balance> $51 Enter previous meter reading> 4198 Enter current meter reading> 4137	Bill includes $2.00 late charge on unpaid balance of $71.50 Total due = $102.00

4. PRIME NUMBER

PROBLEM STATEMENT : Given a positive integer **N**, calculate the sum of all prime numbers between **1** and**N**(inclusive).

Input:

The first line of input contains an integer **T** denoting the number of test cases. T testcases follow. Each testcase contains one line of input containing **N**.

Output:

For each testcase, in a new line, print the sum of all prime numbers between 1 and N.

Constraints:

$1 \leq T \leq 100$

$1 \leq N \leq 10^6$

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	2 5 10	10 17
Test case 2	2 7 10	17 17

5. BUBBLE SORT

PROBLEM STATEMENT : The task is to complete bubble function which is used to implement Bubble Sort

Input:

First line of the input denotes the number of test cases 'T'. First line of the test case is the size of array and second line consists of array elements.

Output:

Sorted array in increasing order is displayed to the user.

Constraints:

1 <=T<= 100

1 <=N<= 1000

1 <=arr[i]<= 1000

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	2 5 4 1 3 9 7 10 10 9 8 7 6 5 4 3 2 1	1 3 4 7 9 1 2 3 4 5 6 7 8 9 10
Test case 2	1	0 2 3 8 9

	5 8 9 3 2 0	

6. TEXT EDITOR

PROBLEM STATEMENT: Design and implement a program to perform editing operations on a line of text. Your editor should be able to locate a specified target substring, delete a substring,and insert a substring at a specified location. The editor should expect source stringsof less than 80 characters.

Problem Constant MAX_LEN 100 /* maximum size of a string */
Problem Inputs
char source[MAX_LEN] /* source string */
char command /* edit command */
Problem Output
char source[MAX_LEN] /* modified source string */

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	Enter the source string: > Internet use is growing rapidly. Enter D(Delete), I(Insert), F(Find), or Q(Quit)> d String to delete> growing	New source: Internet use is rapidly
Test case 2	Enter D(Delete), I(Insert), F(Find), or Q(Quit)> F String to find>**.**	'.' found at position 23

7. ARITHMETIC WITH COMMON FRACTIONS

PROBLEM STATEMENT: You are working problems in which you must display your results as integer ratios; therefore, you need to be able to perform computations with common fractions and getresults that are common fractions in reduced form. You want to write a program thatwill allow you to add, subtract, multiply, and divide several pairs of common fractions.

Design algorithm, flow chart, program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	INPUT 1	OUPUT
Test case 1	Enter a common fraction as two integers separated by a slash> 3/-4	Input invalid—denominator must be positive
Test case 2	Enter a common fraction as two integers separated by a slash> 3/4 Enter an arithmetic operator (+,-,*, or /)	gcd of 44 and 32?> 4 find_gcd returning 4 3/4 + 5/8 = 11/8

	> + Enter a common fraction as two integers separated by a slash> 5/8 Entering find_gcd with n1 = 44, n2 = 32 Do another problem? (y/n)>n	

8. FACTORIAL OF A NUMBER
PROBLEM STATEMENT: Find factorial of a given number n.

Design algorithm , flow chart ,program using the above data requirements for the given problem Try the sample test cases given below :

SAMPLE TEST CASES	**INPUT 1**	**OUPUT**
Test case 1	Enter a number to find factorial>2	Factorial of 2 is 4
Test case 2	Enter a number to find factorial>3	Factorial of 3 is 6

9. COLLECTING AREA FOR SOLAR-HEATED HOUSE – FILES AND FUNCTIONS
PROBLEM STATEMENT : An architect needs a program that can estimate the appropriate size for the collecting area of a solar-heated house. Determining collecting area size requiresconsideration of several factors, including the average number of heating degreedays for the coldest month of a year (the product of the average difference betweeninside and outside temperatures and the number of days in the month), the heating requirement per square foot of floor space, the floor space, and the efficiency ofthe collection method. The program will have access to two data files. File hdd.txtcontains numbers representing the average heating degree days in the constructionlocation for each of 12 months. File solar.txt contains the average solar insolation(rate in BTU/day at which solar radiation falls on one square foot of a given location)for each month. The first entry in each file represents data for January, the second,data for February, and so on.

Problem Inputs
Average heating degree days file
Average solar insolation file
heat_deg_days /* average heating degree days for coldest month */
coldest_mon /* coldest month (number 1 .. 12) */
solar_insol /* average daily solar insolation (BTU/ft^2)for coldest month */
heating_req /* BTU/degree day ft^2 for planned type construction*/
efficiency /* % of solar insolation converted to usable heat */
floor_space /* square feet */
Program Variables
energy_resrc /* usable solar energy available in coldest month (BTUs obtained from 1 ft^2 of collecting area) */
Problem Outputs
heat_loss /* BTUs of heat lost by structure in coldest month */
collect_area /* approximate size (ft^2) of collecting area needed*/

The formula for approximating the desired collecting area (A) is :
A= heat loss / energy resource

Design algorithm , flow chart ,program using the above data requirements for the given problem
Try the sample test cases given below :

SAMPLE TEST CASES	INPUT	OUPUT
Test case 1	What is the approximate heating requirement (BTU / degree day ft^2) of this type of construction? =>9 What percent of solar insolation will be converted to usable heat? => 60 What is the floor space (ft^2)? => 1200	To replace heat loss of 11350800 BTU in the coldest month (month 12) with available solar insolation of 500 BTU / ft^2 / day, and an efficiency of 60 percent, use a solar collecting area of 1221 ft^2.
Test case 2	What is the approximate heating requirement (BTU / degree day ft^2) of this type of construction? =>10 What percent of solar insolation will be converted to usable heat? => 60 What is the floor space (ft^2)? => 1200	To replace heat loss of 12612000 BTU in the coldest month (month 12) with available solar insolation of 500 BTU / ft^2 / day, and an efficiency of 60 percent, use a solar collecting area of 1221 ft^2.

Q10. UNIVERSAL MEASUREMENT CONVERSION

PROBLEM STATEMENT: Design a program that takes a measurement in one unit (e.g., 4.5 quarts) and converts it to another unit (e.g., liters). For example, this conversion request 450 km miles would result in this program output Attempting conversion of 450.0000 km to miles . . . 450.0000km = 279.6247 miles . The program should produce an error message if a conversion between two unitsof different classes (e.g., liquid volume to distance) is requested. The programshould take a database of conversion information from an input file before acceptingconversion problems entered interactively by the user. The user should be able tospecify units either by name (e.g., kilograms) or by abbreviation (e.g., kg).

Structured Data Type
unit_tmembers :
name /* character string such as "milligrams" */
abbrev /* shorter character string such as "mg" */
class /* character string "liquid_volume", "distance", or "mass" */
standard /* number of standard units that are equivalent to this unit */
Problem Constants
NAME_LEN 30 /* storage allocated for a unit name */
ABBREV_LEN 15 /* storage allocated for a unit abbreviation */
CLASS_LEN 20 /* storage allocated for a measurement class */
MAX_UNITS 20 /* maximum number of different units handled */
Problem Inputs
unit_t units[MAX_UNITS] /* array representing unit conversion factors database */

double quantity /* value to convert */
charold_units[NAME_LEN] /* name or abbreviation of units to be converted */
charnew_units[NAME_LEN] /* name or abbreviation of units to convert to */

Problem Output

Message giving conversion.

Data file **units.txt:**

```
miles          mi          distance       1609.3
kilometers     km          distance       1000
yards          yd          distance       0.9144
meters         m           distance       1
quartsqtliquid_volume   0.94635
liters         l           liquid_volume  1
gallons        gal         liquid_volume  3.7854
milliliters    ml          liquid_volume  0.001
kilograms      kg          mass           1
grams          g           mass           0.001
slugsslugs     mass        0.14594
poundslb       mass        0.43592
```

Design algorithm , flow chart ,program using the above data requirements for the given problem

Try the sample test cases given below :

SAMPLE TEST CASES	**INPUT 1**	**OUPUT**
Test case 1	Enter a conversion problem or q to quit. To convert 25 kilometers to miles, you would enter > 25 kilometers miles or, alternatively, > 25 km mi	>450 km miles Attempting conversion of 450.0000 km to miles . . . 450.0000km = 279.6247 miles
Test case 2	Enter a conversion problem or q to quit. > 2.5 qt l Attempting conversion of 2.5000 qt to l . . . 2.5000qt = 2.3659 l Enter a conversion problem or q to quit.	> 100 meters gallons Attempting conversion of 100.0000 meters to gallons . . . Cannot convert meters (distance) to gallons (liquid_volume)

ADDITIONAL PROGRAMS

Problem solving programs:

1. **Chocolate feast :** Little Bob loves chocolates, and goes to a store with $N in his pocket. The price of each chocolate is $C. The store offers a discount: for every M wrappers he gives to the store, he gets one chocolate for free. How many chocolates does Bob get to eat? Note : Evaluate the number of wraps after each step. Do this until you have enough wraps to buy new chocolates.

2. **Angry Professor :**The professor is. Given the arrival time of each student, your task is to find out if the class gets cancelled or conducting a course on Discrete Mathematics to a class of N students. He is angry at the lack of their discipline, and he decides to cancel the class if there are less than K students present after the class startsnot.
3. **Divisible Sum Pairs :** You are given an array of n integers and a positive integer, k. Find and print the number of (i,j) pairs where i< j and ai + aj is evenly divisible by k.
4. **Sherlock And Valid String:** A "valid" string is a string S such that for all distinct characters in S each such character occurs the same number of times in S. Note :The logic of the solution is as follows: count the character counts for each character. Note : if they are all equal – it means that all characters occur exactly N times and there is no removal needed .if 2 or more have less or more characters – there is no way to fix the string in just 1 removal . if exactly 1 char has a different count than all other characters – remove this char completely and S is fixed.
5. **Ice Cream Parlor :**Sunny and Johnny together have M dollars they want to spend on ice cream. The parlor offers N flavors, and they want to choose two flavors so that they end up spending the whole amount. You are given the cost of these flavors. The cost of the ith flavor is denoted by ci. You have to display the indices of the two flavors whose sum is M.
6. **'Missing Numbers' :**Numeros, the Artist, had two lists A and B, such that B was a permutation of A. Numeros was very proud of these lists. Unfortunately, while transporting them from one exhibition to another, some numbers from A got left out. Can you find the numbers missing?
7. **Alternating Characters:** John likes strings in which consecutive characters are different. For example, he likes ABABA, while he doesn't like ABAA. Given a string containing characters A and B only, he wants to change it into a string he likes. To do this, he is allowed to delete the characters in the string.
8. **Game Of Thrones :** I : Dothraki are planning an attack to usurp King Robert's throne. King Robert learns of this conspiracy from Raven and plans to lock the single door through which the enemy can enter his kingdom door. But, to lock the door he needs a key that is an anagram of a palindrome. He starts to go through his box of strings, checking to see if they can be rearranged into a palindrome.For example, given the string ,s=[aabbccdd] one way it can be arranged into a palindrome is abcddcba .
9. **Life and everything :** Your program is to use the brute-force approach in order to find the Answer to Life, the Universe, and Everything. More precisely... rewrite small numbers from input to output. Stop processing input after reading in the number 42. All numbers at input are integers of one or two digits.
   input: 1 2 23 22 42
   output: 1 2 23 22
10. **Filling Jars :**Animesh has N empty candy jars, numbered from 1 to N, with infinite capacity. He performs M operations. Each operation is described by 3 integers a, b and k. Here, a and b are indices of the jars, and k is the number of candies to be added inside each jar whose index lies betweena and b (both inclusive). Can you tell the average number of candies after M operations?

Reference Books:

(4) Jeri R. Hanly , Elliot B .Koffman , Problem solving and program Design in C , 7th Edition
(5) Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
(6) Dietal&Deital , C How to Program 7/E ,PHI Publications

Web References :

- https://www.spoj.com/
- https://projecteuler.net/
- https://www.hackerearth.com/practice/

- https://www.codechef.com/
- https://onlinecourses.nptel.ac.in/

Instructions to the instructor:

This lab course consists of two set of programs

1) Minimum set of sample programs
2) Additional set of programs

Minimum set of sample programs are designed unit wise covering all the topics in the theory .Additional set of programs are designed basing on problem solving

Sessional marks : 50 marks

1) Daily Evaluation (Includes Record, Observation & regular performance) – 30 marks
2) Attendance – 5 marks
3) Internal Exam – 10 marks
4) Viva Voce – 5 marks

Daily Evaluation (30 marks)

- Every Student must execute minimum set of sample programs to secure 60% of marks in Daily Evaluation i.e. 18 Marks and to appear in external examination.
- In addition to that if a student finishes the minimum set and 5 programs from additional set of programs would secure 80% of marks in Daily Evaluation i.e. 24 Marks.
- If a student finishes all the programs in both the set s will secure 100% of marks in Daily Evaluation

Internal Exam (10 marks)

- Every student is given 4 questions in the internal exam out of which the difficulty level of 2 questions is easy / medium and 2 questions of difficulty level is high
- Each easy / medium level question carries 20% of marks and difficulty level question carries 30% of marks

External Exam (50 marks)

- Viva voce – 10 marks
- Write up + Execution – 40 marks

Write up + Execution (40 marks)

- Every student is given 4 questions in the external exam out of which the difficulty level of 2 questions is easy / medium and 2 questions of difficulty level is high
- Each easy / medium level question carries 30% of marks and difficulty level question carries 20% of marks.

ENVIRONMENTAL SCIENCE

Mandatory (Non Credit) course for all branches

Course Code - Category: CIV 128 - MC **Credits:0**

L	T	P	E	O
3	0	0	0	1

Sessional Marks:50

COURSE OBJECTIVE:

- To Make the students get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations
- To know about the causes of pollution due to the day to day activities of human life
- To get an idea about the measures for sustainable development

Course Outcomes:

By the end of the semester, the student will be able to:	
CO1	Identify the characteristics of various natural resources and can implement the conservation practices
CO2	Realize the importance of Ecosystem and Biodiversity for maintaining ecological balance
CO3	Classify, analyze various pollutants and can develop methods for solving problems related to environment
CO4	Get awareness on various environmental laws and methods for sustainable development of environment
CO5	Understand the impact of population growth on human health and environment

SYLLABUS

UNIT I

INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES 8 Periods

Introduction: Definition, Multidisciplinary nature of environmental studies, Scope and Importance of Environmental Sciences, Need for public awareness.

Natural Resources: Renewable and Non-Renewable resources- Forest resources-use and overexploitation, deforestation, Water resources- aquifers, dams and benefits, conflicts over water; Food resources- effects of modern agriculture practices, Energy resources-conventional and non conventional energy resources.

LEARNING OUTCOMES

- Students will be able to know the scope and importance of environment.
- Students will be able to explain natural resources and their associated problems.
- Students will be able to articulate basic understanding of effects of modern agriculture practices on environment.
- Students will be able to recognise the importance of alternative sources of energy.

UNIT- II

ECOSYSTEM & BIO DIVERSITY 8 Periods

Ecosystem: Concept of an ecosystem-structure and function of an ecosystem Food chains, food webs and ecological pyramids, Energy flow in an ecosystem, Ecosystem regulation, Ecological succession.

Biodiversity: Definition, types, India as a Mega diversity Nation, Values of biodiversity, Hot spots of biodiversity, Threats to biodiversity, Endangered and endemic species, Conservation of biodiversity.

LEARNING OUTCOMES

- Students will get a clear picture on structure and functions of ecosystems.
- Students will be able to explain the energy and matter flow in ecosytems.
- Students will be able to identify the threats to biodiversity and conservation methods to protect biodiversity.
- Students will be able to understand the importance of endemic species.

UNIT -III

ENVIRONMETAL POLLUTION AND WASTE MANAGEMENT 8 Periods

Pollution: Sources, effects and control measures of Air pollution, Noise Pollution, Water Pollution, Soil Pollution, Radio Active Pollution; Climate Change, Ozone depletion, Acid rains –causes and adverse effects.

Solid waste management: Sources and effects of municipal waste, bio-medical waste, Industrial waste, e-waste, Process of waste management-composting, sanitary landfills, incineration. Green Chemistry concepts,

LEARNING OUTCOMES

- Students will be able to understand sources, effects and control measures of various types of pollutions.
- Students will be able to understand about solid waste management.
- Students will explain the ill effects of climatic change.

UNIT- IV

SOCIAL ISSUES AND ENVIRONMENTAL LEGISLATIONS 8 Periods

Social Issues and the Environment: Sustainable development, Environmental Impact Assessment, Rain water harvesting, water shed management. Resettlement and rehabilitation of people, Environmental ethics.

Legislational Acts: Importance of Environmental legislation, Air (Prevention and Control of Pollution) act, Water (Prevention and control of Pollution) act, Wildlife Protection act, Forest Conservation act

LEARNING OUTCOMES

- Students will be able to know the mesures to achieve sustainable development.
- Students will have knowledge about watershed management and environmental ethics
- Students will be able to explain the enforcement of Environmental legislations.

UNIT- V
HUMAN POPULATION AND THE ENVIRONMENT **5 Periods**

Human population and environment- Population growth, Population explosion; Family Welfare Programmes; Role of information technology on environment and human health; Value Education – HIV/AIDS – Women and Child Welfare

FIELD WORK/PROJECT: Visit to a local area to document environmental problem;

LEARNING OUTCOMES

- Students will know the impacts of population on human health and environment.
- Students will understand the role of IT on Environment.
- Students will be able to prepare a detailed report on a particular environmental issue.

AWARENESS AND OTHER ACTIVITIES

1. Planting trees
2. Listing out water bodies and discuss the problems associated with it
3. Poster making of ecological pyramids and food chain and food web of different ecosystems like forest, grassland and aquatic system
4. Prepare list of endangered endemic and extinct species
5. Preparation of models
6. Cleanliness drive (Swatch Bharath)
7. Group discussion about waste management
8. Slogan making

Prescribed Book

1. **Anubha Kaushik & C.P.Kaushik**, "*Perspertives of Environmental Studies"* by 5th edition New Age International Publications, 2015.
2. **Erach Bharucha** *Text book of "Environmental Studies for Undergraduate Courses*", universities Press Commission, 2013.
3. **Palaniswamy**- "*Environmental Studies",* 2nd edition, Pearson education 2015.

Reference Books

1. **S. Deswal, A. Deswal**, "*Basic course in Environmental studies",* 2nd edition, Dhanpatrai Publications, 2008.