School of Engineering and Technology

Programme Structure & Syllabus

Civil Engineering

2023-24

K.K. University

Bihar Sharif, Nalanda - 803115

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Objective of the Program:

The major objective of the program is to empower aspiring engineers as an 'Industry Ready Professional' with the knowledge, skills, and experience. The student will embark on a transformative educational journey of skills, innovation, and hands-on learning. The program is aimed to shape the next generation of innovative and ethical civil engineers. Discover the potential and make a lasting impact on society to build a career that matters.

Program Education Outcomes:

PEO-1: To train and equip graduates in civil engineering with professional skills for successful careers dealing with analysis, design and management of infrastructural projects both in India and abroad.

PEO-2: To develop core competency in the civil engineering field so as to formulate, analyse and solve civil engineering and allied problems using the principle of mathematics and science.

PEO-3: To provide the students with a comprehensive and balanced understanding of the several branches of civil engineering such as structural engineering, geotechnical engineering, transportation engineering, and hydraulic and water resources.

PEO-4: To inculcate in students high ethical standards, effective oral and written communication skills, to work as part of teams on multidisciplinary projects in diverse professional environments, and to relate engineering issues to the society and nation.

PEO-5: To provide student with an academic excellence, leadership, management skills and life-long learning needed for a successful professional career.

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Program Outcomes:

PO-1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-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.

PO-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.

PO-5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO-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.

PO-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.

PO-8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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PO-9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-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

PO-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.

PO-12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes:

PSO-1: Analysis and design of foundations and superstructures for residential and commercial buildings using commercial software.

PSO-2: Design of hydraulic structures, highways, railways, airways, docks and harbors

PSO-3: Design, test and evaluate water, sewerage and industrial effluent conveying and treatment systems.

PSO-4: Survey, map and plan layouts for buildings, roads, and hydraulic structures using modern tools such as the total station.

B.Tech Civil Engineering
Programme/Course Structure

FIRST SEMESTER

S. No	CODE	TITLE	L	T	P	Hours Per Week	Credit
1	ETSH-101	Engineering Physics	3	0	0	3	**3**
2	ETSH-102	Engineering Mathematics-I	2	1	0	3	**3**
3	ETCS-101	Introduction to Artificial Intelligence	3	0	0	3	**3**
4	ETSH-103	Soft Skills	3	0	0	3	**3**
5	ETSH-105	Engineering Chemistry	3	0	0	3	**3**
6	ETEA-111	Inter-disciplinary Experimental Active Learning (IDEA LAB)	0	0	3	3	**2**
7	ETME-111	Engineering Workshop Lab	0	0	2	2	**1**
8	ETSH-111	Engineering Physics Lab	0	0	2	2	**1**
9	ETSH-115	Engineering Chemistry Lab	0	0	2	2	**1**
10	ETCS-111	Introduction to Artificial Intelligence with Python Lab	0	0	2	2	**1**
11	ETSH-113	Soft Skill Lab	0	0	1	1	**1**
Total			**14**	**1**	**12**	**27**	**22**

SECOND SEMESTER

S. No	CODE	COURSE TITLE	L	T	P	Hours Per Week	Credit
1	ETSH-201	Engineering Mathematics -II	2	1	0	3	**3**
2	ETEE-201	Basic Electrical & Electronics Engineering	3	0	0	3	**3**
3	ETCS-201	C Programming	3	0	0	3	**3**
4	ETME-201	Fundamental of Mechanical & Civil Engineering	3	0	0	3	**3**
5	ETSH-202	Technical Communication & Project Management	2	1	0	3	**3**
6	ETME-202	Engineering Graphics & Design	1	0	3	4	**3**
7	ETCS-202	Basics of Internet of Things (IoT)	2	0	0	2	**NC**
8	ETEE-211	Basic Electrical & Electronics Engineering Lab	0	0	2	2	**1**
9	ETME-211	Fundamental of Mechanical & Civil Engineering Lab	0	0	2	2	**1**
10	ETCS-211	C Programming Lab	0	0	2	2	**1**
TOTAL			**16**	**2**	**09**	**27**	**21**

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THIRD SEMESTER

S.No	CODE	COURSE TITLE	L	T	P	Hours per week	Credit
1	ETSH301	Engineering Mathematics- Iii	3	1	0	4	**4**
2	ETCE301	Structural Mechanics-I	3	1	0	4	**4**
3	ETCE302	Building Material & Construction Technique	3	0	0	3	**3**
4	ETCE303	Engineering Geology	3	0	0	3	**3**
5	ETCE304	Building Planning and Drawing	3	0	0	3	**3**
6	ETCE311	Structural Mechanics-I Lab	0	0	3	3	**1.5**
7	ETCE312	Building Material & Concrete Technology Lab	0	0	3	3	**1.5**
8	ETCE313	Engineering Geology Lab	0	0	3	3	**1.5**
9	ETCE314	Building Planning and Drawing Lab	0	0	3	3	**1.5**
TOTAL			**15**	**2**	**12**	**29**	**23**

FOURTH SEMESTER

S. No	CODE	TITLE	L	T	P	Hours Per Week	Credit
1	ETCE401	Engineering Hydraulics-I	3	0	0	3	**3**
2	ETCE402	Structural Mechanics-II	3	0	0	3	**3**
3	ETCE403	Surveying	3	0	0	3	**3**
4	ETCE404	Transportation Bridge and Tunnel	3	0	0	3	**3**
5	ETCE405	Reinforced Cement Concrete -I	3	0	0	3	**3**
6	ETCE411	Engineering Hydraulics-I Lab	0	0	3	3	**1.5**
7	ETCE412	Structural Mechanics-II Lab	0	0	3	3	**1.5**
8	ETCE413	Surveying Lab	0	0	3	3	**1.5**
9	ETCE415	Reinforced Cement Concrete -I Lab	0	0	3	3	**1.5**
TOTAL			**15**	**0**	**12**	**27**	**21**

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FIFTH SEMESTER

S. No	CODE	TITLE	L	T	P	Hours Per Week	Credit
1	ETCE501	Structural Analysis-I	3	1	0	4	4
2	ETCE502	Soil Mechanics	3	0	0	3	3
3	ETCE503	Environmental Engineering -I	3	0	0	3	3
4	ETCE504	Engineering Hydraulics-II	3	0	0	3	3
5	ETCE505	Advanced Surveying	3	0	0	3	3
6	ETCE512	Soil Mechanics Lab	0	0	3	3	1.5
7	ETCE513	Environmental Engineering -I Lab	0	0	3	3	1.5
8	ETCE514	Engineering Hydraulics-II Lab	0	0	3	3	1.5
9	ETCE515	Advanced Surveying Lab	0	0	3	3	1.5
TOTAL			**15**	**01**	**12**	**28**	**22**

SIXTH SEMESTER

S. No	CODE	TITLE	L	T	P	Hours Per Week	Credit
1	ETCE601	Structural Analysis-II	3	0	0	3	3
2	ETCE602	Environmental Engineering -II	3	1	0	4	4
3	ETCE603	Steel Structure Design -I	3	0	0	3	3
4	ETCE604	Water Resource & Irrigation Engineering	3	0	0	3	3
5	ETCE605	Highway Engineering	3	0	0	3	3
6	ETCE613	Steel Structure Design -I Lab	0	0	3	3	1.5
7	ETCE614	Water Resource & Irrigation Engineering Lab	0	0	3	3	1.5
8	ETCE615	Highway Engineering Lab	0	0	3	3	1.5
9	ETCE616	Auto-Cad Lab	0	0	3	3	1.5
TOTAL			**15**	**01**	**12**	**28**	**22**

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SEVENTH SEMESTER

S.NO	CODE	TITLE	L	T	P	Hours Per Week	Credit
1	ETCE701	Reinforced Cement Concrete-II	3	0	0	3	**3**
2	ETCE702	Design Of Hydraulic Structure	3	1	0	3	**3**
3	ETCE703	Foundation Engineering	3	0	0	3	**3**
4	ETCE704	Engineering Biology	3	1	0	4	**4**
5	ETCE705	Minor Project	0	0	8	2	**4**
6	ETCE711	Reinforced Cement Concrete-II Lab	0	0	4	3	**2**
7	ETCE716	Industrial Training	0	0	4	3	**2**
TOTAL			**12**	**02**	**16**	**23**	**21**

EIGHTH SEMESTER

S.NO	CODE	TITLE	L	T	P	Hours per week	CREDIT
1	ETCE801	Quantity Surveying and Costing	3	0	0	3	**3**
2	ETCE802	Construction Planning And Management	3	0	0	3	**3**
3	ETCE821A	Computational Methods In Structural Engineering	3	0	0	3	**3**
	ETCE821B	Traffic Engineering					
	ETCE821C	Industrial Waste Treatment					
4	ETCE822A	Structural Dynamics & Earthquake Engineering	3	0	0	3	**3**
	ETCE822B	Pavement Design					
	ETCE822C	Air Quality Monitoring & Control					
	ETCE822D	Advance Water Resources Engineering					
5	ETCE811	Quantity Surveying and Costing Lab	0	0	3	3	**1.5**
6	ETCE812	Major Project	0	0	10	6	**5**
7	ETCE813	General Proficiency + Seminar	0	0	3	3	**1.5**
TOTAL			**12**	**0**	**16**	**24**	**20**

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Elective I:

1. **ETCE821A** Computational Methods in Structural Engineering
2. **ETCE821B** Traffic Engineering
3. **ETCE821C** Industrial Waste Treatment

Elective II

1. **ETCE822A** Structural Dynamics & Earthquake Engineering
2. **ETCE822B** Pavement Design
3. **ETCE822C** Air Quality Monitoring & Control
4. **ETCE822D** Advance Water Resources Engineering

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Ist SEMESTER

Program Structure	B. Tech (Civil Engineering)
Subject Code	ETSH-101
Course Name	Engineering Physics.
Course Credits	3 (T) + 1(P)= 4
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1. **Course Overview:**

To impart knowledge in basic concepts of physics relevant to engineering applications. To introduce advances in technology for engineering applications. Apply Biot- Savart Law and Ampere's Law. To impart knowledge on the concepts of electrostatics, electric potential, energy.

2. **Prerequisite:** Basic Concept of semiconductor, Optics and Laser.

3. **Objective of Syllabus:**

- To impart knowledge in basic concepts of physics relevant to engineering applications.
- To introduce advances in technology for engineering applications.
- Apply Biot- Savart Law and Ampere's Law to compute magnetic field due to a current distribution.
- Calculate the field of a magnetized object.
- To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.

4. **Course Outcome:**

S. No.	Course Outcomes (Cos)
CO1	To design and conduct simple experiments as well as analyze and interpret data.
CO2	Engineering applications Capability to understand advanced topics in engineering.
CO3	Identify formula and solve engineering problems.
CO4	Apply quantum physics to electrical phenomena.
CO5	Apply engineering and physics concepts to the nano-scale and non-continuum domain.

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5. Syllabus.

UNIT I: ELECTROSTATICS AND ELECTROMAGNETIC

Electrostatics, Electric charge as point charge, charge distribution, Coulomb s law, Electric field, electric field due to point charge & charge distribution, Electrostatic Potential, Potential due to point charge, long charged wire, charged Spherical conductor & Electric dipole, Ampere's law, application of Ampere's law, Biot- Savart law, Application of biot- savart law.

UNIT II: OPTICS & LASER

Reflection and refraction, Snell's law, physical significance of refractive index (simple problems), Total internal reflection, Lasers, Characteristics of Laser, Ruby laser, Working Principle of He-Ne Laser. Polarization of light, Brewster's Law, Malu's Law.

UNIT III: QUANTUM PHYSICS

Planck's theory of black body radiation, Compton effect, Photo electric effect, Wave particle duality, De-Broglie waves, De-Broglie wave velocity, Wave and group velocity, Heisenberg's uncertainty principle, Application of uncertainty principle.

UNIT IV: SEMICONDUCTORS

Introduction of semiconductor, intrinsic & Extrinsic semiconductor, P –N junction, P-N junction with forward bias, P-N junction with reverse bias, reverse breakdown, light emitting diode, Zener diode, properties of zener diode.

UNIT V: NANO-PHYSICS

Introduction and Basic definition of Nano Technology, Properties of Nano particles, Elementary ideas of Synthesis of Nano particles, Application of Nano particles.

REFERENCE BOOKS:

1. Modern Physics by G. Aruldhas & P. Rajagopal; Pub: Prentice Hall of India.
2. Quantum Physics by H.C. Verma Pub.: Surya Publication.
3. Lasers and Non-Linear Optics by B.B. Laud; Pub: New Age International (P) Ltd.
4. Principles of electricity by Leigh Page and Normal llsley Adams, Pub.: Eurasia Publishing House, New Delhi.
5. Engineering physics by Dr. Rakesh Dogra Pub: S.k kataria & sons.
6. Engineering physics by Dr. Abhijit Nayak Pub: S.k kataria & sons.

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ENGINEERING PHYSICS LAB SUB-CODE: ETSH-111 CREDIT: 01

LIST OF EXPERIMENTS:

Week 1: Find the acceleration due to gravity (g) with the help of bar Pendulum.
Week 2: To determine the external diameter of solid Cylinder by the slide calipers.
Week 3: To determine the thickness of glass plate by using Spherometer.
Week 4: To determine the diameter of metal wire by using Micrometer (Screw Gauge).
Week 5: Study the junction diode.
Week 6: To find the refractive index of a material given in the form of a prism by using a Spectrometer.
Week 7: To obtain the particle size by the laser.

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Program Structure	**B. Tech (Civil Engineering)**
Subject Code	**ETSH-102**
Course Name	**Engineering Mathematics - I**
Course Credits	**3 (T)**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1. Course Overview:

Techniques in matrices, differentiation and Integration, advanced level of Mathematics and applications.

2. Prerequisite:

Basic knowledge of Algebra & Calculus.

3. Objective of Syllabus:

- Techniques in matrices, differentiation and Integration.
- It aims to equip the students to deal with advanced level of Mathematics and applications that would be essential for their disciplines.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	Use both the limit definition and rules of differentiation to differentiate functions.
CO2	Apply differentiation to solve maxima and minima problems.
CO3	Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
CO4	Evaluate integrals using techniques of integration, such as substitution, partial fra and integration by parts.
CO5	Determine convergence/divergence of improper integrals and evaluate conv proper integrals.
CO6	Apply various techniques in solving differential equations

5. Syllabus.

UNIT I: LINEAR ALGEBRA

Matrix algebra, Determinant, Inverse and rank of a matrix by elementary transformation, solution of system of linear equation, vector, Basis, L.D&L.I, Eigen value and Eigen vector of a real matrix, properties of Eigen values, cay-lay Hamilton theorem. diagonalization of matrices.

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UNIT II: DIFFERENTIAL CALCULUS

Limit, continuity and Differentiability, Successive differentiation, Leibnitz theorem, mean value theorem (Rolle's, Lagrange's Cauchy) Maxima & Minima for single variable, Taylor & Maclaurin Series.

UNIT III: FUNCTION OF SEVERAL VARIABLES

Partial derivative, Homogeneous functions and euler's theorem Total derivative, Differentiation of implicit function of two variables, Maxima and Minima of function of variables, Lagrange's method of undetermined co-efficient.

UNIT IV: INTEGRAL CALCULUS

Integration of various functions, Definition of proper and improper integral, Convergence of improper integral, Beta and gamma functions, Differentiation under integral sign.

UNIT V: CURVE TRACING

Curve tracing of Cartesian and Polar form, Surface area and volume of Surface of revolution.

REFERENCE BOOKS

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher's, 36 th edition, 2010.
2. Erwin Kresyszig, Advance Engineering Mathematics, John Wiley and Sons, 9 th edition, 2006.

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Program Structure	**B. Tech (Civil Engineering)**
Subject Code	**ETCS-101**
Course Name	**Introduction to Artificial Intelligence**
Course Credits	**3 (T) + 1(P)= 4**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1. Course Overview:

The primary objective of this course is to introduce the basic principles techniques, and applications of. Artificial Intelligence, students will get a basic knowledge about Searching techniques like hill climbing,A* Algorithm, AO*.

2. Prerequisite:

To understand the basic knowledge of Reasoning, Mathematics, Psychology and Learning Techniques.

3. Objective of Syllabus:

- The primary objective of this course is to introduce the basic principles
- techniques, and applications of. Artificial Intelligence
- In this course, students will get a basic introduction to the building blocks and components of artificial intelligence
- learning about concepts like algorithms.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	To understand Introduction to AI, Overview of AI, Problems of AI, AI technique, Searching techniques like hill climbing, A* Algorithm, AO*.
CO2	Understand the basic concept of Python, Data types, Variables, Basic input – output operations, Basic Operators, literals, Strings, Number and Conditional Statement, Loop Statements.
CO3	Ability to Define and Accessing List, tuple, Dictionary, Functions, Numpy, Matplotlib.
CO4	To understand Problem in representing knowledge, Knowledge representation using propositional and predicate logic, resolution.
CO5	Ability to understand Probabilistic reasoning, Baye's Theorem, Semantic networks, fuzzy logic, forward and backward reasoning.

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CO6	Ability to understands Learning, various techniques in Learning, Introduction to Neural networks, application of Neural network, common sense and reasoning.

5. Syllabus.

UNIT I:
Introduction to AI: History of AI, Overview of AI, Problems of AI, AI technique, Production Systems, Characteristics of production systems, Tic-Tac-Toe problems, Searching techniques like hill climbing,A* Algorithm, AO* Algorithm etc , and various types of control strategies.

UNIT II:
Introduction to Python: Python basics – Data types, Variables, Basic input –output operations, Basic operators, Python literals, Strings, Number, list, tuple, Dictionary, Functions, Conditional Statement, Loop Statements, Numpy, Matplotlib, Simple programming exercises using Python.

UNIT III:
Knowledge representation, Problem in representing knowledge, Knowledge representation using propositional and predicate logic, resolution, refutation, deducation, Theory proving, monotonic and non-monotonic reasoning.

UNIT IV:
Probabilistic reasoning, Baye's Theorem, Semantic networks, Scripts, Schema, frames, conceptual dependency, fuzzy logic, forward and backward reasoning, introduction to understanding, natural language processing.

UNIT V:
Introduction to learning, various techniques in Learning, Introduction to neural networks, application Neural network, common sense, reasoning, some examples of expert systems.

TEXTBOOKS / REFERENCES

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall

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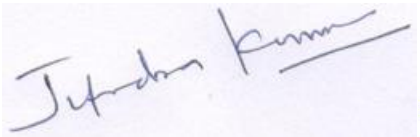
INTRODUCTION TO A.I WITH PYTHON LAB SUB-CODE: ETCS-111 CREDIT: 01

LIST OF EXPERIMENTS:

Week 1: Python program to demonstrate the example for arithmetic operators
Week 2: Python program for simple interest
Week 3: Python program to find power of a number using exponential operator
Week 4: Python program Find largest of three number using nested if else.
Week 5: Python program Calculate discount based on the sale amount.
Week 6: Python program Demonstrate an example of for loop
Week 7: Python program Examples of loops (based on their control)
Week 8: Python program Find factorial of a given number
Week 9: Python Program to print Odd and Even numbers from the list of integers.
Week 10: Python Program to calculate n-th term of a Fibonacci Series
Week 11: Python Program to check whether a given Number is prime or not prime.
Week 12: Python Program to check whether a given Number is Armstrong or not.

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Programme Structure	B. Tech (Civil Engineering)
Subject Code	ETSH-103
Course Name	SOFT SKILLS
Course Credits	3 (T) +1(P) = 4
Total Course Credit	172

Abbreviations: T-Theory

1. **Course Overview**: This course will encourage students for self-awareness, self-Development, and will give good communication skill, Leadership knowledge, and will also have knowledge about ethics.

2. **Prerequisite:** students should have knowledge about Basic English and communication and also about Basic Leading knowledge**.**

3. **Objective of the Syllabus:** The objective of this course to help the students to develop as team member, leader and all-round professional in the long run. This course would focus on over all personality development of the student and to improve his technical writing and documentation.

4. **Course Outcomes:**

S.No.	Course Outcomes (Cos)
CO1	Communicate, interact and present his ideas to the other professionals
CO2	Understand and aware of importance, role and contents of soft skills through instructions, knowledge acquisition, demonstration and practice
CO3	Have right attitude in al and behavioral aspects, and build the same through activities.
CO4	Possess right professional and social ethical values.
CO5	Possess knowledge about Time Management.

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5.Syllabus:

UNIT I: SELF AWARENESS AND SELF-DEVELOPMENT

Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Emotional Intelligence, Lateral thinking, Depression and Habit, relating SWOT analysis &goal setting, prioritization.

UNIT II: COMMUNICATION SKILL

Importance of communication, Aspects of communication, communication through words, communicationthroughbodylanguage,communicationthroughtechnology,Oralcommunication, Listening Skills, Group Discussion and Interview Skills, Presentations kills: preparing the presentation, performing the presentation, Written communication: Reading comprehension, précis writing, Business and technical reports, Styles, Business correspondence, Memorandum writing, Notice, Agenda and Minutes, Research papers and articles, Advertising and job Description, Mechanics of Manuscript preparation.

UNIT III: INTERPERSONAL RELATIONSHIP

Teamwork, Team effectiveness, Group discussion, Decision making- Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics, Multicultural Diversity and Socializing

UNIT IV: LEADERSHIP SKILLS

Leaders: their skills, roles, and responsibilities. Vision, Empowering and delegation, motivating others, organizational skills, team building, Organizing and conducting meetings,decision making,giving support,Vision,Mission,Coaching,Mentoring and counseling, Appraisals and feedback, conflict, Power and Politics, Public Speaking.

UNIT V: OTHER SKILLS

Managing Time, Managing Stress, Meditation. Improving personal memory, Study skills that include Rapid Reading, Note Taking, Self-learning, Complex proble solving and creativity, listening skill and speaking skills, Corporate and Business Etiquettes.

UNIT VI: ETHICS IN ENGINEERING PRACTICE AND RESEARCH Introduction to ethical reasoning and engineer ethics, Right and responsibilities regarding Intellectual property, workplace rights and responsibilities, Central Professional Responsibilities of Engineers, Responsibility for environment.

TEXTBOOKS:

1. Developing Communication Skill: Krishna Mohan, Meera Banerji, -MacMillan India Ltd.
2. BN Ghosh, Managing Soft Skills for Personality Development "Mc Graw Hill
3. Ethics in Engineering Practice and Research: Caroline Whitbeck, Cambridge University press

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4. A Course in Communication Skills: Kiranmai Dutt, Cambridge University press
5. English for Business Communication: Simon Sweeney, Cambridge University Press
6. Basics of Communication in English: Francis Sounderaj, Mac Millan India Ltd.
7. Group Discussions and Interview Skills: Priyadarshi Patnaik, Cambridge University Press
8. Professional Presentations: Malcolm Goodale, Cambridge University Press
9. An IntroductiontoProfessionalEnglishAndSoft Skills: Das, Cambridge University Press
10 A practical course in Effective English speaking skills, G.K.Gangal, PHI Publication.

SOFT SKILL LAB **SUBJECT CODE ETSH-113** **CREDIT: 01**

LIST OF EXPERIMENTS

Week 1: Work/Assignments
Week 2: SWOT analysis Personal & Career Goal setting – Short term & long-term Presentation Skill
Week 3: Dining EtiquettesLetter/Application/Notice/Agenda/MinuteswritingReportwriting
Week 4: Listening skills using Language laboratory
Week 5: Group discussion
Week 6: Resume writing

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Program Structure	**B. Tech (Civil Engineering)**
Subject Code	**ETSH-105**
Course Name	**ENGINEERING CHEMISTRY**
Course Credits	**3 (T) + 1(P)= 4**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1. Course Overview:

A number of academic and research options are available to students in various fields such as pharmaceuticals, food products, environmental monitoring and assessments, environmental chemistry, fuel chemistry, cosmetic chemistry, biochemistry, biomaterials, nano-chemistry, materials chemistry, polymer chemistry, industrial chemistry, water chemistry, etc. in addition to physical, organic and inorganic chemistry that a student can explore for choosing a professional career.

2. Prerequisite:

Students must have Chemistry as a one subject at +2 levels.

3. Objective of Syllabus:

i. Broad and balance knowledge in chemistry in addition to understanding of key chemical concepts, principles and theories.
ii. To develop students' ability and skill to acquire expertise over solving both theoretical and applied chemistry problems.
iii. To provide knowledge and skill to the students' thus enabling them to undertake further studies in chemistry in related areas or multidisciplinary areas that can be helpful for self-employment/entrepreneurship.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	Characterize bonding between atoms, molecules, interaction and energetics (ii) hybridization and shapes of atomic, molecular orbitals, bond parameters, bond-distances and energies.
CO2	Importance of hydrogen bonding, metallic bonding
CO3	Understanding chemistry of Water and its properties
CO4	Understanding principle of UV-Vis/FTIR spectroscopy and its applications.

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CO5	Understanding principles of NMR analysis and study of Flame photometry of materials/characterization of materials.
CO6	Understanding chemistry of polymers, their structures and uses.

5. Syllabus.

UNIT- I: CHEMICAL BONDING

Introduction, Molecular Orbital Theory (MOT), Sigma (σ) and pi (π) Molecular Orbitals, Energy level Diagram for Mono and Di atomic Molecules, Linear Combination of Atomic Orbitals (LCAO) Method, Crystal Field Theory, Calculation of CFSE

UNIT- II: WATER AND ITS TREATMENT

Introduction, Soft and Hard Water, Type of Hardness, Techniques for Water Softening- Lime Soda Process, Zeolite Process, Ion Exchange Process.

UNIT- III: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Basic concept of spectroscopy. Principle and Applications of different spectroscopic techniques (UV-Visible and IR spectroscopy). Nuclear magnetic resonance and magnetic resonance imaging. Elementary Discussion of Flame photometry.

UNIT- IV: POLYMER

Introduction, types of polymerization. Classification, mechanism of polymerization (Free radical and Ionic polymerization). Thermoplastic, and thermosetting polymers Elementary idea of Biodegradable polymers, preparation, properties and uses of the following polymers- PVC, PMMA, Teflon, Nylon-6, Polyester phenol formaldehyde, Urea- Formaldehyde, Buna-s, Vulcanization of Rubber.

UNIT- V: CORROSION AND LUBRICANT

Lubricant- Definition, Classification with examples. Functions of Lubricant, Physical Characterisitics of Lubricants Such and Viscosity, Viscosity Index, Oiliness, Volatility, Flash & Fire Point, and Cloud & Pour Point. Chemical Characteristics of Luricant such as Acid Value or Neutralization Number, Emulsification, Saponification Value etc.

TEXT BOOKS:

- University Chemistry,byB.H.Mahan
- Chemistry Principles and Applications, by M.J.Sienko and R.A.Plane
- Fundamentals of Molecular Spectroscopy, by C.N.Banwell
- Engineering Chemistry (NPTEL Web-book),by B.L. Tembe,KamaluddinandM.S.Krishnan
- Physical Chemistry, by P.W.Atkins

ENGINEERING CHEMISTRY LAB **ETSH-115** **CREDIT: 01**

OBJECTIVES OF THE COURSE:

This Engineering Chemistry Laboratory is common to first year branches of UG Engineering. At
The end of the course the student is expected to provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems. Practical implementation of fundamental concepts.

LIST OF EXPERIMENT: -

Week 1: Qualitative analysis of given salts having three acidic and basic radicals.
Basic radicals: - Pb2+,Cu2+,Al3+,Fe2+,Fe3+,Cr3+,Zn2+,Ca2+,Ba2+ etc.
Acidic radicals:- Cl-,Br-,I-,,SO4,NO3,OH- etc.

Week 2: Determination the total hardness of given water sample.

Week 3: To Determine the Saponification value of given oil sample.

Week 4: To Determine the acid value of given oil sample.

Week 5: Adsorption of acetic acid by charcoal.

Week 6: Synthesis of polymer /drug.

Week 7: To Determine the Ph of given solution by universal indicator or pH meter.

Week 8: To determine dissolved oxygen in water sample.

Week 9: To determine thinner content in oil paint.

Week 10: To determine carbon monoxide, carbon di-oxide, ontent emission from petrol vehicle.

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Programme Structure	B. Tech (Civil Engineering)
Subject Code	ETEA - 111
Course Name	Inter-disciplinary Experimental Active Learning (IDEA LAB)
Course Credits	0 (T) + 3 (P) = 3
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1. **Syllabus:**

Course Objective:

The objective of an Idea Lab course is to foster creativity, innovation, and problem-solving skills among participants. Through a combination of theoretical learning, practical exercises, and hands-on projects, Idea Lab courses aim to:

Cultivate creative thinking: Encourage participants to think outside the box, explore unconventional solutions, and challenge traditional approaches to problem-solving.

Develop ideation skills: Equip participants with techniques and methods for generating, refining, and evaluating ideas effectively.

Promote collaboration: Foster a collaborative environment where participants can exchange ideas, provide feedback to each other, and collaborate on projects.

Encourage experimentation: Encourage participants to experiment with different ideas, prototypes, and solutions, embracing failure as a natural part of the creative process.

Course Outcomes:

The outcomes of an Idea Lab course go beyond the acquisition of knowledge to encompass the development of a creative and entrepreneurial mindset, equipping participants with the skills and confidence to thrive in a rapidly changing world.

LIST OF EXPERIMENTS: -

Week 1 To study various active & passive devices like R, L & C, battery etc.
Week 1 To study the CRO and function generator for signal analysis.
Week 2 To study the basics of mechatronics and various parts of a robot.
Week 3 To study the refrigeration and Air-conditioning system with future perspectives.
Week 4 Identification of various types fabrics like cotton, woolen, linen, silk etc.
Week 4 Identification of different types of stones and aggregates (visual identification) with study of their properties and applications.
Week 5 Identification of timbers: teak, Sal, chir, shisum, siras, deodar, kail and mango. (Visual identification) and with study of their properties and applications.
Week 6 Identification of hard drive, RAM, mother board and other important parts in a desktop computer

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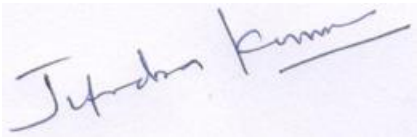
Week 7 To study the types of soil, water and renewable energy with present scenario and future challenges for sustainable development.
Week 8 To learn the parts of fan, LED bulb, induction cook top, electric iron etc.
Week 9 To study the working principle and various parts of a Hybrid Electric Vehicle (HEV)
Week 10 To study the various components of Green Building (also called as Zero Energy Building)



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Programme Structure	B. Tech (Civil Engineering)
Subject Code	ETME - 111
Course Name	Engineering Workshop Lab
Course Credits	0 (T) + 2 (P) = 2
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1. **Syllabus:**

Course Objective:

Providing basic knowledge of workshop tools, equipment, machineries and various workshop activities related to carpentry, smithy, foundry etc. with hands-on practices.

Course Outcomes:

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

- Use welding equipments to join the structures.
- Carry out the basic machining operations
- Illustrate on operations of smithy, Carpentry, foundry and fittings

LIST OF EXPERIMENTS: -

Week 1 Smithy Shop

(a) To prepare a ring a mild steel rod in black smithy shop.

(b) To prepare an eye-nail of M.S rod of 125 mm long & 8 mm thickness.

Week 2 Foundry Shop

(a) To prepare a V block casting using pit furnace.

Week 3 Carpentry Shop

(a) To prepare a dovetail joint in carpentry shop.

(b) To prepare a cross lap joint in carpentry shop.

Week 4 Fitting Shop

(a) To prepare a matching joint in fitting shop.

(b) To prepare a square by chipping & filling.

Week 5 Machine Shop

(a) To prepare a cylindrical job of dia. 25 mm to 22.5 mm on lathe using turning operation.

(b) Drilling Practice

Week 6 Welding

(a) To prepare a T-joint by arc welding.

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(b) To prepare an L-shape corner joint by Arc welding.

Week 7 Sheet Metal Shop

(a) To prepare a conical funnel with soldering in sheet metal shop.

TEXT BOOK:

1. Jain, R.K. Production Technology.

2. Rao, P. N. Manufacturing Technology (Vol. I &II)

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II[nd] SEMESTER

Program Structure	B. Tech (Civil Engineering)
Subject Code	ETSH-201
Course Name	ENGINEERING MATHEMATICS –II
Course Credits	2 (L) + 3 (T)
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1. **Course Overview:**

This course will introduce the core concepts of differential equations, Laplace and Fourier transform, Fourier series and advanced level of mathematics and applications.

2. **Prerequisite:**

Basic knowledge of differential equation.

3. **Objective of Syllabus:**

- The objective of this course is to familiarize the prospective engineers with techniques in ordinary and partially differential equations, Laplace and Fourier transform, Fourier series, complex variables
- It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their discipline

4. **Course Outcome:**

S. No.	Course Outcomes (Cos)
CO1	After successfully completing the course, the student will have a good understanding of the following topics and their applications:
CO2	Analytic function, singularity, residues and complex integration
CO3	Laplace and Fourier transform and its properties, application of Laplace and Fourier transform
CO4	Laplace and Fourier transform and its properties, application of Laplace and Fourier transform.
CO5	Finding the solution of ode and pde

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5. Syllabus.

UNIT 1: ORDINARY DIFFERENTIAL EQUATION

Ordinary differential equation: definitions, order and degree of differential equation, equation, exact differential equations, equations solvable for x, y and p, Clairaut's form, second order linear differential equation with constant coefficient, Cauchy -Euler's equation, Method of variation of parameter.

UNIT 2: PARTIAL DIFFERENTIAL EQUATION

Partial differential equations: Definition and formulation, partial differential equation of the first order, Non-linear Partial differential equations, Legendre's and Charpit's method,Homogeneous linear partial differential equation with constant co-efficient, Methods for finding C.F. and P.I. of Linear Homogeneous Partial Differential Equations.

UNIT 3: LAPLACE TRANSFORM

Laplace Transform: Definition and properties of Laplace transform, shifting theorem, Transform of derivative and integrals, Multiplication by t^n, Division by t.Inverse Laplace transform, convolution theorem (without proof) and its application.

UNIT 4: FOURIER SERIES AND FOURIER TRANSFORM

Fourier series: Periodic Function, Function of arbitrary period, Even and odd functions, half range Series, Fourier Transform: definition and properties of Fourier transform, convolution, Parseval's identity for Fourier transforms, Relation between Fourier transform and Laplace transform.

UNIT 5: COMPLEX ANALYSIS

Complex Analysis: definitions, Cauchy- Riemann Equations, Harmonic functions, Elementary Analytic function and their properties, Cauchy Integral formula (without proof), Taylor's Series, Singularities, Residues, Cauchy Residue Theorem (without proof).

REFERENCE BOOK:

B.S. Grewal, Higher Engineering Mathematics, Khanna publisher's,44thedition
Erwin Kresyszig, Advance Engineering mathematics, John Wiley and Sons,9th edition

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Program Structure	**B. Tech (Civil Engineering)**
Subject Code	**ETEE201**
Course Name	**Basic Electrical & Electronics Engineering**
Course Credits	**3 (T) + 1 (P) = 4**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1. **Course Overview:**

The course provides a thorough understanding of fundamental electrical concepts, beginning with potential difference, current, resistance, and Ohm's law, progressing to advanced topics such as electromagnetism, magnetic circuits, and energy stored in magnetic fields. Students learn analysis techniques for DC circuits and AC fundamentals, including Kirchhoff's laws and sinusoidal voltage/current characteristics. Single-phase transformers and electrostatics are explored, covering construction, working principles, and capacitance. Semiconductor theory, diodes, rectifiers, and transistor configurations and applications are also studied. The course concludes with an introduction to Boolean algebra, logic gates, and simplification techniques, equipping students with a comprehensive skill set for electrical engineering and related disciplines.

2. **Prerequisite:** The prerequisite for the course encompasses a solid understanding of fundamental electrical concepts, including potential difference, current, resistance, and Ohm's law. Additionally, familiarity with electromagnetism, magnetic circuits, and basic analysis techniques for DC circuits and AC fundamentals is required. Students should also possess knowledge of single-phase transformers, electrostatics, semiconductor theory, and Boolean algebra.

3. **Objective of the Syllabus:**

- To explain the laws used in the analysis of DC and AC circuits.
- To understand and analyze AC & DC circuits.
- To provide students with a fundamental knowledge of Single-phase transformer construction and working.
- To provide students with a fundamental knowledge of AC Fundamentals.
- To provide students with a fundamental knowledge of Electrostatics.
- Familiarize with semiconductor devices, rectifier circuits, and their applications.

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- Describe the basic applications of transistors.
- Define logic gates & understand the working principles of logical circuits.
- Describe the significance of Boolean algebra in digital circuits.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Students will comprehend fundamental electrical principles and electromagnetism, enabling them to analyze circuits and understand magnetic effects.
CO2	Learners will master DC and AC circuit analysis techniques, including Kirchhoff's laws and sinusoidal characteristics, enhancing their ability to analyze and design electrical circuits.
CO3	By the end of this module, students will be proficient in understanding the operation of single-phase transformers and electrostatic phenomena, enabling them to evaluate transformer efficiency and capacitor behavior.
CO4	Participants will gain expertise in semiconductor theory, diode, and transistor operation, facilitating their capability to design and analyze electronic circuits.
CO5	Students will develop skills in Boolean algebra and logic gates, allowing them to simplify logical expressions and design digital systems effectively.

5. Syllabus:

Unit I ELEMENTARY CONCEPTS

(A) Prerequisite: Concept of Potential difference. Current and resistance. Ohm's law, resistance Temperature coefficient, insulation resistance, SI units of work Power and Energy (B) Electromagnetism: Magnetic effect of an electric current, cross and dot conventions, right-hand thumb rule and corkscrew rule, Concept of M.M.F., flux, flux density, reluctance, permeability and Field strength, their units and relationships, the analogy of electrical and magnetic circuit, Energy stored In a magnetic field.

Unit II D. C. CIRCUITS AND AC FUNDAMENTALS

(A) Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis (Supernode And super mesh excluded). Source transformation. Star delta transformation. Superposition Theorem, Thevevnins's theorem Norton's theorem, maximum power transfer theorem (Source Transformation not allowed for superposition theorem, Mesh and Nodal analysis. (B) Sinusoidal voltage and currents, their mathematical and graphical representation, the concept of Cycle period, frequency, instantaneous, peak, average, R.M.S. values, peak factor, and form factor, Phase difference.

Unit III SINGLE PHASE TRANSFORMER AND ELECTROSTATICS

A) Single phase transformers: Construction, principle of working, e.m.f. equations, voltage,

and current ratios, losses, the definition of regulation and efficiency, determination of these by direct loading method. B) Electrostatics: electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity, and capacitance, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors.

Unit IV ANALOG DEVICES

A) Semiconductor theory: - Intrinsic and Extrinsic Semiconductors - N type and P type materials –mechanism of the hole and free electrons- majority and minority carriers, drift and diffusion current - Semiconductor diode - V -I characteristics of PN Junction diode, B) Rectifiers: Working and Waveforms of Half wave - Full wave - Bridge rectifiers (without filters) – Differences. C) Transistor: Working Principle of NPN and PNP transistor - Transistor as a switch - Transistor working as an amplifier- common base - common collector- common emitter configuration - input and output characteristics.

Unit V BOOLEAN ALGEBRA AND LOGIC GATES

A) Number representation: Decimal, Binary, Octal, and Hexa- decimal number systems - Conversion of numbers from one number system to another without decimal points - BCD Codes and limitations – Conversion of BCD to decimal and vice versa. B) Logic gates: Definition, truth table, symbol, and logical equations of logic gates: AND – OR - NOT- NAND – NOR-EXOR - EXNOR (Only 2-inputs) – Universal gates. C) Logic Simplification: Rules and laws of Boolean algebra – Demorgan's Theorem and proof - Simplification of logic functions using Boolean.

TEXT / REFERENCES BOOKS:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. E. Hughes, "Electrical and Electronics Technology, Pearson, 2010
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

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Basic Electrical & Electronics Engineering Lab **SUB-CODE: ETEE-211** **CREDIT: 01**

A. BASIC ELECTRICAL ENGINEERING-

WEEK 1-5

1. Verification of Ohm's Law.
2. Verification of KVL (Kirchhoff's Voltage Law) and KCL (Kirchhoff's Current Law).
3. Verification of Superposition theorem.
4. To Verify the Maximum Power Transfer theorem.
5. Measurement of power and power factor of single-phase AC circuit using three voltmeter methods.
6. Verification of the venin's theorem.
7. 7. To verify Norton's theorem.
8. To measure power and power factor in a single-phase A.C. circuit using a wattmeter.

B. BASIC ELECTRONICS ENGINEERING-

WEEK 6-11

1. CRO – Applications.
2. V- I characteristics of Silicon & Germanium PN junction diodes.
3. V-I characteristics of Zener diode.
4. Characteristics of BJT in Common Emitter Configuration.
5. Characteristics of JFET in common source configuration.
6. Half and Full wave rectifier without a filter.
7. Half wave and Full wave rectifier with Filter.
8. Characteristics of Common Emitter BJT amplifier.

REFERENCE BOOKS:

- E. Hughes, "Electrical and Electronics Technology, Pearson, 2010
- V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

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Program Structure	B. Tech (Civil Engineering)
Subject Code	ETCS201
Course Name	C Programming
Course Credits	3 (T) + 1(P)= 4
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1. Course Overview:

Understand the basic concept of C Programming, and its different modules that include Conditional and looping expressions, Arrays, Functions, Pointers, Structures and files.

2. Prerequisite:

To understand the basic knowledge of computer, Keyboard and operating system.

3. Objective of Syllabus:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, and Structures.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	Understand the basic concept of C Programming, Constants, variables & data types Operators and expressions managing input and output operators, and Branching Decision Making and Looping.
CO2	Understanding One–dimensionalArrays and their declaration and Initialisations, Two-dimensional Arrays and their initialisations, Multidimensional Arrays, Dynamic Arrays, String Variables, Reading and Writing Strings, Arithmetic Operations on characters, Putting Strings together, Comparison of Two Strings.
CO3	Understand the concept of Functions, Declaration, Definition and Calling of functions, Nesting function and Recursion, Passing array and string to functions, Storage classes: automatic, external and static variables.
CO4	Ability to Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialisation of Structure, Comparing Structure Variables, Operation on Individual Members, Arrays of Structures, Structures within structures, Structures

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	and Functions, Unions, Size of Structures
CO5	Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, accessing a Variable through its Pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factor
CO6	Understanding Pointers and Arrays, Pointers and Character Strings, Arrays of Pointers, Pointers and Function Arguments, Functions Returning Pointers, Pointers to Functions, Pointers and Structures, Union, File Management in C.

5. Syllabus.

UNIT I: INTRODUCTION TO PROGRAMMING

Introduction to components of a computer system (disks, memory, processor, where a Program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo Code with examples. From algorithms to programs; source code, variables (with data types) Variables and memory locations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence.

UNIT II: CONDITIONAL BRANCHING AND LOOPS & ARRAYS

Writing and evaluation of conditionals and consequent branching, Iteration and loops Arrays (1-D, 2- D), Character arrays and Strings

UNIT III: **BASIC ALGORITHMS & FUNCTIONS**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required) Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

UNIT IV: RECURSION

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort**.**

UNIT V: STRUCTURE & POINTERS

Structures, defining structures and Array of Structures Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

TEXTBOOKS / REFERENCES

1. Byron Gottfried,Schaum's Outline of Programming with C,Mc Graw-Hill
2. E.Balaguruswamy,Programming ANSIC,TataMcGraw-Hill
3. C in Depth by S.K.Srivastava/ Deepali Srivastava
4. C Programming Language (Prentice Hall)
5. https://www.tutorialspoint.com/cprogramming/index.htm
6. https://www.geeksforgeeks.org/c-programming-language/
7. https://www.javatpoint.com/c-programming-language-tutorial

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C PROGRAMMING LAB SUB-CODE: ETCS-211 CREDIT: 01

A Theory: Variable, Data type, Keyword, Operator, Hello world Program, Control Structure, Array, Pointer

Week 1: Write a C program to find the sum of individual digits of a positive integer.

Week 2: Write a C program to generate Fibonacci series.

Week 3: Write a C program to generate all the prime numbers between 1 and n is a Value supplied by the user.

Week 4: Write a C program to find the roots of a quadratic equation.

Week 5: Two integer operands and one operator form user, performs the operation and then prints the result.

Week 6: Write a C program to find the factorial of a given integer by using recursive and non-recursive functions.

Week 7: A C program to find both the largest and smallest number in list of integers

Week 8: Write A C- Program to Determine If the Given String Is a Palindrome or Not

Week 9: Example of Array in C programming to find out the average of 4 integers

Week 10: Write a program in c to Addition of two matrix in C

Week 11: Write a C program to implement the following searching method.

i) Linear search ii) Binary search

Week 12: Write C programs that implement the following sorting methods to sort a given list of integers in ascending order by using Bubble sort.

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Programme Structure	B. Tech (Civil Engineering)
Subject Code	ETME - 201
Course Name	Fundamental of Mechanical and Civil Engineering
Course Credits	3 (T) + 1 (P) = 4
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1. **Course Overview:**

A course on "Fundamental of Mechanical and Civil Engineering" is foundational for understanding the physical principles that govern the behavior of solids and fluids. This part of the course covers topics such as force systems, moments, equilibrium conditions, free-body diagrams, and analysis of trusses, frames, and beams. Students learn how to calculate reactions, internal forces, and stresses in static systems. Fluid mechanics deals with the behavior of fluids (liquids and gases) at rest and in motion. Topics include fluid properties, fluid statics, fluid dynamics, continuity equation, Bernoulli's equation, momentum equation, flow in pipes, and boundary layer theory. Students learn about the principles governing fluid flow and their applications in engineering systems. Overall, a course on Fundamental of Mechanical & Civil Engineering provides students with a strong foundation in the principles of mechanics, enabling them to analyze and design mechanical and structural systems with confidence and precision.

2. **Prerequisite:**

Throughout the course, students are exposed to a variety of engineering problems and applications that require the application of mechanics principles. This could include analyzing structures, designing mechanical components, and solving real-world engineering challenges.

3. **Objective of the Syllabus:**

The main learning objective of this course is to prepare the students for:

- Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
- Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
- To understand the concepts of Centroid and centre of gravity.
- To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
- To study the concepts of properties of fluids.

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- To study the civil engineering materials and building components.

4. **Course Outcomes:**

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

S.No.	Course Outcomes (Cos)
CO1	Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
CO2	Apply the concepts of locating Centroid / center of gravity of various sections
CO3	To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
CO4	To study the concepts of properties of fluids.
CO5	To study the Civil Engineering Material, Survey and Building Components.

5. **Syllabus:**

UNIT 1 FORCE SYSTEMS AND FRICTION

Introduction –Laws of Mechanics – Lami's theorem, Triangle, Parallelogram and polygon law of forces –Force system and its classifications –Equivalent systems of forces, free body diagram.

Beam and types of beams – Support and types of support, Shear force and bending moment diagram– for cantilever and simply supported beam with concentrated, distributed load and couple.

Friction-its types, Laws of friction, Co-efficient of friction, Angle of friction, Angle of repose and its relation.

UNIT 2 CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA

Center of gravity and Moment of inertia; Centroid and center of gravity, Moment Inertia of area and mass, Radius of Gyration

UNIT 3 THERMAL ENGINEERING

Introduction, Classification of power plants – Working principle of steam, Gas, Diesel, Hydro-electric and nuclear power plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles - Principle of vapour compression system – Layout of typical domestic refrigerator – Window and split type room Air conditioner

UNIT 4 BASIC CONCEPTS OF FLUID MECHANICS

Fluid – definition, - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension, Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges. Bernoulli's equation and its applications.

UNIT 5 CIVIL ENGINEERING MATERIAL, SURVEY AND BUILDING COMPONENTS

Civil Engineering Material: Brick, Stone, Cement, Concrete and its properties.

Surveying: Principles, Measurements of distances, Determination of angles, area, and leveling

Building components: Foundation and its types, bearing capacity, Requirement of good foundation

Superstructure: Brick masonry, Stone Masonry, beams, columns, Lintels, roofing, flooring, plastering.

BOOKS AND REFERENCES

Text Books

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education. 11thEdition, 2017

2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

3. Nag. P.K. "Power Plant Engineering" Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008

4. B. C. Punamia- Surveying part-1

5. N.S. Basak – Surveying

6. Building Material – S. K. Duggal

7. R. K. Bansal Fluid Mechanics and Machinery

Reference Books

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.

2. Hibbeller, R.C., and Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.

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Fundamental of Mechanical and Civil Engineering SUB-CODE: ETME-211 **CREDIT: 01**

Course Objective:

The main learning objective of this course is to prepare the students for:

- Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
- Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
- To understand the concepts of Centroid and centre of gravity.
- To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
- To study the concepts of properties of fluids.
- To study the civil engineering materials and building components.

Course Outcomes:

At the end of the course the students are able to:

- Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To study the concepts of IC engine components.

Syllabus:

Week 1 To verify the parallelogram law of forces.

Week 2 To verify the lami's theorem.

Week 3 To determine the coefficient of Friction of an inclined Plane.

Week 4 To study about the model of two stroke petrol engine.

Week 5 To study about the four-stroke petrol engine and diesel engine.

Week 6 To Verify the Bernoulli's Theorem.

Week 7 To determine the compressive strength of Brick

Week 8 To determine the horizontal angle with prismatic and surveyor compass.

Week 9 To determine the area by chain survey.

Week 10 To measure horizontal and vertical angles in the field by using Theodolite.

BOOKS AND REFERENCES

Text Books

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education. 11thEdition, 2017

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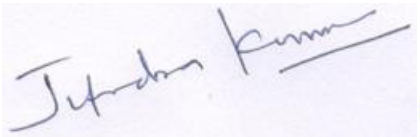
2. Vela Murali, “Engineering Mechanics-Statics and Dynamics”, Oxford University Press, 2018.
3. Nag. P.K. “Power Plant Engineering” Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008
4. B. C. Punamia- Surveying part-1
5. N.S. Basak – Surveying
6. Building Material – S. K. Duggal
7. R. K. Bansal Fluid Mechanics and Machinery

Reference Books

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeller, R.C., and Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013



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Programme Structure	B. Tech (Civil Engineering)
Subject Code	ETSH-202
Course Name	Technical Communication & Project Management
Course Credits	2 (L) + 1 (P)
Total Course Credit	172

Abbreviations: T-Theory

1. **Course Overview**:
   In this course student will learn about letter writing and technical presentation skills.

2. **Prerequisite:**
   Basic knowledge of grammar, letter & application.

3. **Objective of the Syllabus**
   - To introduce the students to the fundamentals of mechanics of writing.
   - To facilitate them with the style of documentation and specific formal written communication.
   - To initiate in them the art of critical thinking and analysis.
   - To help them develop techniques of scanning for specific information, comprehension and organization of ideas.
   - To enhance their technical presentation skills.

4. **Course Outcomes:**

S.No.	Course Outcomes (Cos)
CO1	Students will heighten their awareness of correct usage of English grammar in writing and speaking
CO2	Acquisition of technical communication's generic aspects like Reading Technical Material, Technical Writing, Listening
CO3	Learning the skill of proofreading and copy editing, paraphrasing and spinning using technical tools
CO4	Learning the technical phrases and writing styles like descriptive, argumentative etc for developing good technical documents for presentations or disseminating technical documents

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CO5	Accessing the reading material and developing the writing technical material with the use of technical concepts and tools

5.Syllabus:

UNIT I:
Mechanics of Writing: Grammar rules -Articles, Tenses, Part of Speech. General Reading and Listening comprehension – rearrangement & organization of sentences.

UNIT II:
Different kinds of written documents: Definitions- descriptions- instructions-recommendations-user manuals – reports – proposals. Formal Correspondence: Writing formal Letters. Reading & Listening Comprehension.

UNIT III:
Technical paper writing: documentation style – document editing – proof reading – Organizing and formatting Reading and listening comprehension of technical documents technical presentations

UNIT IV:
Reading and listening comprehension of technical documents technical presentations

UNIT V:

Project Writing

TEXT BOOKS:

- Essential Communication Strategies for Scientists, Engineers and Technology Professionals. II Edition. New York: IEEE press, 2002
- Technical Communication: A Reader-Centred Approach. V Edition. Harcourt Brace College Publication, 2003
- Technical Report Writing Today. VIII Edition (Indian Adaptation). New Delhi: Biztantra, 2004.
- Practical English Usage, Oxford University Press, 2000

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Programme Structure	B. Tech (Civil Engineering)
Semester	2nd
Subject Code	ETME202
Course Name	Engineering Graphics & Design
Course Credits	1(L)+3(P)
Total Course Credit	172

Abbreviations: L-Lecture, T- Tutorial, P-Practical

1) **Course Overview:** This course of Graphics explains the concepts of engineering drawing of objects in order to develop the skill of designing the new and existing engineering products.

2) **Prerequisite:** There are no specific prerequisites for this course, although a basic understanding of Geometry and Menstruation is recommended.

3) **Objectives of the Syllabus:** To develop graphic skills for communication of concepts, ideas and design of engineering products among the students. To expose them to existing national standards related to technical drawings.

4) Course Outcomes: On successful completion of this course, the student will be able to

SL No.	Course Outcomes (Cos)
CO1	Familiarize with the fundamentals and standards of Engineering graphics
CO2	Perform freehand sketching of basic geometrical constructions and multiple views of objects.
CO3	Project orthographic projections of lines and plane surfaces.
CO4	Draw projections and solids and development of surfaces.
CO5	Visualize and to project isometric and perspective sections of simple solids.

5) Syllabus:

CONCEPTS AND CONVENTIONS

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Importance of graphics in engineering applications–Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning, Scales

MODULE I: PLANE CURVES

Plane Curves: - Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of in volutes of square and circle – Drawing of tangents and normal to the above curves.

MODULE II: PROJECTION

Projection: - Types of projection, Orthographic projection, First and Third angle projection, Projection of points and lines, Line inclined to one plane, Inclined with both the plane.

MODULE III: PROJECTION OF PLANES AND SOLIDS

Projection of Planes and Solids: - Projection of Planes likes circle and polygons in different positions; Projection of polyhedrons like prisms, pyramids and solids of revolutions like cylinder, cones in different positions.

MODULE IV: SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Section of Solids: - Section of right solids by normal and inclined planes; Intersection of cylinders.

Development of Surfaces: - Parallel line and radial - line method for right solids, Introduction of surfaces-cylinder.

MODULE V: ISOMETRIC PROJECTIONS & COMPUTER AIDED DRAFTING

Isometric Projections: -Isometric scale, Isometric axes, Isometric Projection from orthographic drawing.

Computer Aided Drafting (CAD): Introduction, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.

ENGINEERING GRAPHICS & DESIGN LAB

Sub code: ETME111

LIST OF EXPERIMENTS: -

Week-1: Introduction to the sheet layout
Week-2: Dimensioning & Lettering
Week-3: Conic sections
Week-4: projection of points
Week-5: projection of lines
Week-6: projection of planes
Week-7: Section o Week-2: f solids and development of surfaces

BOOKS AND REFERENCES:

1) Bhatt, N.D.,Panchal V M and Pramod R. Ingle, "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2014.
2) Parthasarathy, N. S. and Vela Murali, "Engineering Drawing", Oxford University Press, 2015
3) Agrawal, B. and Agrawal C.M., "Engineering Drawing", Tata McGraw, N. Delhi, 2008.
4) Gopalakrishna, K. R., "Engineering Drawing",Subhas Stores, Bangalore, 2007.
5) Natarajan, K. V., "A text book of Engineering Graphics", 28thEd.,Dhanalakshmi Publishers, Chennai, 2015
6) Shah, M. B., and Rana, B. C., "Engineering Drawing", Pearson, 2nd Ed., 2009.
7) Venugopal, K. and Prabhu Raja, V., "Engineering Graphics", New Age, 2008.

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Programme Structure	B. Tech (Civil Engineering)
Subject Code	ETCS202
Course Name	Basics of Internet of Things (IoT)
Course Credits	2(L)
Total Course Credit	172

Abbreviations: L-Lecture, P-Practical

ETCS-202 BASICS OF INTERNET OF THINGS (IOT)

OBJECTIVES OF THE COURSE:

- The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time.
- It's becoming the Internet of Things (IoT).
- The course enables student to understand the basics of Internet of things and protocols.
- It introduces some of the application areas where Internet of Things can be applied.
- Students will learn about the middleware for Internet of Things.

1. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural Models
CO2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
CO3	Appraise the role of IoT protocols for efficient network communication.
CO4	Elaborate the need for data analytics and security in IoT.
CO5	Illustrate different sensor technologies for sensing real world entities.

MODULE - 1 INTRODUCTION

Introduction, Definition and Characteristics of IoT, Some basic terminologies related to IoT, The

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technology
behind IoT, Design principles of IoT:Physical design of IoT, Logical design of IoT, Functional blocks of IoT, , Advantage & Disadvantage of IoT. Applications of IoT.

MODULE-2 IOT& M2M

IoT& M2M ,M2M Communication, Key features of M2M, M2M Applications, Difference between IoT
and M2M, Sensing, Actuation, Basic of Networking. M2M ecosystem.

MODULE-3 IOT ARCHITECTURE

IOT ARCHITECTURE - IoT Open-source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoT acivity stack
architecture- Resource model and Abstraction.

MODULE-4 IOT AND ITS COMPONENT

IoT and its component –Introduction, RFID, Applications of RFID, Wireless Sensor network (WSN & VSN), Participatory Sensing Technology, Embedded platform for IoT. Interfacing a gas sensor to
Arduino.

MODULE- 5 IOT APPLICATION DEVELOPMENT AND DESIGN CHALLENGES

IoT Design methodology, Requirement and process model of IoT, Process specification, Information model for IoT application. IoT applications- smart city street lights-control and monitoring, home automation, E-health, Smart farming.

TEXT BOOKS /REFERENCES:

• Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press,2012.
• Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
• David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010.
• Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012. References:
• Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”,1st Edition, VPT, 2014
• Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
• CunoP fister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

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THIRD SEMESTER

ETSH301	ENGINEERING MATHEMATICS-III	L	T	P	C	HOURS PER WEEK
		3	1	0	4	4

Objectives of the Course: -

The objective of this course is to familiarize the students with statistical techniques.

Itaimstoequipthestudentswithstandardconceptsandtoolsatanintermediateto advancedlevelthatwillservethemwelltowardstacklingvariousproblemsinthedis cipline.

Module I: Basic Probability

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multi nominal distribution, Poisson approximation to the binomial distribution, in finite sequences of Bernoulli trials, sums of independent random variable s; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Module II: Continuous Probability Distributions and Bivariate Distributions

Continuous random variables and their properties, distribution functions and densities,

normal,bi variate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes'rule

Module III: Basic Statistics: Measures of Central tendency

Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression– Rank correlation.

Module IV: Applied Statistics

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Module V: Small samples

Test for single mean, difference of means and correlation coefficients, test for ratio of variances -Chi-square test for goodness of fit and independence of attributes.

ReferenceBooks

1. **B.S.Grewal,**Higher Engineering Mathematics, Khanna Publisher's, 36th edition, 2010.
2. **Erwin Kresyszig,** Advance Engineering Mathematics, John Wiley and Sons, 9th edition,2006.

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Programme Structure	B. Tech (Civil Engineering))
Subject Code	ETCE301
Course Name	Structural Mechanics -I
Course Credits	3 (T) + 1 (Tu) = 4
Total Course Credit	172

Abbreviations: T-Theory, P-Practical, Tu-Tutorial

2. Course Overview:

This course provides an understanding of the mechanics of deformable materials and structures. It
introduces the concepts of stress and strain, and basic structural elements like rods, beams, and shearing and bending elements. A thorough understanding of structural members and their strength, stiffness, and stability. Develop an understanding of, and the capability to, solve practical engineering problems involving stress and strain analysis in elementary structural members, such as bars and beams. A thorough understanding of concepts related to strength, stiffness, and stability of structures needed for engineering analysis and design.

3. **Prerequisite:** Student should have knowledge of fundamentals of Engineering Mechanics, and Concrete Technology.

4. Objective of the Syllabus:

The objective of the present course is to make the students acquainted with the concept of load resultant, consequences and how different kinds of loadings can be withstood by different kinds of members with some specific materials. To familiarize the student with the various stresses that may act on a material such as compressive stress, tensile stress, tangential stress, etc and the response of a material to each of these types.

5. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Determine the simple stresses and strains when members are subjected to axial loads.
CO2	To determine the shear force and bending moment diagrams for beams under various loading conditions and evaluating deflections in these beams.

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CO3	Assess Bending and shear stresses in beams subjected to different loadings
CO4	To analyze the cylindrical shells under circumferential and radial loading.
CO5	Calculate the stability limits of members subjected to axial compressive loads.

6. Syllabus:

Unit I Simple & Principal Stress and Strains

Concept of Elastic body stress and Strain, Hooke's law, Types of stress and strains, Elastic constants, Stresses in compound bars, Composite and tapering bars, Temperature stresses, Complex Stress and Strains- Two dimensional and three-dimensional stress systems, Principal Planes, Principal Stresses and Strains, Mohr's circle of stresses.

Unit II Shear Force, Bending Moment and Deflection of Beams

Introduction, Types of Beams, Load & Support, Support Reactions, Shear force and bending moment Diagram for Cantilever, simply supported and overhanging beam with concentrated, distributed load and Couple, Determination of Slope and Deflection of beams by Double Integration Method, Macaulay's Method, Area Moment Method.

Unit III Bending and Shearing Stresses

Theory of simple bending, Concept of pure bending and bending stress, Equation of bending, Neutral axis, Section-Modulus, Differential equation of the elastic curve, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading, bending stress distribution across a section of beam, Shearing Stress & shear stress distribution across a section in Beams.

Unit IV Torsion of Shafts, Thin Shell& Spring

Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Torsion of solid and hollow circular shafts, Analyses of problems based on combined Bending and Torsion, Thin Pressure Vessels: cylinders and spheres, Stress due to internal pressure, Change in diameter and volume, Introduction of spring, Types of spring, Closed coil helical spring, Laminated spring.

Unit V Columns and Struts

Introduction, Theory of columns, Slenderness ratio, Direct and bending stresses in short columns, Kern of a section. Buckling and stability, Euler's buckling/crippling load for columns with different end conditions, Rankin's formula, Eccentric loads and the Secant Formula-Imperfections in columns.

BOOKS AND REFERENCES

Text Books

1. R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010.

2. S.S. Rattan “Strength of Materials” McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013).

Reference Books

1. B.S. Basavarajaiah, P.Mahadevappa “Strength of Materials” in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010.
2. Ferdinand P. Beer, E. Russell Johnston and Jr.John T. DeWolf “Mechanics of Materials”, Tata McGraw-Hill, Third Edition, SI Units.
3. D.H. Young, S.P. Timoshenko “Elements of Strength of Materials” East West Press Pvt. Ltd., 5th Edition (Reprint 2014).
4. H. J. Shah, Reinforced concrete, Vol.1 & 2, Charotar publishing house Pvt. Ltd, 2011.
5. Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.
5. Ramamurtham. S., “Strength of Materials”, 14th Edition, Dhanpat Rai Publications,2011.

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STRUCTURAL MECHANICS-I LAB
SUB-CODE: ETCE311 **CREDIT: 1.5**

Course Objective:

- The objective of the strength of materials lab is to demonstrate the basic principles in the area of strength and mechanics of materials and structural analysis to the undergraduate students through a series of experiments.
- To determine experimental data, include universal testing machines and torsion equipment.
- Analyze material response to applied loading by applying standard experimental tests and interpreting the results.
- In this lab the experiments are performed to measure the properties of the materials such as impact strength, tensile strength, compressive strength, hardness, ductility etc.

Course Outcomes:

At the end of the course the students are able to:

- Analyse and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behaviour of materials.
- Understand the physical insight into the behaviour materials and structural elements, including distribution of stresses and strains, deformations and failure modes.
- Perform stress analysis and design of beams subjected to bending and shearing loads using several methods.
- Ability to conduct compression tests and Fatigue of cast iron and steel.

Syllabus:

Week 1: To determine the tensile strength of metals and materials by Universal Testing machine
UTM.

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Week 2: To determine the Compressive and Tensile Strength of Materials.
Week 3: To determine the Brinell Hardness of Materials.
Week 4: To determine the Rockwell Hardness of Materials.
Week 5: To determine the Toughness of the materials.
Week 6: To determine the stiffness of the spring.
Week 7: To determine the deflection of Beam by the use of deflection-beam apparatus.
Week 8: To determine the compressive strength of metals and materials by Universal testing machine UTM.
Week 9: To determine bending strength of metals and materials by Universal testing machine UTM.
Week 10: To determine shearing strength of metals and materials by Universal testing machine UTM

REFERENCE BOOKS:

1. R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010.
2. Ramamurtham. S., "Strength of Materials", 14th Edition, Dhanpat Rai Publications, 2011.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE302**
Course Name	**Building Material & Construction Technique**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

The course relates to the fundamentals related to concrete and concrete material, besides dealing with masonry, reinforcement, etc. The course begins with an outline of what concrete is, what are the processes involved in formation of concrete, various materials that are used in concrete formation, properties of each ingredient of concrete, standard tests to be applied to concrete and concrete ingredients. The course then moves on to design-mix, special concretes, Nondestructive testing. The prevalent techniques for damp proofing, termite proofing and fire resistance will also be explained. etc.

2.Prerequisite: Student should have knowledge of fundamentals of Materials of constructions, Basic civil Engineering and Construction Process.

3.Objective of the Syllabus:

The objective of the course is to introduce students to the characterization of construction materials and their behaviour, with a view of developing their understanding of the mechanisms that govern the performance of these materials. The course will be focused primarily on cement and concrete, and include the following techniques; the physics of the techniques and their application to cement science, including lab demonstrations and experiments will be covered.

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4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Define the fundamental science and engineering principles relevant to civil engineering materials.
CO2	to provide an in-depth understanding of the physical properties, behavior, and ingredients of concrete, as well as its application in various environments.
CO3	Distinguish the special concretes like Self compacting concrete, Fibre reinforced concrete, Polymer concrete and light weight concrete etc..
CO4	Understanding about Production of crushed stone aggregate batching, Equipment's for production and concreting, Non-destructive testing, Repair technology for concrete structures.
CO5	To comprehend the fundamental principles of masonry materials and behavior and apply them in the analysis, design of contemporary masonry structures.

5.Syllabus:

Unit I Introduction

Building Materials: - Stones, Bricks, Cement, Timber, Introduction of Concrete & its properties, Grades, Advantage & disadvantages of concrete, Ingredients of concrete, Workability, Strength properties of Concrete, Admixtures, Nominal proportion of Concrete, Preparation of concrete, Compaction, Curing. Inspection & testing of materials as per IS Specifications.

Unit II Fresh and Hardened Concrete

Introduction, Workability of Fresh Concrete, testing of concrete, Factors affecting to Properties of Concrete, Rheology of concrete, Compressive & Tensile strength, Stress and strain characteristics, Shrinkage and temperature effects, Creep of concrete Permeability, Durability, Thermal properties & micro-cracking of concrete. Various classical methods of concrete mix design, I.S. code method Basic considerations and factors influencing the choice of mix design, Acceptance criteria for concrete.

Unit III Advance Construction Materials

Light weight concrete, Ready mix concrete, Vacuum concrete, Ferrocement, Fiber reinforced concrete, Polymer concrete composites, Shortcrete & Guinting, Prestressed concrete, heat resistant concrete, Mass concrete, D.P.C. materials, building materials made by Industrial & agricultural waste, Clay products P.V.C. materials, Use of fly ash in mortars, concrete, Fly ash bricks, Stabilized mud blocks.

Unit IV Production and Quality Control of Concrete

Production of crushed stone aggregate batching, Equipments for production and concreting, curing at different temperatures, Concreting underwater, Hot & cold weather condition,

Statistical quality control, Field control, Non-destructive testing, Repair technology for concrete structures, Inspection & Testing of Concrete.

Unit V Masonry and Walls

Brick masonry, Bonds, Jointing, Stone masonry, Casting and laying, masonry construction, Brick cavity walls, Code provisions regarding load bearing and non-load bearing walls, Common defects in construction and their effect on strength, Designed Brick masonry, precast stone masonry block, Hollow concrete block, Plastering and pointing, white and color washing, distempering, Doors, Windows and Ventilators: Types based on material etc., size location, fittings, construction sunshades, sills and jambs, RCC doors/windows frames, Stairs types, rule of proportionality.

BOOKS AND REFERENCES

Text Books

1. SK Duggal, Building Materials, New Age Publications 4th Edition, April, 2014.
2. B C Punmia, Ashok Kumar Jain and Arun Kumar Jain, Building Construction, Laxmi Publications (P) Ltd., New Delhi, 10th Edition, 2013.
3. P C Varghese, Building Construction, Prentice Hall of India Private Ltd., New Delhi,2nd Edition, 2007.

Reference Books

1. Roy Chudley "Construction Technology" Vol. – 1 & 2,2nd Edition, Longman, UK, 1987.
2. Building Materials and construction – Arora & Bindra, Dhanpat Roy Publications, 2000.
3. Building planning, designing and scheduling by Gurucharan Singh, Standard book House, 2006.
4. Engineering Materials by Rangawala, Charotar Publications, Fortieth Edition: 2013.
5. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.

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BUILDING MATERIAL & CONCRETE TECHNOLOGY LAB
SUB-CODE: ETCE312 **CREDIT: 1.5**

Course Objective:

- The objective of concrete laboratory is to determine the physical properties of building construction materials like cement, fine and coarse aggregate.
- The tests include determination of specific gravity, fineness, normal consistency, setting times, workability and soundness of cement, fineness modulus of fine and coarse aggregate, strength of cement mortar, cement concrete.
- Students can design the mix, make the specimens and test the same for their respective strengths.

Course Outcomes:

At the end of the course the students are able to:

- Determine the various physical properties of cement.
- To perform the tests on concrete for its characterization.
- Analyze the properties of fresh and hardened concrete mix.
- Examine the different physical test of coarse and fine aggregate.
- Design and develop a performance-based mix which can fulfill the requirements of ready-mix concrete plant.

Syllabus:

Week 1: To determine the fineness of cement.
Week 2: To determine the normal consistency of cement.
Week 3: To determine the initial and final setting time of cement.

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Week 4: To determine compressive strength of cement.
Week 5: To determine tensile strength of cement.
Week 6: To determine the soundness of cement.
Week 7: To determine the fineness modulus of fine aggregate & coarse aggregate.
Week 8: Determining workability of concrete.
Week 9: Compressing strength of concrete cube.
Week 10: To determine the Workability of concrete by Slump cone test.
Week 11: To determine the Workability of concrete by Compaction factor.
Week 12: To determine the Workability of concrete by Vee Bee test

REFERENCE BOOKS:

1. M L Gambhir, Concrete Technology Theory and Practice, McGraw-Hill Education.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi.
3. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
4. M S Shetty; Concrete Technology, S.Chand Publication New Delhi.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE303**
Course Name	**Engineering Geology**
Course Credits	**3 (T) + 1.5(P) = 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course provides an overview of geological processes such as rock formation, soil mechanics, and groundwater flow, and how they influence engineering projects like building foundations, tunnels, dams, and roads. Students learn to assess geological risks such as landslides, earthquakes, and soil liquefaction, and develop strategies to minimize their impact on infrastructure. Additionally, the course covers methods for site investigation, geological mapping, and geotechnical testing to gather crucial data for project planning and design. Overall, engineering geology equips students with the knowledge and skills to effectively integrate geological considerations into engineering projects, ensuring their safety, sustainability, and economic viability.

2. Prerequisite:

Students should have completed introductory courses in geology, earth sciences, or geological engineering to understand fundamental geological concepts such as rock types, geological processes, and the geological timescale.

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3.Objective of the Syllabus:

The objective of the syllabus for engineering geology is to provide students with a comprehensive understanding of geological principles and their practical applications in civil engineering. Through this course, students aim to grasp fundamental concepts such as rock types, geological structures, soil properties, and groundwater behavior, and comprehend how these factors influence engineering projects.

By studying engineering geology, students develop the ability to identify geological hazards like landslides, earthquakes, and subsidence, and to assess their potential impact on infrastructure. Moreover, the syllabus aims to equip students with the skills to conduct site investigations, interpret geological maps and data, and perform geotechnical testing to gather essential information for project planning and design.

Ultimately, the objective is to empower students to integrate geological considerations seamlessly into engineering practices, ensuring the safety, sustainability, and success of construction projects in diverse geological settings.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will develop the Understanding of general geology of earth like its crust, core and mantle and also about origin of earth.
CO2	Understanding about mineralogy and crystallography.
CO3	Know about earthquake and related consequences.
CO4	Will developed the understanding of geology of India.
CO5	Know about the geotechnical properties of rocks and rock masses.

5.Syllabus:

MODULE-I General Geology: -Objects and scope of geology the crust and the interior of the earth Origin and age of the earth Sub-aerial land, sub-terrain weathering, Denudation and deposition, wind, river, glacial and marine erosion Geological classification of soil and concept of earthquake, Plate- tectonics.

MODULE -II Mineralogy and Crystallography: -Fundamentals of mineralogy Study of common rock form minerals Ores and minerals of economic importance to civil engineering Elements of crystallography and introduction to crystal systems.

MODULE –III Earthquake, Mass Movements and Site Investigation: -Introduction of Earthquake Causes, types, intensity and magnitude of earthquake Engineering designs and precautions Landslides, stability of hill slopes and road cuttings Factors in site selection, alignment and construction of dam Factors in site reservoir, bridge and tunnel.

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MODULE –IV Geology of India & Structural Geology: -Physical features of India Brief geological history of India Occurrence of important ores and minerals in India Structures related to rocks Dip, Strike and outcrops Classification and detailed studies of geological structures i.e. folds, Faults, Joints, Unconformity and their importance in Civil Engineering.

MODULE –V Geotechnical Properties of Rocks and Rock Masses: -Rocks as construction material Common tests Occurrence and distribution of the building stones Road and rail ballast in India Engineering properties and geo-mechanical classification of rock mass.

BOOKS AND REFERENCES

Text books/References:

1. Prabin Singh, (2000), Engineering and General Geology, Kataria Pubs. Delhi.
2. M.C. Kesavalu, (2000), Text Book of Engineering Geology, CBS Pubs. New Delhi
3. P.D., Krynine and W.R. Judd, (2000), Principles of Engineering Geology and Geotechnics, CBS Pubs.New Delhi."
4. IS: 2386, Part I to VIII. (1963), IS: 7422, Part I to V (1974), Govt. of India

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ENGINEERING GEOLOGY LAB SUB-CODE: ETCE313 CREDIT: 1.5

Course Objective:

- Familiarize students with geological field techniques and instrumentation used in site investigation and data collection.
- Introduce students to geotechnical testing methods for assessing soil and rock properties, such as grain size analysis, moisture content determination, and shear strength testing.
- Provide hands-on experience in geological mapping, including the identification and characterization of rock types, structures, and geological features relevant to engineering projects.

Course Outcomes:

At the end of the course the students are able to learn:

- Learn to interpret geological data collected from field observations and laboratory tests to assess site suitability, geological hazards, and engineering constraints.
- Develop proficiency in conducting geological field surveys, mapping geological features, and interpreting their significance for engineering projects.
- Acquire skills to identify and assess geological hazards such as landslides, earthquakes, and groundwater issues, and propose mitigation measures to minimize their impact on construction projects.

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Syllabus:

Week 1: Identification of simple rock-forming minerals and important ores.

Week 2: Identification of Sedimentary rocks.

Week 3: Identification of Metamorphic rocks.

Week 4: Identification of Igneous rocks.

Week 5: To Study of Topographic and geological map

Week 6: To study of Geological section of horizontal.

Week 7: To study of Geological section of vertical rocks

Week 8: To study of Geological section of inclined rocks

Week 9: To study of Geological section of Unconformable rocks

Week 10: To study of Geological section of Folded rocks

Week 11: To study of Geological section of Faulted rocks

Week 12: Field Visit / Geological Excursion.

REFERENCE BOOKS:

1. Prabin Singh, (2000), Engineering and General Geology, Kataria Pubs. Delhi.
2. M.C. Kesavalu, (2000), Text Book of Engineering Geology, CBS Pubs. New Delhi

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE304**
Course Name	**Building Planning and Drawing**
Course Credits	**3 (T)+ 1.5(P) = 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

The course relates to the fundamentals related to Building planning and drawing, besides dealing with Architectural aspect and other provisions for drawing of building elements. The course begins with an outline of what is building elements, what are the processes involved in the drawing of various components and their uses used in civil engineering aspect. The course then moves on the planning of building drawing.

2.Prerequisite: Student should have knowledge of fundamentals uses of drawing, and use of drawing sheet.

3.Objective of the Syllabus:

The objective of the course is to introduce students to the planning different drawing sheets of the various types of buildings and their components. The course will be

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focused primarily on planning, and include the drawing techniques; different views of plan section and elevation, including lab demonstrations and small projects of complete building drawing will be covered.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understanding about Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, etc.
CO2	To provide an in-depth understanding of the National Building Code, Building bye-law open area, Setbacks, FAR terminology, Principle of architectural composition, Principles of planning, Orientation.
CO3	Know about the Building Services like water supply and drainage, Electrification, Ventilation and lightening and staircases, Fire safety, Thermal insulation, Acoustics of buildings.
CO4	To comprehend the Design and preparation of detailed drawings of various types of buildings like residential building, institutional buildings and commercial buildings, Detailing of doors, windows, ventilators and staircases etc.
CO5	Understanding about Elements of perspective drawing involving simple problems.

5.Syllabus:

MODULE –I Drawing of Various Building Elements: -Drawing of various elements of buildings like various types of footing, open foundation, raft, grillage, pile and well foundation, Drawing of frames of doors, window, various types of doors, window and ventilator, lintels and arches, stairs and staircase, trusses, flooring, roofs etc.

MODULE –II Provisions & Other Factor Building Planning: -National Building Code, Building bye-law open area, Setbacks, FAR terminology, Principle of architectural composition (i.e. Unity, contrast, etc.), Principles of planning, Orientation.

MODULE –III Building Services: -Introduction of Building Services like water supply and drainage, Electrification, Ventilation and lightening and staircases, Fire safety, Thermal insulation, Acoustics of buildings.

MODULE –IV Design and Drawing of Building: - Design and preparation of detailed drawings of various types of buildings like residential building, institutional buildings and commercial buildings, Detailing of doors, windows, ventilators and staircases etc.

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MODULE –V Perspective Drawing: -Elements of perspective drawing involving simple problems one point and two-point perspectives energy efficient buildings.

Text books/References:

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Duggal, Surveying, Tata McGraw Hill New Delhi.
3. Punmia, B.C., Surveying, Standard book depot.
4. S.C. Rangwala, Building Construction, Charotar publications House, Anand.
5. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
6. Grucharan Singh, Building Construction, Standard Book House, New Delhi

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BUILDING PLANNING AND DRAWING LAB

SUB-CODE: ETCE314 **CREDIT: 1.5**

Course Objective:

- The objective of Building planning and drawing is to gain knowledge and techniques of building planning of different types of buildings.
- The drawing includes the various building components like foundation, doors, windows, staircases etc.
- Students can easily learn about drawing sheets used on building constructions.

Course Outcomes:

At the end of the course the students are able to:

- Planning of different types of buildings.
- To sketch the drawing sheets as per building laws.
- Analyze the different types of drawing views on drawing sheets.
- Draw plan, elevation and sectional view of residential and institutional building

Syllabus:

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Week 1: Sketches of various building components.
Week 2. One drawing sheet of doors
Week 3. One drawing sheet of windows
Week 4. One drawing sheet of stairs
Week 5. One drawing sheet of foundations
Week 6. One drawing sheets each for services and interiors of buildings.
Week 7. One drawing sheet containing detailed planning of one/two bed room residential building (common to all student)
Week 8. One drawing sheet of residential building
Week 9. One drawing sheet of institutional building
Week 10. Use of AutoCAD for preparation of drawings.

REFERENCE BOOKS:

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Duggal, Surveying, Tata McGraw Hill New Delhi.
3. Punmia, B.C., Surveying, Standard book depot.

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FOURTH SEMESTER

Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE401**
Course Name	**Engineering Hydraulics-I**
Course Credits	**3 (T)+1.5(P) = 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course will introduce the core concepts of fluids and their properties which are used for the further analysis of static, kinematics and dynamics condition of fluids. Students should be able to analyze and design fluid systems commonly found in engineering applications, such as pipelines, pumps, turbines, and hydraulic systems.

2.Prerequisite: Understanding of the basic of fluids.

3.Objective of the Syllabus:

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This course Engineering Hydraulics-I is an essential part of any Civil engineering education. The objective of an Engineering Hydraulics-I course in civil engineering is to provide students with an understanding of the behavior of fluids (liquids and gases) and their applications in civil engineering practice.

To impart knowledge of the basic principles governing fluid behavior, including fluid statics and dynamics, continuity equation, Bernoulli's equation, and Euler's equation. To equip students with analytical techniques for solving problems related to fluid flow, such as control volume analysis, differential analysis, and dimensional analysis.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will be able to understand the different properties of fluid, types of fluid, and measurement of pressure under static condition with the help of Pascal's law, hydrostatics law and manometers.
CO2	Will be able to understand the kinematics behavior of fluids like types of flow, flow path, and force on immersed body, velocity potential, and continuity equation.
CO3	Will understand the dynamic behavior of fluids like velocity measurement, flow measurement by using Euler's and Bernoulli's equation.
CO4	Will understand the dimensional number and dimensional model by using Rayleigh method and Buckingham-pi theorem
CO5	Will know about Reynolds number and laminar & turbulent flow, flow through circular pipes and Laminar flow between parallel plates.

5.Syllabus:

MODULE –I Basic Fluid Properties & Fluid Statics: -Engineering Units of measurement Mass density, Specific weight, Specific volume, Specific gravity, Viscosity, Surface tension, Capillarity, Bulk modulus of elasticity, Pressure and vapour pressure. Pressure at a point, Pressure variation in static fluid Absolute and gauge pressure, manometers, Forces on plane and curved surfaces Buoyant force, Stability of floating and submerged bodies Relative equilibrium.

MODULE –II Kinematics of Flow & Forces on Immersed Bodies:-Types of flow-ideal & real , Steady &unsteady, uniform & non uniform, one, two and three dimensional flow Path lines, Streak lines, streamlines and stream tube, Continuity equation for one and three dimensional flow Rotational & Irrotational flow, circulation Stagnation point, separation of flow, sources & sinks Velocity potential, stream function Types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, Magnus effect.

MODULE –III Dynamics of Flow:-Euler's equation of motion along a streamline and derivation of Bernoulli's equation "Application of Bernoulli's equation, energy correction factor Linear momentum equation for steady flow; momentum correction factor The moment of momentum equation, forces on fixed and moving vanes and other applications Velocity measurement (Pitot

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tube, Prandtl tube, current meters etc.)Flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venturimeter, weirs and notches).

MODULE –IV-Dimensional Analysis and Dynamic Similitude: -Dimensional analysis, dimensional homogeneity Use of Rayleigh method and Buckingham-pi theorem Calculation of dimensionless numbers, Similarity law Specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)

MODULE –V Laminar Flow & Potential Flow: -Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number "Relation between shear & pressure gradient Laminar flow through circular pipes Laminar flow between parallel plates Laminar flow through porous media, Stokes law. Introduction of Potential Flow, its measurement & application.

BOOKS AND REFERENCES

Text books/References:

1. Modi& Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. White ; Fluid Mechanics ; TMH
4. R.J. Garde, “Fluid Mechanics” RPH, Roorkee, India.
5. R. K. Bansal, Fl

ENGINEERING HYDRAULICS-I LAB SUB-CODE: ETCE401 CREDIT: 1.5

Course Objective:

- To understand the pressure in a fluid.
- To know about the device for measuring pressure.
- Demonstrate Reynolds experiment.

Course Outcomes:

At the end of the course the students are able to learn:

- Ability to measure pressure in static fluids.
- Ability to design and solve Reynolds experiment problems.
- Ability to simulate different models of dimensional analysis.

Syllabus:

Week 1: To determine the local point pressure with the help of pitot tube.
Week 2: Verification of Impulse momentum principle.
Week 3: To find out the terminal velocity of a spherical body in water.
Week 4: Calibration of Venturimeter
Week 5: Determination of Cc, Cv, Cd of Orifices
Week 6: Calibration of Orifice Meter
Week 7: Calibration of Nozzle meter and Mouth Piece
Week 8: Reynolds experiment for demonstration of stream lines & turbulent flow

Week 9: Determination of metacentric height
Week 10: Verification of Bernoulli's equation

REFERENCE BOOKS:

1. R. K. Bansal, Fluid Mechanics and Hyd. Machines, Laxmi publisher, New Delhi.
2. White; Fluid Mechanics; TMH

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Programme Structure	**B. Tech (Civil Engineering)**
Subject Code	**ETCE402**
Course Name	**Structural Mechanics II**
Course Credits	**3 (T) + 1.5(P)= 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course will introduce the core concepts, of stress analysis in space, stress analysis in chimney, dam, retaining wall and Stress analysis in thin and thick cylinder, deflection in beam by conjugate beam and energy method, to find shear center, unsymmetrical bending, and pure bending in curved beams.

2.Prerequisite: To understand the stress analysis in space structure, determination of deflection in beam, to find shear center and yield criteria of structure.

3.Objective of the Syllabus:

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To develop an appreciation of need, importance and scope of generalized state of stress and strain, Analysis of statically determinate structure, Stress analysis of thick, Compound Cylinder, Theories of failure, Deflection of Beam by conjugate Beam method and energy method, Unsymmetrical bending, Shear center, curved beam.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Analysis of generalized state of stress and strain, analysis of stress and strain tensor, Stress analysis in dam, chimney and retaining wall.
CO2	Analysis of stress in thick and thin compound cylinder, Theories of failure.
CO3	To find out the deflection of beam by conjugate method.
CO4	Analysis of unsymmetrical bending, analysis of pure bending in curved beams, study of shear center.
CO5	To find the deflection of beam by strain energy method; Castigliano's theorem, virtual work method, unit load method, Maxwell reciprocal theorem.

5.Syllabus:

Unit I

Generalized State of Stress and Strain, & Analysis of Statically Determinate Structure: - Generalized state of stress and strain, Stress and strain tensor, and Stress space. Stability of dams, retaining walls and chimneys.

Unit II

Stress Analysis of Thick, Compound Cylinder & Theories of Failure: -Stress analysis of thick and compound cylinder, and theories of failure; Tresca, Von-Misses, Beltrami or Haigh's theory.

Unit III

Deflection of Beam -Conjugate Beam method

Unit IV

Unsymmetrical Bending, Shear Centre & Curved Beam: - Principal moment of Inertia, Product of Inertia, bending of a beam in a plane which is not a plane of, symmetry. Shear center; Curved beams: Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis

Unit V

Energy Method: -Strain energy, elastic, complementary and total strain energy, Strain energy of axially loaded bar, Beam in bending, shear and torsion; General energy theorems Castigliano's theorem, Maxwell Bettie's reciprocal theorem; Virtual work and Unit load method for deflection, Application to problems of beams and frames

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BOOKS AND REFERENCES

Text Books

1 Solid Mechanics by S.M.A KAZMI, TMH, Delhi, India

2. Singh Surendra 'Strength of Materials', Vikas Publishing House Pvt. Ltd., New Delhi.

3. Solid mechanics by R.K BANSAL.

Reference Books

1. Rajput R. K., 'Strength of Materials', S. Chand & Company Ltd., New Delhi.
2. Strength of Materials by Sadhu Singh.
3. Strength of Material by Ramamrutham.

STRUCTURAL MECHANICS- II LAB SUB-CODE: ETCE412 CREDIT: 1.5

Course Objective:

- To determine the hardness of material, Verification of the deflection of beam, study of end conditions of column.
- To understand the stress-strain curve of mild steel in tension and compression.
- Verification of shear force and bending moment in beam.

Course Outcomes:

At the end of the course the students are able to:

- Ability to understand difference between ductility and brittleness of material.
- Ability to understand the significance of shear force and bending moment.
- Ability to simulate deflection of beam with actual beam of structure.

Syllabus:

Week 1: To determine the impact value of the given specimens by IZOD impact testing machine.

Week 2: To determine the transverse modulus of elasticity by plotting the load deflection curve.

Week 3: To study the deflected shapes of columns for different end conditions.

Week 4: To determine the buckling load on columns for different end conditions.

Week 5: Verification of bending moment and shear force in beams.
Week 6: To determine the shear modulus by plotting the torque twist diagram for a circular shaft.
Week 7: To determine the Brinell's Hardness number for different materials.
Week 8: To understand the behavior of a mild steel bar under tension by plotting stress-strain curve.
Week 9: To understand the behavior of a mild steel bar in compression by plotting stress-strain curve.
Week 10: Verification of deflection in beams.

REFERENCE BOOKS:

1. Rajput R. K., 'Strength of Materials', S. Chand & Company Ltd., New Delhi
2. Strength of materials lab manual by Anand Jayakumar Arumugham.

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Programme Structure	**B. Tech (CIVIL ENGINEERING)**
Semester	**4th**
Subject Code	**ETCE403**
Course Name	**SURVEYING**
Course Credits	**3 (L) + 1.5(P)= 4.5**
Total Course Credit	**172**

Abbreviations: L-Lecture, P-Practical

1.Course Overview:

To learn about different surveying equipment's and their uses, and the different techniques of linear surveying, angular surveying, leveling, Trigonometrical leveling, Traversing, Hydrographic Surveying.

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2.Prerequisite: To understand the fundamental of geometry and fundamental trigonometric relationship.

3.Objective of the Syllabus:

This course Surveying is an essential part of any Civil engineering education. These objectives aim to provide students with a comprehensive understanding of Surveying equipment's , preparing them for further study or careers in fields such as Civil engineering, Draughtsman , Surveyor, Architecture.

Learn the fundamentals of Survey process and equipment's used, they can easily survey for roads, building and other structures also.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understands the objectives and Principles of surveying, classification of surveying, Study and use of instruments for linear Measurements, Errors and corrections in measurements.
CO2	Know about Principle of compass survey, Types of compasses, Bearing of lines, WBC and QB, Conversion of bearings, Fore bearing & back bearing
CO3	Understanding about different terms used in Levelling, Basic Levelling instruments and their uses, Methods of levelling.
CO4	Understanding about Traversing by theodolite, traverse computations, latitude and departures, adjustments, plotting & adjusting or traverse, Trigonometrical leveling.
CO5	Know about Hydrographic Surveying, Soundings, Computations and plotting.

5.Syllabus:

MODULE –I Introduction of Surveying & Chain surveying: - Definition, Objects of surveying, Principles of surveying, Uses of Survey classification of surveying, Primary –plain, Geodetic. Secondary – based on instruments, Method, Object, Nature of field, Principle of chain survey, Study and use of instruments for linear Measurements- Chain, Tape, ranging rod, Arrows, Pegs, Cross Staff, Optical square, Line ranger, Survey lines, Check lines, Tie lines, Base line, Offsets & Obstacles, Errors in chain surveying & applying corrections for chain & tape.

MODULE –II Compass Surveying: - Definition & principle of compass survey, Meridian, bearing of lines, Fore bearing & back bearing, Whole circle bearing and Reduced bearing, Conversion of bearings, Finding included angles from bearings, Prismatic & Surveyor compass – Component, Construction and use, Local attraction,

Correction of bearings affected due to local attraction.

MODULE –III Leveling:- Definitions – level surface, Level line, Horizontal line, Vertical line, Datum surface, Reduced level, Bench mark and its types, Dumpy & Auto level – Components, Construction & their temporary adjustments, Line of sight, Line of collimation, Bubble tube axis, Leveling staff -telescopic and folding type, Foresight, Back sight, Intermediate sight, Change point, Height of collimation, Method of reduction of levels – Height of instrument method and Rise and fall method, Arithmetical checks, Numerical problems, Computation of missing readings, Classifications of leveling - Simple, Differential, Profile, Cross sectional, Fly and Check leveling.

MODULE –IV Traversing: - Traversing by theodolite, Field work checks, traverse computations, latitude and departures, adjustments, computations of co-ordinates, plotting & adjusting or traverse, Omitted measurements, Measurement EDM, Trigonometrical leveling,

MODULE –V Hydrographic Surveying: - Soundings, Methods of observations, Computations and plotting. Principles of photographic surveying: aerial photography, Tilt and height distortions, Introduction of Remote sensing, GPS and GIS.

BOOKS AND REFERENCES:

1 . Kanetkar, T.P. Surveying &Levelling, Vol. I & II.
2. Duggal; Surveying vol I and II; TMH
3. Basak; Surveying and Leveling; TMH
4. Devis R.E., Surveying theory & Practice, Mc.Graw Hill, New York
5. David Clark & J Clendinning, Plane & Geodetic surveying Vol. I & II, constable & Co. London.
6. Roy, S.K., Fundamentals of surveying, prentice - Hall of India New Delhi

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SURVEYING LAB
SUB-CODE: ETCE413 **CREDIT: 1.5**

Course Objective:

- To be know about basic Surveying equipment's.
- Investigate the characteristics and applications of various types of Surveying equipment's and their uses.
- Gain experience through laboratory experiments, design of small projects to reinforce theoretical concepts and develop practical skills.

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Course Outcomes:

At the end of the course the students are able to:

- Ability to implement the characteristics and applications of various types of surveying equipment's.
- Ability to design and develop practical skills.
- Ability to simulate and implement Gain experience through laboratory experiments, and design projects

Syllabus:

List of Experiment: -

Week 1: - Familiar with different instruments used for surveying
Week 2: -Measure horizontal distance by tape
Week 3: - Measure horizontal distances by chain on plain ground
Week 4: - Perform detail chaining between two points
Week 5: - Measure bearing of traverse by surveyor compass
Week 6: - Measure bearing of traverse by prismatic compass
Week 7: - Measure level of area by Dumpy level
Week 8: - Measure level of area by Auto level
Week 9: - Profile leveling, contouring & cross sectioning
Week 10: - Theodolite traversing

REFERENCE BOOKS:

1. Punmia, B.C. Punmia, Surveying Vol. I, II, III, Laxmi Publications New Delhi
2. Arora, K.R. Surveying Vol. I & II, standard book House, New Delhi

Additional Learning Sources: -

1. Web links to e-learning: NPTEL.

Web links to e-learning: NCTEL

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE404**
Course Name	**Transportation bridge and tunnel**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

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This course will introduce the core concepts of railway, bridge and tunnel engineering. A course on Transportation Bridge and Tunnel Engineering typically covers a range of topics related to the design, construction, maintenance, and management of transportation infrastructure, including bridges and tunnels.

2.Prerequisite: To understand the basic of transportation.

3.Objective of the Syllabus:

This course Transportation Bridge and Tunnel is an essential part of any Civil engineering education. The purpose of this course is to understand about the rail, sleeper, ballast, point and crossing, station and yard, signaling and interlocking, bridge and tunnel. How effectively we can construct the P-way, bride and its foundation, and tunnel.

Learn the fundamentals of rail, bridge and tunnel, learn the mechanisms of constructing P-way, bridge foundation and types of tunnels.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will be able to understand about P-way, rail, rail fastening, sleeper, and ballast.
CO2	Will be able to understand the knowledge of the station and yard, point and crossing, signaling and interlocking.
CO3	Will understand the planning and site investigation for bridge.
CO4	Will understand the construction, testing and strengthening of bridge foundation.
CO5	Will know about planning, surveying for tunnel site and the construction method of different tunnel.

5.Syllabus:

MODULE –I Introduction, Tractive Resistances & Permanent Way: -Principles of Transportation, Transportation by Roads, railways, Airways, Waterways, their importance and limitations ,
Route surveys and alignment, Railway track development and gauges, Hauling capacity and tractive effort,
Rails: types, welding of rails, wear and tear of rails, rail creep,
Sleepers: types and comparison, requirement of a good sleeper, sleeper density,
Rail fastenings: types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails.
Ballast: Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track.

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MODULE -II

Geometric Design, Station & Yards; Points and Crossings & Signaling and Interlocking:- Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency ,Various types of curves, speed on curves, Types, locations, general equipments, layouts, Marshalling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, Principles of signaling and inter-locking.

MODULE –III Bridge Site Investigation and Planning, Loading Standards &Component Parts:-Selection of site, alignment, Collection of bridge design data: essential surveys, Hydraulic design, Scour depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges, Design loads and forces, Impact factor, Bridge super structure and sub-structures, abutments, piers, wing walls, return walls, approaches, floors & flooring system.

MODULE –IV Bridge Foundations, Construction, Testing and Strengthening of Bridges:-Different types of foundation: piles and wells, Sinking of wells, coffer-dams, Choice of bridges and choice of materials, details of construction underwater and above water, Erection of bridges, girders, Equipments and plants, Inspection and Data collection, Strengthening of bridges, Bridge failure.

MODULE –V Tunnels: -Selection of route, Engineering surveys, alignment, Shape and size of tunnel, Bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts, Construction, tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking Operation, Drainage and ventilation.

BOOKS AND REFERENCES

Text books/References:

1. Chakraborty and Das; Principles of transportation engineering; PHI
2. Rangwala SC; Railway Engineering; Charotar Publication House, Anand
3. Rangwala SC; Bridge Engineering; Charotar Publication House, Anand
4. Ponnuswamy; Bridge Engineering; TMH
5. Arora & Saxena, Railway Engineering – Dhanpat Rai & Sons
6. Antia K.F., Railway Track
7. Bindra S.P. Principles and Practice of Bridge Engineering - DhanpatRai& Sons
8. Alagia J.S. Bridge Engineering - Charotar Publication House, Anand

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE405**
Course Name	**Reinforced Cement Concrete -I**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

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1.Course Overview:

The course on Reinforced Cement Concrete -I has been so designed that the students will understand the basic knowledge of concrete and concrete structures. The syllabus is designed to cover the critical design aspects of structural elements such as beams, slab, footings, and columns. Through this course the students will get a hands-on exposure on the philosophies related to design. In addition to this, the course will lay the foundation for the advance course in Concrete design.

2.Prerequisite: Student should have knowledge of fundamentals of Materials of constructions, Strength of Materials and Concrete Technology.

3.Objective of the Syllabus:

The aim of this course is to provide students with a thorough understanding of the design of reinforced concrete structures. Topics covered will include: design of beams and slabs for flexure and shear; detailing of flexural and shear reinforcement; behavior of reinforced concrete members under combined flexure and axial load; design of short columns; behavior and design of slender columns.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understanding the fundamental building material: cement and concrete; basic knowledge of different types of concrete structures and various design philosophies.
CO2	To analyze & design Singly & doubly Reinforced Rectangular Section under Flexure and Shear as per IS 456 (2000).
CO3	To analyze & design the slab for different boundary conditions and to capture the failure patterns of slabs under various loading conditions.
CO4	Apply fundamental mechanics to the design of reinforced concrete columns and foundations at the limit state including determination strength under uniaxial and biaxial bending.
CO5	To design & detail the dog legged and open well staircase

5.Syllabus:

Unit I Basic Principles of Structural Design

Introduction of R.C.C and its Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to WSM and LSM of design method, Partial safety factor for load and material, Calculation of various loads for structural design of singly

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reinforced beam.

Unit II Design of Beams
Doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement, Redistribution of moments in continuous beams, Introduction of Deep beams, Design of beam for shear and bond.

Unit III Design of Slabs
Introduction of slab, Slabs spanning in one direction, Cantilever, simply supported and Continuous slabs, Slabs spanning in two directions Circular slabs, Waffle slabs & Flat slabs, Yield line theory.

Unit IV Columns & Footings
Introduction of column & Effective length of columns, short and long columns- Square, Rectangular and Circular columns, Design of Isolated and combined footings, Design of Strap footing, Columns subjected to axial loads and bending moments, Design of Raft foundation.

Unit V Staircases
Introduction of staircase and relation between riser and trade, Staircases with waist slab having equal and unequal flights with different support conditions, Slab-less tread-riser staircase.

NOTE: -All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids).

BOOKS AND REFERENCES

Text Books

1. Jain, A.K., Reinforced Concrete: Limit State Design, Seventh edition, Nem Chand & Brothers-Roorkee, 2012.
2. Raju N.K., Reinforced Concrete Design IS 456 – 2000 Principles & Practice, Fourth edition New Age International Publishers, New Delhi, 2019.

Reference Books

1. Sinha, Reinforced Concrete Design, McGraw Hill Education; Third edition, 2017.
2. Karve & Shah, Design of R.C.C. Structures, Assorted Editorial; 8th edition 2017.
3. Punmia B.C., Limit State Design of Reinforced Concrete, Laxmi Publication (P),

Delhi, 2007.
4. H. J. Shah, Reinforced concrete, Vol.1 & 2, Charotar publishing house Pvt. Ltd, 2011.
5. Design of Reinforced Concrete Foundations by P. C Varghese, PHI Learning Private Limited., New Delhi,2008.
5. IS 456 (2000): Code of Practice of Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.

REINFORCED CEMENT CONCRETE -I LAB

SUB-CODE: ETCE415 **CREDIT: 1.5**

Course Objective:

- To develop an appreciation for understanding the essence of structure design and drawing, and its importance in Civil Engineering.
- To apply basic skills acquired in Civil Engineering in the design of structural components as part of Building Design and Drawing.
- To develop capabilities for design of structural plans for the benefit of the community.
- To apply the collection of sectional requirements to detailing and prepare the bar bending schedule of different RCC structural members.

Course Outcomes:

At the end of the course the students are able to:

- Ability to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters).
- Ability to read and interpret structural drawings of different elements.
- Ability to deal with elementary design principles as per BIS code of practice IS: 456 – 2000 and their relevant drawings.

Syllabus:

Week 1: Sketch cross section, strain diagram & stress diagram for singly reinforced section.
Week 2: Sketch cross section, strain diagram & stress diagram for doubly reinforced section.
Week 3: Details of reinforcement in a simply supported RCC beam (singly reinforced and doubly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing.
Week 4: Determine the sectional properties and sketch the detailing of a singly reinforced beam and prepare bar bending schedule.
Week 5: Determine the sectional properties and sketch the detailing of a one-way slab and prepare bar bending schedule.
Week 6: Sketch the reinforcement details of a two-way slab, corners held down and not held down and prepare bar bending schedule.
Week 7: Details of reinforcement in plan and section for a simply supported RCC one way

slab with intermediate support and two-way slabs from the given data. Bar bending schedule should be prepared.

Week 8: IS specifications for main and lateral reinforcement including spiral reinforcement.

Week 9: Details of reinforcement for a RCC square and circular column with isolated square footing.

Week 10: Draw sketches of the plan and longitudinal section - Staircase - dog legged and open well showing all the details and dimensions (A typical structural drawing may be adopted.)

REFERENCE BOOKS:

1. Raju N.K., Reinforced Concrete Design IS 456 – 2000 Principles & Practice, Fourth edition New Age International Publishers, New Delhi, 2019.
2. Sinha, Reinforced Concrete Design, McGraw Hill Education; Third edition, 2017

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FIFTH SEMESTER

Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE501**
Course Name	**Structural Analysis-I**

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Course Credits	3 (T) + 1(T)= 4
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course is intended to provide students with a thorough understanding of the theory and application of structural analysis as it applies to trusses, beams and frames. Emphasis is placed on developing the student's ability to both model and analyse statically determinate and indeterminate structures and to provide realistic applications encountered in professional practice. Topics to be chosen from: influence lines; calculation of deflections in statically determinate structures; force method of analysis for indeterminate structures; displacement methods of analysis for indeterminate structures including the slope-deflection method, method of moment distribution, and the stiffness method; an introduction to finite element modelling; and plastic analysis.

2.Prerequisite: Student should have knowledge of fundamentals of Structural Mechanics, Strength of Materials and Applied Mechanics.

3.Objective of the Syllabus:

This course is designed to review the fundamentals and practices of structural engineering
within the Civil Engineering curriculum. Students will explore the concept of global structural stability, theory of structural analysis, and methods in structural analysis. To develop an understanding of various types of structures and their built to facilitate the performance of various activities connected with residence, transportation, storage, healthcare etc. in the field of civil engineering.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Apply fundamental concept of mechanics statics, mathematics of deformable body and principle of dynamics to the solution of fundamental civil engineering structural analysis problems.
CO2	Understand shear force and bending moment diagram for Fixed and continuous beams for various external loadings.
CO3	Apply knowledge of mathematics and engineering in calculating slope, deflection, bending moment and shear force using slope deflection, moment distribution method.
CO4	Determine the stresses and thrust in cables and suspension bridges and also calculate shear and bending in stiffening girders.
CO5	Construct Influence Diagrams and equations to characterize how the positioning of live loading will affect the reactions, shear forces and/or bending moment at a given point on a structure.

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5.Syllabus:

Unit I Virtual Work and Energy Principles

Principles of Virtual work applied to deformable bodies, strain energy and complementary energy, Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

Unit II Indeterminate Structures-I

Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by theorem of three moments, Effect of sinking and rotation of supports, Moment distribution method (without sway).

Unit III Indeterminate Structures- II

Analysis of beams and frames by slope Deflection method, Column Analogy method.

Unit IV Arches and Suspension Cables

Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches - Rib shortening and temperature effects.

Unit V Rolling Loads and Influence Lines

Maximum SF and BM curves for various types of Rolling loads, focal length, EUDL, Influence Lines for Determinate Structures- Beams, Three Hinged Arches.

BOOKS AND REFERENCES

Text Books

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi, 2012.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., New Delhi,2015.

Reference Books

1. Bhavikatti, Structual Analysis, Vikas Publishing House Pvt. Ltd, New Delhi, 2002.
2. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition, 2014.
3. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi, 2008.
4. H. J. Shah, Reinforced concrete, Vol.1 & 2, Charotar publishing house Pvt. Ltd, 2011.
5. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd, 2007.
5. S Ramamrutham, "Theory of Structures", Dhanpat Rai Publications, 9th Edition, 2014.
6. B C Punmia, "Theory of Structures" Laxmi Publication house, 16th Edition, 2017

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Subject Code	ETCE502
Course Name	Soil mechanics
Course Credits	3 (T) + 1.5(P)= 4.5
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course will introduce the core concepts of soil mechanics, origin and classification of soils, Physical and engineering properties of soil, capillarity, effective stress, permeability, compaction, consolidation, shear strength and stability of slopes.

2.Prerequisite: To understand soil formation and composition, applying principles like mechanics and fluid mechanics to soil behavior, fluid flow and its interaction with soil. Basics of structural analysis and design, Awareness of environmental factors affecting soil properties.

3.Objective of the Syllabus:

The objective of soil mechanics is to study the behavior of soils under various conditions such as Loading, environmental factors, and geological processes. This field aims to understand how soil Behave, deform, and interact with structures and the environment. By studying soil mechanics, Engineers can design structures that are safe, stable, and durable, taking into account factors like Foundation design, slope stability, and soil erosion. Additionally, soil mechanics plays a crucial role in geotechnical engineering, construction, and environmental protection.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will be able to understand origin and classification of soils, soil water relationship, grain size distribution, and clay mineral and soil structure.
CO2	Demonstrate the knowledge of Total, neutral and effective stress, Capillarity in soil, Permeability Darcy's law, and factors affecting permeability. Laboratory determination of permeability, Permeability of stratified soils Quick sand conditions and liquefaction of soil.
CO3	Ability to understand Theory of compaction, laboratory compaction tests, optimum moisture content and zero air void line. Field methods and compaction, Seepage Flow net uses of a flow net Seepage, Stresses in soil mass due to surface loading Boussinesq and Wester Gard's formulae for point load. Pressure bulb, Vertica pressure.
CO4	Ability to understand Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxle compression test, unconfined compression test, Vane shear test, Liquefaction, Infinite and finite slopes, Types of slope failures, Effect of ground water, stability analysis, Analytical and graphical methods of stability analysis, Stability of Earth dams.
CO5	Ability to understand Spring analogy, Equation of one-dimensional consolidation. Coefficient of consolidation, coefficient of compression, compression index, pre-compression pressure. Over consolidation ratio, Consolidation Settlement analysis. Basics of three-dimensional consolidation,

	Sand drains.

5.Syllabus:

Unit I

Introduction, Index Properties& Classification: -Definition and scope of soil mechanics, Origin and Classification of soils, Soil water relationship (phase system of soil), Index properties and their determination, Grain size analysis, Soil consistency, determination of consistency limit thixotropic, sensitivity and Activity number, Classification of soil based on Unified soil classification system & IS soil classification system, clay mineral & Soil structure.

Unit II

Introduction, Index Properties& Classification: -Total, neutral and effective stress, Capillarity in soil**,** Permeability Darcy's law, factors affecting permeability. Laboratory determination of permeability, Permeability of stratified soils Quick sand conditions and liquefaction of soil.

Unit III

Compaction, Seepage through soil & Soil stresses: -Theory of compaction, laboratory compaction tests, optimum moisture content and zero air void line. Field methods and compaction control, Seepage and seepage pressure. Flow net uses of a flow net Seepage in anisotropic soil, Seepage through non-homogeneous soil, Stresses in soil mass due to surface loading. Boussinesq and Wester Gard's formulae for point load. Pressure bulb. Vertical pressure under various uniformly loaded area. Newmark's influence chart. Approximate methods

Unit IV

Shear Strength of Soils & Stability of Slopes: -

Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxle compression test, unconfined compression test, Vane shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction, Infinite and finite slopes, Types of slope failures, Rotational slips, Stability number, Effect of ground water, Selection of shear strength parameters in slope stability analysis, Analytical and graphical methods of stability analysis, Stability of Earth dams.

Unit V

Compressibility and Consolidation: -Spring analogy, Equation of one-dimensional consolidation. Coefficient of consolidation, coefficient of compression, compression index, pre-compression pressure. Over consolidation ratio, Consolidation Settlement analysis. Basics of three-dimensional consolidation, Sand drains.

BOOKS AND REFERENCES

Text Books

1. Gopal Ranjan and A.S.R. Rao "Basic and Applied Soil Mechanics", New Age International (P) Ltd, New Delhi.
2. Soil Mech. & Found. By Dr. B.C. Punamia - Laxmi Publications, Delhi.
3. Soil Mech. & Found. Engg. By Dr K.R. Arora - Std. Publishers Delhi
4. V.N.S .Murthy, "Soil Mechanics and Foundation Engineering", Saikripa Technical Consultants, Banglore.
5. Alam Singh, "Soil Engineering in Theory and Practice", Asia Publishing House, New Delhi.

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Reference Books

1. V.N.S .Murthy, “Soil Mechanics and Foundation Engineering”, Saikripa Technical Consultants, Bangalore.
2. Soil Mech. & Found. By Dr. B.C. Punamia - Laxmi Publications, Delhi
3. Alam Singh, “Soil Engineering in Theory and Practice”, Asia Publishing House, New Delhi.

SOIL MECHANICS LAB SUB-CODE: ETCE512 CREDIT: 1.5

Course Objective:

- **Hands-on Experience**: Provide students with practical, hands-on experience in conducting laboratory tests on soil samples to supplement theoretical knowledge gained in lectures.
- **Soil Testing Techniques**: Familiarize students with common laboratory testing techniques used to determine soil properties, including grain size analysis, moisture content, density, permeability, and shear strength.
- **Instrumentation and Equipment**: Introduce students to the instrumentation and equipment used in soil mechanics testing, including sieves, hydrometers, compaction moulds, triaxle cells and direct shear apparatus.
- Train students in the collection, recording, and analysis of experimental data obtained from soil tests, emphasizing accuracy and attention to detail.

Course Outcomes:

At the end of the course the students are able to:

- Demonstrate proficiency in performing a range of soil tests accurately and efficiently, including tests for grain size analysis, moisture content, density, permeability, and shear strength.
- Students should be able to collect, record, and analyze data obtained from soil tests, demonstrating the ability to interpret test results and draw meaningful conclusions regarding soil behavior and properties.
- Able to apply theoretical concepts learned in lectures to the practical context of laboratory experimentation.

Syllabus:

Week 1: Determination of water content of soil by oven drying method.
Week 2: Determination of water content of soil by pycnometer method
Week 3: Determination of water content of soil by Rapid moisture meter method.
Week 4: Determination of specific gravity of soil by Pycnometer method.
Week 5: Determination of in-situ density by Core cutter method.
Week 6: Determination of in-situ density by Sand replacement method
Week 7: Determination of particle size distribution by sieving (Grain size analysis)
Week 8: Determination of liquid limit, Plastic limit, and Shrinkage limit of fine soil.
Week 9: Determination of co-efficient of permeability.

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Week 10: Determination of maximum dry density and optimum moisture content by Standard Proctor compaction method.

Week 11: To determine shear strength parameters of the given soil by direct shear test.

Week 12: To determine shear strength parameters of the given soil by triaxle test.

Week 13: To determine shear strength parameters of the given soil by vane shear test.

REFERENCE BOOKS:

1. Gopal Ranjan and A.S.R. Rao, "Basic and Applied Soil Mechanics", New Age International (P)
Delhi.
2. Soil Mech. & Found. By Dr. B.C. Punamia - Laxmi Publications, Delhi

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE503**
Course Name	**Environmental Engineering-I**
Course Credits	**3 (T) + 1.5(P) = 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course Environmental Engineering I is an introductory course that provides a comprehensive overview of the fundamental principles and practices essential for the design, management, and maintenance of water supply systems. The course covers various aspects including the sources of water, hydraulics, water demand estimation, water quality, treatment processes, and distribution systems. Emphasis is placed on understanding the characteristics of water sources, the principles of water treatment, and the design of distribution systems. Through theoretical lectures and practical applications, students will gain insights into the challenges and solutions involved in providing clean and safe water to communities. Additionally, the course explores the environmental, economic, and social factors influencing water supply engineering, ensuring students are equipped with the necessary knowledge and skills to address real-world water supply challenges.

2. Prerequisite:

Students should have basic understanding of fluid mechanics, hydrology, and environmental engineering.

3.Objective of the Syllabus:

The objective of the syllabus of Water Environmental Engineering-I is to provide students with a fundamental understanding of the principles, practices, and technologies related to the planning, design, and management of water supply systems. This course aims to equip students with the necessary knowledge and skills to analyze, plan, and design components of water supply systems, including water sources, treatment processes, distribution networks, and associated infrastructure. Additionally, the syllabus intends to foster an understanding of the challenges and considerations in providing safe, reliable, and sustainable water supply to communities.

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4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will develop the Understanding of source of water and population forecasting.
CO2	Will develop the Understanding of water quality parameters like physical, chemical and biological.
CO3	Will understand to learn the procedure for treatment of water in water treatment plant, like sedimentation, filtration, disinfection etc. also design the different units of water treatment plant
CO4	Will developed the understanding of water distribution in a city by using some method.
CO5	Will understand about the impact of air and noise pollution and how to control it.

5.Syllabus:

MODULE –I Sources of Water and their Demand: -Ground and Surface sources, Intakes structures for surface water source & ground water source, Water Quantity/Demand, Design period, Population forecast, Variation of quantity of water demand, Factor affecting water demand.

MODULE –II Water Quality: - Physical, chemical and biological parameters, Examination of physical, chemical and biological characteristics of water, Water-borne diseases, Water standards for different uses, Conveyance of water, pipe materials, pumps - operation & pumping stations.

MODULE –III Water Purification: - Philosophy of treatment, Unit operations & process, Introduction to physical, chemical and biological processes, Plain sedimentation, Coagulation and flocculation, Filtration: Slow and Rapid sand filters, Disinfection, Softening, Introduction of adsorption and Reverse Osmosis and other treatment methods.

MODULE –IV Water Distribution System:-Water Storage, pumping and Transportation of water, Pipe fittings, Valves and appurtenances, Analysis of distribution system, Hardy cross method, Leak detection, maintenance of distribution systems, Service reservoir capacity and height of reservoir

MODULE –V Air and Noise pollution: -Introduction of air pollution and pollutant, Types of air pollutant, Sources of pollutant, Analysis of air pollutant, Control measure of air pollution- Natural & Engineering system, Introduction of noise pollution, Sources, Effect, Control measure.

BOOKS AND REFERENCES

Text books/References:

K.K. UNIVERSITY 803115 NALANDA

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1. Garg S.K., Environmental Engineering (Voll), Water Supply Engineering, Khanna Publishers, New Delhi.

2. Garg S.K., Environmental Engineering (Vol II), Sewage Disposal & Air Pollution Engineering, Khanna Publishers, New Delhi.

3. Punmia B.C Water Supply Engineering Laxmi Publications (P) Ltd. New Delhi

4. Peavy H.S, Rowe D.R. and Tchobanoglous G, Environmental Engineering, Tata McGraw Hills, New Delhi.

5. G.S. Birdi, Water Supply & Sanitary Engg.Laxmi Publications (P) Ltd. New Delhi

6. CPHEEO: Manual on water supply and treatment, Ministry of Urban Development

ENVIRONMENTAL ENGINEERING-I LAB SUB-CODE: ETCE513 CREDIT: 1.5

Course Objective:

- Learn to measure and analyze various water quality parameters such as pH, turbidity, conductivity, and total dissolved solids (TDS).
- Gain an understanding of the significance of these parameters in determining water quality and potability.
- Learn how to use standard laboratory equipment to measure parameters such as pH, turbidity, conductivity, and temperature.

Course Outcomes:

At the end of the course the students are able to learn:

- Demonstrate proficiency in conducting standard water quality tests.
- Apply theoretical knowledge to real-world scenarios in water treatment.
- Gain hands-on experience with various water treatment processes and equipment.

Syllabus:

Week 1: To determine the amount of total, fixed and volatile solids present in the given sample.

Week 2: To determine the amount of suspended & dissolved solids present in the given sample

Week 3: To find out the turbidity of the given sample

Week 4: To determine the pH of water

Week 5: To determine the residual chlorine for the given water sample

Week 6: To determine the amount of Dissolved Oxygen present in the given sample

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Week 7: To determine the amount of Chemical Oxygen Demand present in the given sample

Week 8: To determine the amount of Bio-chemical Oxygen Demand present in the given sample

Week 9: To determine the electrical conductivity of water.

Week 10: To determine the total hardness present in the given sample

REFERENCE BOOKS:

1. Garg S.K., Environmental Engineering (VolI), Water Supply Engineering, Khanna Publishers, New Delhi.

2. Garg S.K., Environmental Engineering (Vol II), Sewage Disposal & Air Pollution Engineering, Khanna Publishers, New Delhi.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE504**
Course Name	**Engineering hydraulics II**
Course Credits	**3 (T) + 1.5(P)= 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1. Course Overview:

Engineering Hydraulics II is an advanced course focusing on complex topics like turbulent Flow pipe flow analysis, pen channel flow, hydraulic machinery, hydrology, sediment transport, Hydraulic structures, and computer modelling through case studies and projects, students Apply theoretical concepts to practical engineering problems, honing their skills in hydraulic Analysis design, and simulation, preparing them for careers in civil engineering, water resource Management and environmental engineering.

2.Prerequisite:

The prerequisite for Engineering Hydraulics II is typically completion of Engineering Hydraulics I or an equivalent introductory course in fluid mechanics.

3. Objective of the Syllabus:

The objective of Engineering Hydraulics II is to provide students with an advanced understanding

Of pipe flow, different types of flow, open channel flow and type of flow, boundary layer theory,

Separation of flow, rough and smooth surface, turbine flow, its type and working.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will be able to understand Pipe Flow Problems & Pipe Network Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes Water Hammer (only quick closure case). Transmission of power Hardy Cross Method.

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CO2	Ability to understand Uniform Flow in Open Channels, Channel geometry, velocity distribution, energy in open channel flow, specific energy, types of flow, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections, Saint Vegnet equation.
CO3	Ability to understand Non-Uniform Flow in Open Channels Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.
CO4	Ability to understand Boundary Layer Theory, Development of boundary layer over a flat plate, boundary layer thickness, displacement, momentum and energy thicknesses, Application of momentum equation to boundary layer flow, local and mean drag coefficients, Hydro-dynamically rough and smooth surfaces, boundary layer separation and its control.
CO5	Ability to understand Classifications, definitions, similarity laws, specific speed and Unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, reaction turbine, draft tube theory, cavitation. manomeric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, Principle of working, single acting and double acting pump, Manomeric head, Acceleration head.

5.Syllabus:

Unit I

Pipe Flow Problems & Pipe Network: - Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes Water Hammer (only quick closure case). Transmission of power. Hardy Cross Method.

Unit II

Uniform Flow in Open Channels: - Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections, Saint Vegnet equation.

Unit III

Non-Uniform Flow in Open Channels: - Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.

Unit IV

Boundary Layer Theory: - Introduction, Development of boundary layer over a flat plate, boundary layer thickness, displacement, momentum and energy thicknesses, Application of momentum equation to boundary layer flow, local and mean drag coefficients, Hydro-dynamically rough and smooth surfaces, boundary layer separation and its control.

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Unit V

Turbines & Pumps: - Classifications, definitions, similarity laws, specific speed and Unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation. Various types and their important components, manomeric head, total head, net positive suction head, specific speed, shut off head, energy losses, cavitation, principle of working and characteristic curves. Principle of working, Coefficient of discharge, slip, single acting and double acting pump, Manomeric head, Acceleration head

BOOKS AND REFERENCES

Text Books

1.Modi& Seth; Fluid Mechanics; Standard Book House, Delhi
2.R. K. Bansal, Fluid Mechanics and Hyd. Machines, Laxmi publisher, New Delhi.

Reference Books

1. Som and Biswas; Fluid Mechanics and machinery; TMH.
2. R.J. Garde, "Fluid Mechanics" RPH, Roorkee, India.
3. Som and Biswas; Fluid Mechanics and machinery; TMH.

ENGINEERING HYDRAULICS II LAB SUB-CODE: ETCE514 CREDIT: 1.5

Course Objective:

- Hands-on Application: Provide students with practical, hands-on experience applying theoretical concepts learned in lectures.
- Experimentation**:** Conduct experiments related to advanced topics in fluid mechanics, pipe flow, open channel flow, hydraulic machinery, and hydraulic structures.
- Analyse experimental data to understand fluid flow behaviours, hydraulic system performance, and structural responses.
- Skill Development: Enhance practical skills in equipment operation, measurement techniques, and experimental setup.

Course Outcomes:

At the end of the course the students are able to:

- Practical Application: Apply theoretical concepts to real-world hydraulic systems and experiments.
- Data Analysis: Analyse collected data to understand fluid flow behaviour's and hydraulic system performance.
- Problem-solving Skills**:** Develop critical thinking abilities to troubleshoot experimental setups and unexpected outcomes.

Syllabus:

Week 1: Study and validate of losses in flow through pipes.
Week 2: Study of Hardy Cross Method.
Week 3: Analyze the flow profile in open channel.
Week 4: Study of hydraulic jump and hump in open channel.
Week 5: Study of back water curve in open channel.
Week 6: To determine operation characteristics of Pelton wheel turbine.
Week 7: Study of Francis turbine.
Week 8: Study on the impact of jet.
Week 9: Study of Kaplan turbine.
Week 10: Study through visit of any water pumping station/plant.

REFERENCE BOOKS:

1.Modi& Seth; Fluid Mechanics; Standard Book House, Delhi.
2. Som and Biswas; Fluid Mechanics and machinery; TMH.
3.R. K. Bansal, Fluid Mechanics and Hyd. Machines, Laxmi publisher, New Delhi.
4. R. J. Garde, "Fluid Mechanics" RPH, Roorkee, India.
5. White; Fluid Mechanics; TMH.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE505**
Course Name	**Advanced Surveying**
Course Credits	**3 (T) + 1.5 (P)= 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course will introduce to basic understanding about knowledge and skill for Modern equipment's for surveying, curve, plane table, contouring, Tachometry Surveying, Astronomy, Photogrammetry

2.Prerequisite:

Advance surveying often builds upon foundational knowledge acquired in basic surveying courses. Prerequisites might include proficiency in geometry, trigonometry and calculus as well as understanding fundamental surveying techniques.

3. Objective of the Syllabus:

Understand and able to setting out curves, use of tachometry for traversing and contouring, plane

Table survey, photogrammetry, electronic distance measurement, total station and global positioning

System.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will be able to understand elements of circular curve, setting out curves by offset and theodolite compound curves, transition curves, vertical curve.

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CO2	Demonstrate the knowledge of Tachometric systems and principles, stadia system, uses of anallactic lens, tangential system, sub tense system, instrument constant, field work reduction, direct-reading tachometers, use of tachometry for traversing and contouring
CO3	Ability to understand plane table survey, Instruments and uses, Principle of surveying, Methods of plane table, closing errors and its adjustment, two-point problem and three-point problem Concept & definition of contour line; contour interval & horizontal equivalent; factors governing contour interval, characteristics of contours; Methods of contouring; Interpolation of contours; Use of contours maps.
CO4	Will be able to understand Principle, definitions and classifications of terrestrial and aerial photogrammetry, flight planning for aerial photography, scale and relief displacements of vertical aerial photographs, stereoscopic vision on vertical photographs, computation of position, length and elevations of objects using photographs and photo mosaic Definitions of astronomical terms coordinate systems for locating heavenly bodies.
CO5	Will be able to understand Digital levels and theodolite, Electronic Distance measurement (EDM), Total Station and Global Positioning Systems (GPS), Digital Planimeter.

5.Syllabus:

Unit I

Curves: - Classification and use; elements of circular curves, calculations, setting out curves by offsets and by theodolite, compound curves, reverse curves, transition curves, cubic spiral and lemniscates, vertical curves, setting out

Unit II

Tachometry: -Tachometric systems and principles, stadia system, uses of anallactic lens, tangential system, sub tense system, instrument constant, field work reduction, direct-reading tachometers, use of tachometry for traversing and contouring

Unit III

Plane table survey and Contouring- Introduction of plane table survey, Instruments and uses, Principle of surveying, Methods of plane tabling, closing errors and its adjustment, two-point problem and three-point problem Concept & definition of contour line; contour interval & horizontal equivalent; factors governing contour interval, characteristics of contours; Methods of contouring; Interpolation of contours; Use of contours maps.

Unit IV

Photogrammetry and Surveying Astronomy: - Principle, definitions and classifications of terrestrial and aerial photogrammetry, flight planning for aerial photography, scale and relief displacements of vertical aerial photographs, stereoscopic vision on vertical photographs, computation of position, length and elevations of objects using photographs and photo mosaic Definitions of astronomical terms coordinate systems for locating heavenly bodies.

Unit V

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Modern Equipment's for Surveying: - Digital levels and theodolite, Electronic Distance measurement (EDM), Total Station and Global Positioning Systems (GPS), Digital Planimeter.

BOOKS AND REFERENCES

Text Books

1. Advance surveying by R. Agor, Khanna publication.
2. Surveying vol -II by Dr. B.C. Punamia, Ashok k . Jain, Dr. Arun k. Jain.

Reference Books

1. Kanetkar, T.P. and Kulkarini, S.V., Surveying and Leveling-Part-I & II, Pune VidyarthiGriha Prakashan, Pune
2. Schofield, W. Engineering Surveying: Theory and Examination Problems for Students, Butterworth, Heinemann, Oxford.
3. Duggal, S.K. Surveying Vol. II, Tata McGraw Hill Publishing Company Ltd. New Delhi.
4. Lille sand T.M. and Kiefer R.W. Remote Sensing and image interpretation

ADVANCED SURVEYING LAB SUB-CODE: ETCE515 CREDIT: 1.5

Course Objective:

- To understand purpose and importance of surveying and method of surveying.
- Setting out curves, prepare drawing of field measurement by different methods.
- Understand working principle of EDM, Theodolite, Total stations etc.
- Measure distance, direction, elevation, area etc. by the use of modern equipment of surveying.

Course Outcomes:

At the end of the course the students are able to:

- Ability to setting out reverse curve, compound curve, vertical curves.
- Ability to drawing of field measurement by radiation method, resection method, intersection method, traversing.
- Ability to understand working principle of EDM.
- Ability to understand working principal of total station, digital planimeter.
- Ability to measure distance, direction, elevation, area etc. by the use of modern equipment of surveying.

Syllabus:

Week 1: Setting out of a simple curve.
Week 2: Setting out of a Compound curve.
Week 3: Prepare drawing of field measurements by radiation method in plane table survey.
Week 4: Prepare drawing of field measurements by intersection method.
Week 5: Prepare drawing of field measurements by resection method in plane table.
Week 6: Prepare drawing of field measurements by traversing.
Week 7: Study the working principle of EDM.

Week 8: Study the working principle of Total station.

Week 9: Study the working principle of digital Planimeter.

Week 10: Measure Distance, Direction, Elevation, Area etc. by the use of Modern Equipment's of Surveying

REFERENCE BOOKS:

1. Kanetkar, T.P. and Kulkarini, S.V., Surveying and Leveling-Part-I & II, Pune VidyarthiGriha Prakashan, Pune.
2. Schofield, W. Engineering Surveying: Theory and Examination Problems for Students, Butterworth, Heinemann, Oxford.
3. Surveying vol -II by Dr. B.C. Punamia, Ashok k. Jain, Dr. Arun k. jain.
4. Advance surveying by R. Agor, Khanna publication.

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SIXTH SEMESTER

Programme Structure	**B. Tech (Civil Engineering)**
Subject Code	**ETCE601**
Course Name	**STRUCTURAL ANALYSIS II**
Course Credits	**3 (T) 0(P)=3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course will introduce the core concepts of structural analysis of beam and frame structure by moment distribution method and kani's method. Matrix method of structural analysis. Analysis of indeterminate structure using influence line diagram. Analysis of tall frames and plastic theory.

2.Prerequisite: To analyze the beam and frames using MDM, kani's method, matrix method and using influence line diagram.

3.Objective of the Syllabus:

To develop an understanding of various types of structures and their built to facilitate the performance of

Various activities connected with residence, transportation, storage, healthcare etc. in the field of civil

Engineering.

4.Course Outcomes:

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S. No.	Course Outcomes (Cos)
CO1	To understand about Sway analysis of frames by Moment distribution method, analysis of beam and frame using kani's method.
CO2	To understand about Plastic analysis of beam and frames.
CO3	Analysis of tall frames, wind and earthquake loads, codal provisions, & Approximate analysis of multistory frames for vertical and lateral loads
CO4	To understand about matrix method of structural analysis.
CO5	To develop influence line diagram for indeterminate structure.

5.Syllabus:

Unit I

MDM With Sway & Kani's Method.: - Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

Unit II

Plastic Theory: - Plastic analysis of beams and frames.

Unit III

Analysis of Tall Structure: - Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

Unit IV

Matrix Method of Structural Analysis: - force method and displacement method

Unit V

ILD for Intermediate Structures: - Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam-Columns.

BOOKS AND REFERENCES

Text Books

1. A. Ghali & A.M. Neville Structural Analysis - A Unified classical and matrix Approach.
2. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
3. J. sterling Kinney Indeterminate structural Analysis, Addison Wesley.
4. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
5. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo

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Reference Books

1. Structural analysis II by S.S. Bhavikatti.
2. Theory of structure by G S Pandit, SP Gupta, R Gupta.
3. Theory of structure by S Ramamrutham , R. Narayan.

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Programme Structure	**B. Tech (CIVIL ENGINEERING)**
Semester	**6th**
Subject Code	**ETCE602**
Course Name	**Environmental Engineering-II**
Course Credits	**3 (L) + 1(T)= 4**
Total Course Credit	**172**

Abbreviations: L-Lecture, P-Practical, T- Tutorial

1.Course Overview:

To learn about the basic concepts of waste water production, conveying and their treatment before disposal. Determination of characteristics of waste water and their treatment. Know about Characteristics, generation, collection and transportation of solid wastes.

2.Prerequisite: The basic understanding of environmental terms which were used in Environmental engineering-I, and basic knowledge of chemistry labs.

3.Objective of the Syllabus:

This course Environmental Engineering-II is an essential part of Civil engineering education. These objectives aim to provide students with a comprehensive understanding of Sewage, sewerage system, and design of waste water treatment plant units, preparing them for further study or careers in fields such as Civil engineering, Environmental Engineer, Waste generation managements.

Learn the fundamentals of waste water characteristics, they can easily design the units of waste water treatment plants, its component's and its maintenance.

4.Course Outcomes:

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S. No.	Course Outcomes (Cos)
CO1	Understands the objectives of Sewerage schemes and their importance, Collection & conveyance of sewage, Design of sewer, Construction & maintenance of sewer.
CO2	Know about Characteristics and analysis of waste water, Physical, chemical & biological parameters, Oxygen demand i.e. BOD & COD, Natural methods of waste water disposal, Cycles of decomposition, Self-purification of stream.
CO3	Understanding about Waste water Unit operations & process, Treatments, Screens, grit chamber, floatation tank, Skimming tank, theory & design.
CO4	Understanding about biological treatments of waste water, Types, Significance, Activated Sludge process, Sources & treatment of sludge, sludge disposal.
CO5	Know about Municipal Solid Wastes Characteristics, generation, collection and transportation, engineered systems for solid waste management.

5.Syllabus:

MODULE-I Sewage & Sewerage System: - Sewerage schemes and their importance, Collection & conveyance of sewage, Storm water quantity, Fluctuation in sewage flow, Flow through sewer, Design of sewer, Construction & maintenance of sewer, Sewer appurtenances, pumps & pumping stations.

MODULE II Characteristics of Waste Water& Disposal Standard: - Characteristics and analysis of waste water, Physical, chemical & biological parameters, Oxygen demand i.e. BOD & COD, TOC, TOD, ThOD, Relative Stability, population equivalent, Natural methods of waste water disposal i.e. by land treatment & by dilution, Cycles of decomposition, Self-purification of stream, Oxygen sag analysis.

MODULE –III Waste Water Treatment: - Unit operations & process, Preliminary treatment, Primary treatment, Secondary treatment, Tertiary treatment, Screens, grit chamber, floatation tank, Skimming tank, Detritus tank, Sedimentation and chemical clarification, theory & design.

MODULE –IV Biological Treatment: - Introduction, Types, Significance, Activated Sludge process, Oxidation ditch, Stabilization ponds, Aerated lagoon, Anaerobic lagoons, septic tank & imhoff tank, UASB, Sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.

MODULE –V Municipal Solid Wastes: -Characteristics, generation, collection and transportation of solid Wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

BOOKS AND REFERENCES:

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1. Garg S.K., Environmental Engineering (Vol II), Sewage Disposal & Air Pollution Engineering, Khanna Publishers, New Delhi.
2. Punmia B.C Waste Water Engineering Laxmi Publications (P) Ltd. New Delhi
3. Peavy H.S, Rowe D.R. and Tchobanoglous G, Environmental Engineering, Tata McGraw Hills, New Delhi.
4. Hammer Mark J, Water & Waste Water Technology, Prentice - Hall of India, New Delhi
5. Metcalf & Eddy, Waste Water Engineering, McGraw Hill Book Company New Delhi

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE603**
Course Name	**Steel Structure Design-I**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

The course on Steel Structure Design -I has been so designed that the students will understand the basic knowledge of steel structures. The subject covers all the necessary components such as material specifications, connections and elementary design of structural members for designing steel structures. Knowledge of this subject will be applied in the design of Steel Connections, Tension Members Compression Members, Beams, Girders and Plastic analysis of Beams and Frames etc. The concepts of this course are applicable in all civil engineering structures.

2.Prerequisite: Student should have knowledge of fundamentals of Structural Analysis, Theory of simple bending and Mechanics of Solids.

3.Objective of the Syllabus:

The objective of this course is to introduce students to the fundamental design process of steel as a structural member. The emphasis is on the general theory and performance of structural steel, as well as design and analysis of structural members subjected to various

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loading conditions based on the current design code. The course will explore the behavior and design of structural steel members including tension members, compression members, flexural members, connections, and beam-columns. To provide necessary context, the course will also investigate structural steel material, design methodologies and the loading on steel buildings.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand material behavior, recognize various design philosophies in Steel structures and use limit state concepts to design general and eccentric connections in steel structures.
CO2	Use limit state method to design tension members, compression members with battened and laced column and base plates.
CO3	Utilize plastic theory and limit state method to design steel beams, welded plate girder and gantry girder.
CO4	Design built-up column and column base systems as per IS: 800-2007.
CO5	Apply fundamental mechanics to the design of roof trusses, purlins and transmission tower including determination strength under various loading conditions.

5.Syllabus:

Unit I Connections
Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, Design of structural connections -Bolted, Riveted and Welded connections.

Unit II Design of Compression & Tension Members
Design of compression members, Tension members, Roof Trusses - Angular & Tubular, Lattice Girders.

Unit III Design of Flexural members
Design of simple beams, Built-up beams, Plate girders and gantry girders.

Unit IV Design of Column & Foundation
Effective length of columns, Design of columns-simple and compound, Lacings & battens, Design of footings for steel structures, Grillage foundation.

Unit V Design of Industrial Shed & Transmission Towers
Design of Industrial building frames, multistory frames, Bracings for high rise structures, Design of transmission towers.

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NOTE: -All the designs for strength and serviceability should strictly be as per the latest version of IS:800 (2007).

BOOKS AND REFERENCES

Text Books

1. Limit State Design of Steel Structures, SK Duggal, Third Edition, Tata Mac-Graw-Hill Publication-2010.
2. Limit-State-Design of Steel Structures by N. Subramanium, Second Edition, Oxford University Press-2016.

Reference Books

1. Ramchandra and Gehlot, "Limit State Design of Steel Structures, Second Edition, Scientific Publishers, 2018.
2. Dayaratnam P, "Design of Steel Structures, Second Edition S. Chand & Co., 2003.
3. Arya and Ajmani, "Design of Steel Structures", Third Edition, Nem Chand Brothers, 2007.
4. S. S. Bhavikatti, Design of Steel Structures by Limit State Methods as Per IS 800-2007, I &
   K. International,2012.
5. Duggal S.K. "Design of Steel Structures, Third Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
6. I.S.800:2007," Code for general construction in steel structures," Bureau of Indian Standards, Manak Bhavan,9, Bahadur Shah Zafar Marg, New Delhi.
7. I.S.875 (part I to part V)," Code of Practice For. Design Loads," Bureau of Indian Standards, Manak Bhavan,9, Bahadur Shah Zafar Marg, New Delhi.
8. I.S.808:1989," Code for Classification of Hot Rolled Steel," Bureau of Indian Standards, Manak Bhavan,9, Bahadur Shah Zafar Marg, New Delhi.

STEEL STRUCTURE DESIGN -I LAB

SUB-CODE: ETCE613 **CREDIT: 1.5**

Course Objective:

- To develop an appreciation for understanding the essence of structure design and drawing, and its
  importance in Civil Engineering.
- Identify and compute the design loads on various structural steel systems.
- Apply principles and relevant codal provisions for the analysis and design of various structural steel systems.
- Prepare detailed structural drawings for any given design.

Course Outcomes:

At the end of the course the students are able to:

- Comprehend the basic steel design and detailing bolted and welded connections.

- Analyze, design and make detailing of tension members and lug angles as per latest codes of practice IS 800.
- Analyze, design and create detailing of laced/battened columns column, slab bases and footings.
- Identify behavior of beam in flexure and detailing laterally supported and unsupported steel beams

Syllabus:

Week 1: Sketch the layout of different types of Rivet connections.
Week 2: Draw the neat sketch of staggered joints and show pitch, gauge and edge distance for riveted and bolted connection.
Week 3: Draw the layout of different types of welded connections with eccentric connections.
Week 4: Draw the neat sketch of column made by angle section with necessary arrangement of lacing and battening.
Week 5: Draw the neat sketch of column made by channel section with necessary arrangement of lacing and battening.
Week 6: Draw the plan and elevation of Gusset base.
Week 7: Draw the plan and elevation of slab base.
Week 8: Draw the plan and elevation of Grillage foundation.
Week 9: Determine the sectional properties and sketch the detailing of a welded plate girder.
Week 10: Determine the sectional properties and sketch the detailing of a gantry girder.
Week 11: Draw sketches of the plan and longitudinal section of roof truss system (A typical structural drawing may be adopted.)
Week 12: Draw sketches of the plan and elevation of different types of transmission tower.

REFERENCE BOOKS:

1. Limit State Design of Steel Structures, SK Duggal, Third Edition, Tata Mac-Graw-Hill Publication-2010.
2. Ramchandra and Gehlot, "Limit State Design of Steel Structures, Second Edition, Scientific Publishers, 2018.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE604**
Course Name	**Water Resource & Irrigation Engineering**
Course Credits	**3 (T)+1.5(P) = 4.5**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course on water resources and irrigation engineering typically covers the principles and practices of water resources engineering as they apply to the study of water movement, distribution, and management in natural and engineered systems.

2.Prerequisite: Understanding of the basic of mathematics, physics, data analysis etc.

3.Objective of the Syllabus:

This course water resources and irrigation engineering is an essential part of any Civil engineering education. The objective of water resources and irrigation engineering course in civil engineering is to provide students to gain a comprehensive understanding of the principles, processes, and management of water resources, including surface water,

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groundwater, and their interactions. Develop skills in analyzing hydrologic data and assessing water availability, including techniques for estimating rainfall, runoff, and groundwater recharge.

Learn about the design, operation, and management of irrigation systems for agricultural, residential, and industrial purposes, including surface irrigation, sprinkler irrigation, and drip irrigation.

Overall, the goal of water resources and irrigation engineering is to equip students with the knowledge, skills, and tools necessary to address complex water-related challenges and contribute to the sustainable management of water resources for societal benefit. Additionally, there may be a focus on environmental considerations, sustainability, and the role of engineers in managing water resources responsibly.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will understand the fundamental concepts of hydrology and its significance in engineering applications. Understand precipitation formation, different types of precipitation; calculate average rainfall intensity, depth-duration-frequency relationships, and rainfall losses
CO2	Will understand evaporation, transpiration, interception, and infiltration processes. Calculate potential evapotranspiration using empirical and analytical methods.
CO3	Will understand runoff and its components, factors influencing runoff generation, estimate runoff using empirical and analytical methods. Analyze hydrographs to interpret watershed response to precipitation events, for flood forecasting and flood management.
CO4	Will understand the energy dissipation principles in hydraulic engineering. Importance of energy dissipaters in hydraulic structures for preventing erosion, scour, and other hydraulic problems.
CO5	Will understand floods and their causes and characteristics, discuss flood frequency analysis and flood risk assessment techniques, flood magnitudes and probabilities using probability distributions.

5.Syllabus:

MODULE-I Introduction: -Hydrologic cycle and processes, Precipitation, Infiltration and Evapotranspiration, Forms of precipitation, measurement, analysis, depth-area-duration and intensity-duration frequency relations.

MODULE-II Evaporation: -Process, Measurement and estimation, Infiltration process, Measurement and estimation, Evapotranspiration measurement and estimation, Stream flow measurements.

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MODULE-III Runoff and Hydrographs: - Factors affecting flow hydrograph, Rainfall Runoff correlations, Flow duration curve, Mass curve, Unit hydrograph, its analysis and S-curve hydrograph, Synthetic and instantaneous Unit hydrographs.

MODULE-IV Energy Dissipators: - Principles of energy dissipation Energy dissipators based on tail water rating curve and jump height curves, Spillway crest gates - vertical lift and radial gates, their design principles, Design of canal regulating structures, Design of Channel transitions, Design of Sarda type Falls, Design of cross drainage works viz Syphon aqueduct and Canal syphon. **9**

MODULE-V Channel, Groundwater hydrology & **Flood Routing**: - time series analysis of droughts and floods, flow equations confined and unconfined flow, Well hydraulics Steady and unsteady flow, Well losses, Specific capacity.

BOOKS AND REFERENCES

Text books/References:

1. Subramanya, K, Engineering Hydrology, Tata McGraw Hill Pub., New Delhi.
2. Chow,V.T, Applied Hydrology, McGraw Hill International, New York.
3. Singh, V.P. Elementary Hydrology, Prentice Hall.
4. Raghunath, H.M., Groundwater, Wiley Easter Ltd.
5. Todd, D.K., Groundwater Hydrology, John Wiley and sons.

WATER RESOURCE & IRRIGATION ENGINEERING LAB SUB-CODE: ETCE604 CREDIT: 1.5

Course Objective:

- Analyze precipitation data to determine average rainfall, intensity, and frequency.
- Understand methods for estimating losses, such as the Soil Conservation Service Curve Number method.
- Calculate runoff hydrographs and understand factors influencing runoff generation.

Course Outcomes:

At the end of the course the students are able to learn:

- Used various techniques for measuring precipitation, including rain gauges and weather radar.
- Measure and analyze runoff from different surfaces using methods like the SCS-CN method.
- Understand stream flow characteristics and calculate stream flow parameters.

Syllabus:

Week 1: Rainfall measurement by rain-gauge.

Week 2: Evaporation loss test by evaporimeter.

Week 3: Stream flow measurement.

Week 4: Practice on Khosla theory.

Week 5: Problem on uplift pressure calculation using Bligh theory.

Week 6: Practice on energy curve.

Week 7: Study of evapotranspiration.

Week 8: Study the principle of different rain gauge.

Week 9: Study about cross drainage work in canal.

Week 10: Study about different irrigation loss.

REFERENCE BOOKS:

1.Subramanya, K, Engineering Hydrology, Tata McGraw Hill Pub., New Delhi.
2.Todd, D.K., Groundwater Hydrology, John Wiley and sons.

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Programme Structure	**B. Tech (CIVIL ENGINEERING)**
Semester	**6th**
Subject Code	**ETCE605**
Course Name	**Highway Engineering**
Course Credits	**3 (L) + 1.5(P)= 4.5**
Total Course Credit	**172**

Abbreviations: L-Lecture, P-Practical

1.Course Overview:

To learn about the basic concepts of geometric design of highway, monitoring and maintenance of road pavements, operations and design of road junction, Conduct experiments on materials for highway engineering.

2.Prerequisite: To understand about application of fundamental concepts of mathematics and laws of mechanics.

3.Objective of the Syllabus:

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This course Highway Engineering is an essential part of Civil engineering education. These objectives aim to provide students with a comprehensive understanding of construction and design of highway pavements and its maintenance, preparing them for further study or careers in fields such as Civil engineering, Highway design Engineer, Bridge engineer etc.
Learn the fundamentals of highway pavements and equipment's used for its construction, they can easily design the roads pavements its component's and its maintenance.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understands the objectives of Highway Planning, Alignment & Geometric Design and different term related to it.
CO2	Know about Properties of sub-grade and pavement component material, Tests on stone aggregate and bituminous materials, Construction of Earthwork, WBM, GSB, WMM etc.
CO3	Understanding about Traffic characteristics, road user & vehicular characteristics, PCU, peak hour factor, parking study, Accident study and analysis, Traffic operations, traffic control devices, Signal design, Highway lightening.
CO4	Understanding about rigid pavements, Design factors for flexible and rigid pavements, Group Index and CBR methods for flexible pavement design,
CO5	Know about Airport planning and Airport layout, runway orientation, Wind Rose diagram, Airport classification & Lightning System, Geometric design, Airport capacity.

5.Syllabus:

MODULE-I Highway Planning, Alignment & Geometric Design:-Importance & modes of Transportation, Brief history of highway developments, Scope of Highway Engineering, Classification roads and road patterns, Highway Planning & survey, Importance to Geometric Design, Right of way; Width of formation Width of pavement; Number of Traffic Lanes; Camber; Gradient, Design speed, Sight distance, Super elevation, Design of super elevation, Methods of providing super elevation, Extra widening at curves, Set Back Distance, Design of horizontal curves, Design of vertical curves.

MODULE-II Highway Material and Construction: - Properties of sub-grade and pavement component material, Tests on stone aggregate and bituminous materials, Construction of various layers, Earthwork, WBM, GSB, WMM, various types of bituminous layers, Interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance, joints in rigid pavements.

MODULE-III Traffic Engineering: - Traffic characteristics, road user & vehicular characteristics,

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Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, Accident study and analysis, statistical analysis of traffic data, Traffic operations, traffic control devices, Signal design, Highway lightening, Types of intersections and channelization, Highway capacity and level of service of rural highways and urban roads.

MODULE IV Design of Highway Pavements: -Introduction of pavement, Advantages and disadvantages of rigid pavements, Design factors for flexible and rigid pavements, Group Index and CBR methods for flexible pavement design, Analysis of wheel load stresses in rigid pavement, Westergaard's method for design of rigid pavement.

MODULE –V Airport Engineering: - Airport planning and Airport layout- runway orientation, Wind Rose diagram, Basic runway length, corrections for runway length, Airport classification & Lightning System, Geometric design, Airport capacity, Aircraft parking systems.

BOOKS AND REFERENCES:

1. Khanna, S.K. and Justo, C.E.G., "Highway Engineering", Nem Chand & Bros.
2. Kadiyali, L.R., "Traffic Engineering and Transportation Planning", Khanna Publishers.
3. Sharma, S.K., "Principles and Design of Highway Engineering", S. Chand & Co.
4. Khanna, S.K. &Arora, M. G. "Airport Planning and Design", Nemi Chand &Bros.Roorkee, India.
5. Papacostas, C.S. and Prevedouros, P.D., "Transportation Engineering and Planning", Prentice Hall.

HIGHWAY ENGINEERING LAB

SUB-CODE: ETCE615 **CREDIT: 1.5**

Course Objective:

- To be know about basic highway pavements terms.
- Investigate the characteristics and applications of various types of pavement's materials and their tests.
- Gain experience through laboratory experiments, design of small projects to reinforce theoretical concepts and develop practical skills.

Course Outcomes:

At the end of the course the students are able to:

- Ability to implement the design concept on highway geometric design, materials used and their testing.
- Ability to design and develop practical skills.
- Ability to simulate and implement Gain experience through laboratory experiments, and design of small projects.

Syllabus:

List of Experiment: -

Week 1: - To determine the specific gravity and water absorption of the given aggregate.
Week 2: - To determine aggregate impact value of given aggregate.
Week 3: - To determine the Deval attrition value.
Week 4: - To determine Los Angeles abrasion value of the aggregate.
Week 5: - To determine flakiness index of a given aggregates sample.
Week 6: - To determine elongation index of given aggregate sample.
Week 7: - To determine grade of given bitumen by penetration test.
Week 8: - To determine ductility of the given bitumen.
Week 9: - To find out optimum bitumen content of given mix by marshall stability test.
Week 10: - To determine softening point of a given bitumen sample.
Week 11: - To determine the viscosity value of the given bitumen sample.
Week 12: - To determine the stripping value of aggregates by static immersion method.
Week 13: - To determine the crushing strength of road aggregates

REFERENCE BOOKS:

1 Khanna, S.K. and Justo, C.E.G., "Highway Engineering", Nem Chand & Bros.
2. Kadiyali, L.R., "Traffic Engineering and Transportation Planning", Khanna Publishers.
3. Sharma, S.K., "Principles and Design of Highway Engineering", S. Chand & Co.

Additional Learning Sources: -

Web links to e-learning: NPTEL.
Web links to e-learning: NCTEL

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SEVENTH SEMESTER

Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE701**
Course Name	**Reinforced Cement Concrete -II**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

It is an intensive course covering material aspects of concrete, specifications, analysis, and design of reinforced concrete (RC) components using the working and the limit state method. The focus will be given to the background and mechanics of the code provisions

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and their limitations. Particularly, the students will learn advanced topics related to the behaviour and design of reinforced concrete. The advanced topics include flexural behaviour of reinforced concrete, the behaviour and design of water tanks, silos, retaining walls, continuous beam and prestressed members. Special topics will also include the design of bridges, moment redistribution in continuous beams, and ductile detailing for earthquake resistant design.

2.Prerequisite: Student should have knowledge of fundamentals of Basic course on concrete technology and reinforced concrete Design.

3.Objective of the Syllabus:

The main objective of this course is to provide students with a rational basis of the design of reinforced concrete members and structures through advanced understanding of material and structural behavior. The subject will be approached by looking into the behavior of reinforced concrete at different levels: material level, element level and structural and systems level. To strengthen the basic fundamentals of design of RCC structures and to apply these basic fundamentals for the design of advanced reinforced concrete structures.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Ability to conduct the stability checks, dimensioning and designing of retaining wall with or without shear keys as per Indian Standard Guidelines.
CO2	Skill to select the type of water tank and perform designing based on demand capacity as per Indian Standard Guidelines.
CO3	To analyze & design the silo and bunkers under various loading conditions.
CO4	Ability to calculate the losses in pre-stress and plot the variation of stress across cross section in pre tensioned and post tensioned concrete.
CO5	Apply fundamental mechanics to the design of reinforced concrete continuous beam and bridges with emphasis on ductile detailing.

5.Syllabus:

Unit I Earth Retaining Structures

Introduction of retaining wall and its types, Stability of retaining wall, Design of cantilever retaining wall, Design of counter fort types retaining walls.

Unit II Water Tanks

Introduction of Water tank and its types, Design criteria for water tank, Design of water tank

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resting on the ground, Design of elevated water tank, Design of underground water tank, Design of INTZ water tank.

Unit III Silos and Bunkers
Introduction of Bins and its types, Design criteria for bunker and silo, Design of Bunker, Design of Silo.

Unit IV Prestressed Concrete
Introduction of prestressed concrete, Prestressing concepts materials, Systems of prestressing, Analysis of beam sections at transfer and service loads, Losses of prestressing.

Unit V Design of Continuous Beam, Multistory Buildings & Bridge
Design of continuous beam and building frame, Moment redistribution, Detailing of earthquake resistant construction, Ductility criterion, T-beam & Slab bridges- for highway loading (IRC Loads).

NOTE: -All the designs for strength and serviceability should strictly be as per the latest version of IS:456. Use of SP-16 (Design aids).

BOOKS AND REFERENCES

Text Books

1. Jain, A.K., Reinforced Concrete: Limit State Design, Seventh edition, Nem Chand & Brothers-Roorkee, 2012.
2. Raju N.K., Reinforced Concrete Design IS 456 – 2000 Principles & Practice, Fourth edition New Age International Publishers, New Delhi, 2019.

Reference Books

1. Sinha, Reinforced Concrete Design, McGraw Hill Education; Third edition, 2017.
2. Karve & Shah, Design of R.C.C. Structures, Assorted Editorial; 8th edition 2017.
3. Punmia B.C., Limit State Design of Reinforced Concrete, Laxmi Publication (P), Delhi, 2007.
4. H. J. Shah, Reinforced concrete, Vol.1 & 2, Charotar publishing house Pvt. Ltd, 2011.
5. Design of Reinforced Concrete Foundations by P. C Varghese, PHI Learning Private Limited., New Delhi,2008.
5. IS 456 (2000): Code of Practice of Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.
6. IS:1893-2016 (Part-1). Criteria for earthquake resistant design of structures: general provisions and buildings.
7. IS:13920-2016. Ductile detailing of reinforced concrete structures subjected to seismic forces — code of practice.

REINFORCED CEMENT CONCRETE -II LAB

SUB-CODE: ETCE711 **CREDIT: 2**

Course Objective:

- The engineer should provide detailed arrangements of the structural members which may include plans, sections and elevations.
- By the process of structural detailing one can show all the structural elements in detail. All of these elements must be given a member size, orientation and design of their respective end connections.
- To apply basic skills acquired in Civil Engineering in the design of structural components as part of Building Design and Drawing.
- To develop capabilities for design of structural plans for the benefit of the community.
- To apply the collection of sectional requirements to detailing and prepare the bar bending schedule of different RCC structural members.

Course Outcomes:

At the end of the course the students are able to:

- Ability to design advance structural elements, make changes in design depending upon availability of materials (bars of different diameters).
- Ability to read and interpret structural drawings of different elements.
- Ability to deal with elementary design principles as per BIS code of practice IS: 456 – 2000 and IS 13920 with their relevant drawings.

Syllabus:

Week 1: Details of reinforcement counterfort retaining walls with the given design data regarding the size.
Week 2: Details of reinforcement cantilever retaining walls with the given design data regarding the size.
Week 3: Design and detail of circular water tank.
Week 4: Design and detail of INTZ type water tank.
Week 5: Determine the sectional properties and sketch the detailing of a silo.
Week 6: Sketch the reinforcement details of a bunker and prepare bar bending schedule.
Week 7: Sketch different types of anchoring systems for Prestressed systems.
Week 9: Details of reinforcement for a RCC continuous beam with curtailment.
Week 10: Draw sketches of the plan and longitudinal section - bridges- T beam and slab bridge
showing all the details and dimensions.
Week 10: Draw sketches of the plan and longitudinal section of columns and beams as per IS 13920.

REFERENCE BOOKS:

1. Raju N.K., Reinforced Concrete Design IS 456 – 2000 Principles & Practice, Fourth edition New Age International Publishers, New Delhi, 2019.
2. Sinha, Reinforced Concrete Design, McGraw Hill Education; Third edition, 2017.
3. IS:13920-2016. Ductile detailing of reinforced concrete structures subjected to seismic forces — code of practice.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE702**
Course Name	**Design Of Hydraulic Structure**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

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1.Course Overview:

This course will introduce to basic understanding about designing and detailing of some typical irrigation structures. To understand the significance of efficient and proper design of irrigation works, Earthen canals, Lined Canals, Stable alluvial channel, Canal regulation structures, Cross drainage works, Diversion headwork, to understand the effect of uplift pressure in the design of hydraulic structures on permeable soils.

2.Prerequisite:

Designing hydraulic structures typically requires a solid understanding of fluid mechanics, hydrology, and structural engineering. Prerequisites may include courses in calculus, physics and engineering mechanics to grasp the principles governing fluid behavior and structural analysis. Additionally, knowledge of materials science, geotechnical engineering and environmental engineering may be beneficial depending on the specific type of hydraulic structure being designed.

3. Objective of the Syllabus:

Understand the importance of hydraulic structure, design criteria of dam, construction method and its

Failure criteria of dams, principal of energy dissipaters, design of canal fall, regulators, cross drainage

Work.

4. **Course Outcomes:**

S. No.	Course Outcomes (Cos)
CO1	Will be able to understand design criteria and forces acting on dams, stability analysis of dams.
CO2	To know about failure criteria of dam, construction method & Estimation of seepage through and below the dam, seepage control, Stability of slopes by slip circle method of analysis, Pore pressures, Sudden draw down, Steady seepage and construction pore pressure condition.
CO3	Ability to understand Ogee spillway and its design, details of syphon, Shaft, Chute and side channel spillways, Emergency spillways, Design of outlets and rating curves.
CO4	Will be able to understand Principles of energy dissipation Energy dissipaters based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles. Design of canal regulating structures, Design of Channel transitions, and Design of Sarda type Falls, and Design of cross drainage works viz Syphon aqueduct and Canal syphon
CO5	Will be able to understand Design of canal falls, Regulators, Cross drainage works, Introduction of Hydropower development, General features of hydro-electric schemes, Selection of turbines.

5.Syllabus:

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Unit I

Gravity Dams: Design Criteria, Forces acting on gravity dams, Elementary profile, Low and high gravity dams, Stability analysis, Practical profile, Evaluation of profile by method of zoning, Foundation treatment, Construction joints, Galleries in gravity dams

Unit II

Earth Dams: Types, causes of failure and design criteria, Soils suitability for earth dam construction, Construction methods, Foundation requirements, Typical earth dam sections, Estimation of seepage through and below the dam, seepage control, Stability of slopes by slip circle method of analysis, Pore pressures, Sudden draw down, Steady seepage and construction pore pressure condition.

Unit III

Spillways: Ogee spillway and its design, details of syphon, Shaft, Chute and side channel spillways, Emergency spillways, Design of outlets and rating curves.

Unit IV

Energy Dissipaters: Principles of energy dissipation Energy dissipaters based on tail water rating curve and jump height curves Spillway crest gates - vertical lift and radial gates, their design principles. Design of canal regulating structures, Design of Channel transitions, and Design of Sarda type Falls, and Design of cross drainage works viz Syphon aqueduct and Canal syphon

Unit V

Canal Structures and Hydropower Plants: Design of canal falls, Regulators, Cross drainage works, Introduction of Hydropower development, General features of hydro-electric schemes, Selection of turbines.

BOOKS AND REFERENCES

Text Books

1. S. K., “Garg Irrigation Eng. and Hydraulic Structures”
2. Punamia & Pandey B.B.Lal, Irrigation & Water Power Eng.

Reference Books

1. P.N. Modi, “Irrigation Water Resources and Water Power
2. Bharat Singh, “Irrigation Engineering”
3. S. K., “Garg Irrigation Eng. and Hydraulic Structures”
4 Punamia & Pandey B.B.Lal, Irrigation & Water Power Eng.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE703**
Course Name	**Foundation Engineering**
Course Credits	**3 (T) = 3**

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Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course describes the application of soil mechanics in the analysis and design of foundations (shallow and deep) and earth retaining structures. The course includes an overview of geotechnical site investigation methods and in situ tests used to estimate engineering parameters and emphasizes the importance of parameter selection in calculations of ultimate and serviceability limit state calculations for both shallow and deep foundations, and discusses methods of soil improvement. The section on earth retaining structures considers systems ranging from gravity walls to composite construction (reinforced earth), from structural support to field monitoring of excavations.

2.Prerequisite: Student should have knowledge of fundamentals of Soil mechanics, Applied mechanics and Engineering geology.

3.Objective of the Syllabus:

The objectives of the course are to introduce the theory and application of analysis and design of Shear Strength of Soils, slope stability analysis, shallow and deep foundations and machine foundations. To emphasize the importance of soil investigations including destructive and nondestructive methods. This course explains the significance of earth pressure theory in retaining structure design, the concept of bearing capacity, safe bearing capacity estimation, selection of suitable shallow foundation systems for site conditions, and analysis of pile and pile group under different soil conditions. It also discusses the need for piles and pile groups under different soil conditions.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Able to understand concept of theories of active and passive earth pressure for cohesive and cohesionless soil as backfill of retaining wall and able to check the stability of a retuning wall.
CO2	Able to determine the bearing capacity of soil using different test procedures and understand the causes of shear failure and Settlements.
CO3	Able to understand concept of pile and well foundation and their design methods and their field test.
CO4	Able to understand the different methods of penetration test and boring process and became well versed in sub soil exploration.
CO5	To understand the concept of special foundations considering theory of vibration

5.Syllabus:

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Unit I Lateral Earth Pressure

Earth Pressure, Earth Retaining Structures and Sheet Pile Walls, Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cohesionless and cohesive soils. Effect of surcharge, water table and wall friction. Arching in soils.

Unit II Shallow Foundations

Introduction, Type of foundations shallow and deep, bearing capacity of foundation on cohesion less and cohesive soils, General and local shear failures, Factors effecting Bearing capacity, Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on Bearing capacity, Total and differential settlements, Test for Bearing capacity.

Unit III Deep Foundation

Pile foundation, Types of piles, Estimation of individual and group capacity of piles in cohesion less and cohesive soils, Static and dynamic formulae, Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design, Piles under tension, inclined and lateral load Caissons, Well foundation. Equilibrium of wells, Analysis for stability tilts and shifts.

Unit IV Soil Improvement Techniques, Soil Exploration and Foundations on Expansive and Collapsible soils

Compaction, Factors affecting compaction, Lift thickness, Various equipment for field compaction and their suitability, Soil stabilization: Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilization and stabilization by grouting, Geo-synthetics, types, functions, materials and uses, Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams, Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils, CNS layer.

Unit V Sheet piles/Bulkheads and Machine Foundation

Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications, Modes of vibration, Mass-spring analogy, Natural frequency, Effect of vibration on soils, Vibration isolation, Criteria for design, Design of block foundation for impact type of machine.

BOOKS AND REFERENCES

Text Books

1. Murthy. V.N.S, "Textbook of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 1st Edition, 2009.
2. Garg, S.K., "Soil Mechanics and Foundation Engineering", Khanna Publishers, New Delhi, India, 2003.

Reference Books

1. Khan I. H., "A Text Book of Geotechnical Engineering", Prentice –Hall of India Pvt. Ltd., Delhi, India. 2nd Revised edition, 2005.

2. Arora, K. R., “Soil Mechanics and Foundation Engineering”, Standard Publishers, New Delhi, India. Standard Publisher Dist.,2009.
3. Punmia, B.C., “Soil Mechanics and Foundation Engineering”, Laxmi Publications Pvt. Ltd., New Delhi, 1995. Prentice Hall India Learning Private Limited, 2011.
4. Bowles. J.E, “Foundation analysis and design”, McGraw Hill, 5th Edition, 2001.
5. Gopal Ranjan and A.S.R.Rao, “Basic and Applied Soil Mechanics”, New Age International (P) Ltd, 2nd Edition (2005), New Delhi.

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETSH721**
Course Name	**ENGINEERING BIOLOGY**
Course Credits	**3 (T) +1(Tu)= 4**

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Total Course Credit	172

Abbreviations: T-Theory, P-Practical, Tu-Tutorial

1.Course Overview:

This course describes the application of Engineering Biology in the common subjects which all engineering students should know. The course includes an overview and classification based on different factors. Next course goes towards Genetics and Concept of Gene mapping, then Biomolecules, Enzymes, DNA, RNA and the last Identification and classification of microorganisms Microscopy which comes under Microbiology parts.

2.Prerequisite: Student should have knowledge of fundamentals Biology technical words used in up to school level.

2. **Objective of the Syllabus:**

The objectives of the course are to introduce the Engineering Biology. Chemistry, classification is not what biology is all about. The underlying criterion, such to convey that Biology is as important a scientific discipline as Mathematics, Physics and as morphological, biochemical or ecological be highlighted, "Genetics is to biology what Newton's laws are to Physical Sciences". Mendel's laws, Concept of segregation and independent assortment, all forms of life have the same building blocks and yet the manifestations are as diver e as one can imagine, Molecules of life, without catalysis life would not have existed on earth. The molecular basis of coding and decoding genetic information is universal.

3. **Course Outcomes:**

After studying the course, the student will be able to:

S. No.	Course Outcomes (Cos)
CO1	Describe how biological observations of 18th Century that lead to major discoveries. Convey that classification, highlight the underlying criteria, such as morphological, biochemical and ecological.
CO2	Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring Classify enzymes and distinguish between different mechanisms of enzyme action.
CO3	Identify DNA as a genetic material in the molecular basis of information transfer. Analyse biological processes at the reductionistic level.
CO4	Able to understand Apply thermodynamic principles to biological systems. Identify and classify microorganisms.

4. **Syllabus:**

Module 1: Introduction & Classification Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an

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independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor, these examples will highlight the fundamental importance of observations in any scientific inquiry.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) Energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E. coli, S. cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

Module 2: Genetics Concept of allele, Gene mapping, Gene interaction, Epistasis, Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring, Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes, Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module 3: Biomolecules & Enzymes In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins, Nucleotides and DNA/RNA, two carbon units and lipids

Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification, Mechanism of enzyme action, Discuss at least two examples. Enzyme kinetics and kinetic parameters, why should we know these parameters to understand biology? RNA catalysis

Module 4: Information Transfer Molecular basis of information transfer, DNA as a genetic material, Hierarchy of DNA structure- from single stranded to double helix to nucleosomes, Concept of genetic code, Universality and degeneracy of genetic code, Define gene in terms of complementation and recombination

Module 5: Microbiology Concept of single celled organisms, Concept of species and strains, Identification and classification of microorganisms Microscopy, Ecological aspects of single celled organisms, Sterilization and media compositions, Growth kinetics

Text books/References:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, “Biology: A global approach”, Pearson Education Ltd, 2014.

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2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, “Outlines of Biochemistry”, John Wiley and Sons, 2009.
3. D. L. Nelson and M. M. Cox, “Principles of Biochemistry”, W.H. Freeman and Company, 2012.
4. G. S. Stent and R. Calendar, “Molecular Genetics”, Freeman and company, 1978
5. L. M. Prescott, J. P. Harley and C. A. Klein, “Microbiology”, McGraw Hill Higher Education, 2005.

Programme Structure	B. Tech (Civil Engineering))
Subject Code	ETCE801
Course Name	Quantity Surveying and Costing
Course Credits	3 (T) + 1.5 (P)= 4.5
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course will introduce to basic understanding about estimation and valuations of civil engineering structure, preparation of rates of important items of work, current schedule rate, and earth work calculations for roads, culverts etc. Preparation of DPR.

2.Prerequisite:

To understand basics about costing and estimation, mode of measurement and valuation**.**

3. Objective of the Syllabus:

Understand and interpret civil engineering construction drawing. Prepare bill of quantity, bill of

Materials, and labour statement adhering to specification and construction drawing. Develop insight in

Tendering of new projects and related contract documents.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will be able to understand purpose and importance of estimates, type of estimates and mode of measurement.
CO2	Demonstrate the knowledge of preparation of rates of important items of work, current schedule rate and various factors involved in the rate of an item.
CO3	Ability to Earth work calculations for roads and estimating of culverts Services for building such as water supply, Drainage and electrification.
CO4	Will be able to understand Overhead charges, Contingencies and work charge establishment, various percentages for different services in building, Preparation of DPR.
CO5	Will be able to understand Methods of valuation, Rent fixation of buildings.

5.Syllabus:

Unit I

Introduction: - Purpose and importance of estimates, Principles of estimating, Methods of taking out quantities of items of work, Mode of measurement, measurement sheet and abstract sheet, Bill of quantities, Types of estimates, plinth area rate, cubical content rate,

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Preliminary, original, revised and supplementary estimates for different projects.

Unit II

Rate Analysis: -Task for average artisan, various factors involved in the rate of an item, material and labour requirement for various trades, Preparation for rates of important items of work, Current schedule of rates. (C.S.R.).

Unit III

Preparing detailed estimates of various types of buildings R.C.C. works, Earth work calculations for roads and estimating of culverts Services for building such as water supply, Drainage and electrification.

Unit IV

Cost of Works: -Factors affecting cost of work, Overhead charges, Contingencies and work charge establishment, various percentages for different services in building, Preparation of DPR.

Unit V

Purposes, depreciation, sinking fund, scrap value, Year's purchase, gross and net income, Dual rate interest, Methods of valuation, Rent fixation of buildings

BOOKS AND REFERENCES

Text Books

1. Dutta B.N., Quantity Surveying & Costing
2. Rangawala S.C., Estimating & Costing

Reference Books

1. Birdi G.S., Estimating & Costing for Civil Eng.
2. Chakraborty, Quantity surveying & costing
3. Dutta B.N., Quantity Surveying & Costing.
4. Rangawala S.C., Estimating & Costing.

QUANTITY SURVEYING AND COSTING LAB SUB-CODE: ETCE811 CREDIT: 1.5

Course Objective:

- To understand purpose and importance of estimates, type of estimates and mode of measurement.

- Preparation of rates of important items of work, current schedule rate and various factors involved in the rate of an item.
- Understand Methods of valuation, Rent fixation of buildings.
- Ability to Earth work calculations for roads and estimating of culverts Services for building such as water supply

Course Outcomes:

At the end of the course the students are able to:

- Ability to Earth work calculations for roads and estimating of culverts Services for building such as water supply, Drainage and electrification.
- Ability to valuation, Rent fixation of buildings.
- Ability to understand Overhead charges, Contingencies and work charge establishment.
- Ability to Preparation of DPR of Civil Engineering Project.
- Ability to detailed estimate for earth work for the road construction or arched culvert.

Syllabus:

Week 1: Preparation of detailed estimate

Week 2: Detailed estimate for services of plumbing and water supply or Electrification work.

Week 3: Detailed estimate for earth work for the road construction or arched culvert

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Week 4: Rate analysis for at least 8 items of construction

Week 5: Preparation of DPR of Civil Engineering Project

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REFERENCE BOOKS:

1. Dutta B.N., Quantity Surveying & Costing.
2. Rangawala S.C. Estimating & Costing.
3. Birdie G.S., Estimating & Costing for Civil Eng.
4. Chakraborty, Quantity surveying & costing.

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Programme Structure	B. Tech (Civil Engineering))
Subject Code	ETCE802
Course Name	Construction Planning and Management
Course Credits	3 (T) = 3
Total Course Credit	172

Abbreviations: T-Theory, P-Practical

1.Course Overview:

Project management skills are important for overall planning, coordination, and control of a project from commencement to accomplishment of the project efficiently and effectively. The awareness of various project management techniques is very essential to ensure that construction projects are completed within time and budget which is a biggest challenge. For this to achieve project management team has to manage various resources with the objective to complete the construction project with predetermine scope, cost, time and quality, and the constraints imposed on human material and financial resources. This course is therefore designed in such a way that after learning this course the students will be able to plan, organize and control construction operations by using various management techniques and software. Thus, students would be able to complete the project in time & budget and as per desired quality.

2.Prerequisite: Student should have knowledge of fundamentals of Materials of constructions, Estimation and rate analysis and Construction Technology.

3.Objective of the Syllabus:

The aim of this course is to provide students with a thorough understanding to manage various resources and activities, effectively and efficiently using appropriate techniques to complete the construction project within time and budget according to desired quality. This course also provides an understanding of construction management, including contracts, estimating, scheduling, subcontracting, cost control, claims, safety, quality and project closeout.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Plan and develop project organization for executing construction projects.
CO2	Analyze the equipment used for projects for hoisting, compacting and grouting of materials.

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CO3	Prepare work break down plan and estimate resources requirements for the preparation of tenders, their approval and sanction.
CO4	Recognise and understand how projects are evaluated, structured and delivered in terms of risk allocations and contractual obligations.
CO5	Learn construction project planning, scheduling, and control techniques, apply them in a real-world project, and demonstrate the learning process.

5.Syllabus:

Unit I Preliminary and Detailed Investigation Methods

Methods of construction, Form work and centering, Schedule of construction, Types of construction projects, Job layout, principles of construction management, Modern management techniques like CPM/PERT with network analysis.

Unit II Construction Equipments

Factors affecting selection, Investment and operating cost, Output of various equipments, Brief study of equipments required for various jobs such as earth work, Dredging, Conveyance, Concreting, Hoisting, Pile driving, Compaction and grouting.

Unit III Tenders & Contracts

Different types of Tenders & Contracts, Notice inviting tenders, Contract document, Departmental method of construction, Rate list, Security deposit and earnest money, Conditions of contract, Arbitration, administrative approval, technical sanction, Tendering and construction contracts.

Unit IV Specifications & Public Works Accounts

Importance, Types of specifications, Specifications for various trades of engineering works, Various forms used in construction works, Measurement book, Cash book, materials at site account, Imprest account, Tools and plants Various types of running bills, Secured advance, Final bill.

Unit V Site Organization & Systems Approach to Planning

Accommodation of site staff, Contractor's staff, Various organization charts and manuals, Personnel in construction, Welfare facilities, Labour laws and human relations, Safety engineering, Problem of equipment management, assignment model, Transportation model and waiting line modals with their applications, Shovel truck performance with waiting line method.

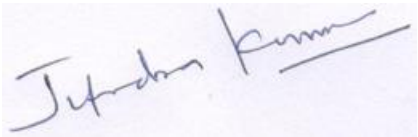
BOOKS AND REFERENCES

Text Books

1. Construction project scheduling and control. Mubarak, Saleh A, Third Edition, John Wiley & Sons, 2015.
2. Construction project management: Theory and practice. Jha, Kumar Neeraj, First Edition, Pearson Education India, 2011.
3. Chitkara.K. K, Construction Project Management: planning, Scheduling and control, Second Edition, Tata McGraw Hill Publishing Company, New Delhi, 1998.

Reference Books

1. Construction project scheduling. Callahan, Michael T., Daniel G. Quackenbush, and James E.
   Rowings, First Edition, McGraw-Hill 1992.
2. Construction project management. Clough, Richard H., Glenn A. Sears, and S. Keoki Sears, Fourth Edition, John Wiley & Sons, 2000.
3. Project management for engineering and construction. Oberlender, Garold D, First Edition McGraw-Hill Education, 2014.
4. Construction Project Management - Guidelines: Part 1 General, IS 15883 (Part 1), Bureau of
   Indian Standards, 2009.
5. Construction Project Management - Guidelines: Part 2 Time Management, IS 15883 (Part 2),
   Bureau of Indian Standards, 2013.



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Elective I

Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE821A**
Course Name	**Computational Methods in Structural Engineering**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course introduces students to various computational methods used in structural engineering. It emphasizes the application of computational techniques in analyzing and solving structural engineering problems. The course covers fundamental concepts of structural analysis, matrix methods, finite element methods, and their implementation in software tools. Students will gain practical experience in using computational methods to model and analyze structural systems.

2. **Prerequisite:**

Students should have a foundational understanding of engineering mechanics, calculus, and numerical methods. Proficiency in mathematical concepts such as linear algebra, differential equations, and numerical analysis is essential. Additionally, familiarity with programming languages such as MATLAB, Python, or similar is required, as the course will involve the implementation of computational methods for structural analysis and design.

3.Objective of the Syllabus:

The objective of the syllabus of course "Computational Methods in Structural Engineering" is to equip students with the necessary theoretical and practical knowledge to effectively utilize computational methods in the field of structural engineering. Throughout this course, students will delve into the fundamental principles of computational methods and their application in analyzing and designing structures. By the end of the course, students will be proficient in utilizing computational tools to model, analyze, and optimize various structural systems. Additionally, they will develop the skills to critically evaluate the results obtained from computational analyses and apply them to real-world structural engineering problems. Through a combination of theoretical instruction and hands-on

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exercises, students will gain a comprehensive understanding of how computational methods can enhance the efficiency, accuracy, and reliability of structural engineering practices.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will develop the Understanding of principle of virtual work and energy
CO2	Will develop the Understanding of Basics of the Direct Stiffness method
CO3	Will understand to learn the procedure for Concepts of Bandwidth, various storage schemes & equation
CO4	Will developed the understanding of Analysis of continuum structures
CO5	Will understand about the Two-Dimensional Iso parametric elements, shape functions for Simplex

5.Syllabus:

MODULE – I Matrix formulation for the principle of virtual work and energy principles:- Principle of contragradience, stiffness and flexibility matrices, Degree of Freedom, Axial, bending, shear and torsional deformations, Local and Global Element stiffness matrices for bar, beam, shaft, grid, shear wall, beam column, beam with rigid ends, beam on elastic foundation and elements with special boundary conditions, Non-prismatic and curved elements, forces and displacements in general coordinate axes, structure stiffness matrix.

MODULE- II -Basics of the Direct Stiffness method: - Analysis of pin jointed frames, rigid jointed structures, plane grids and composite structures for different loads including temperature, shrinkage, prestressing forces. Elastic stability analysis of 2-D rigid jointed frames, (Sway & Non sway)

MODULE- III Concepts of Bandwidth, various storage schemes & equation solvers: - Reduction in order of stiffness matrix - use of substructures, static condensation method, Exploiting symmetry, skew symmetry and cyclic symmetry in structures, Imposition of Constraints – Lagrange Multiplier and Penalty Methods.

MODULE- IV-Analysis of continuum structures: - Fundamental equations of theory of elasticity (2D), basic concepts of Finite Element Analysis, derivation of generalised element stiffness matrix and load vectors, convergence requirements, stiffness matrices for various elements using shape functions, Triangular and Rectangular elements. (PSPS)

MODULE- V-Two Dimensional Iso parametric elements, shape functions for Simplex: -Lagrangian and Serendipidity family elements in natural coordinates, computation of stiffness matrix for iso-parametric elements, degrading of elements, plate bending elements.

BOOKS AND REFERENCES

Text books/References:

1. Ghali A & Neville M., Structural Analysis - A Unified Classical and Matrix Approach, Chapman and Hall, New York.
2. Weaver William & Gere James M., Matrix Analysis of Framed structures, CBS Publishers and Distributors, New Delhi.
3. Cook R.D., Concepts and Applications of Finite Element Analysis, Wiley, New York.
4. Gallagher R., Finite Element Analysis Fundamentals, Prentice-Hall, Englewood Cliffs, NJ.
5. Rubenstein M.F., Matrix Computer Analysis of structures, Prentice Hall, Englewood Cliffs, N.J.
6. Zeinkiewicz O.C & Taylor R.L., The Finite Element Method, McGraw Hill, London

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Programme Structure	**B. Tech (Civil Engineering))**
Subject Code	**ETCE821B**
Course Name	**TRAFFIC ENGINEERING**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

A course in traffic engineering provides students with a comprehensive understanding of the principles, methodologies, and applications involved in the planning, design, operation, and management of traffic. The course delves into key concepts such as traffic flow theory, traffic analysis, and modeling techniques.

2. **Prerequisite:**

Some basics concept of mathematics (algebra, calculus, statics) and physics, concept of static, dynamics and kinematics.

3.Objective of the Syllabus:

The objective of traffic engineering course is to equip students with the knowledge and skills necessary to understand, analyze, and design transportation systems to effectively and safely accommodate the movement of people and goods. Through theoretical study, practical applications, and hands-on experiences, students will gain a deep understanding of

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traffic flow theory, traffic control devices, and transportation planning principles. The course aims to develop proficiency in traffic data collection and analysis techniques, including traffic volume counts, speed studies, and travel demand modeling. Additionally, students will learn about traffic signal design, intersection and roadway design principles, and traffic management strategies to optimize traffic flow and safety.

Students will develop the ability to evaluate transportation problems, propose solutions, and make informed decisions to improve the efficiency, safety, and sustainability of transportation systems. Overall, the course seeks to prepare students for careers in traffic engineering, transportation planning, and related fields, where they can contribute to the development of sustainable and efficient transportation infrastructure.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will understand the fundamental concepts of traffic engineering, scope and importance, historical development.
CO2	Will understand traffic studies, method of data collection, and analysis of traffic data, parking studies.
CO3	Will understand operate and control traffic system
CO4	Will understand the street lighting needs, design, method, concept of night vision.
CO5	Will understand major accident pattern and mass traffic movement like expressway.

5.Syllabus:

MODULE-I-Traffic Characteristics: - (i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. (ii) Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

MODULE –II-Traffic Studies: - (i)Spot Speed Studies and Volume Studies. (ii) Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. (iii) Origin and destination Studies (O& D): Various methods, collection and interpretation of data, planning and sampling. (iv) Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service. (v) Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

MODULE-III-Traffic Operations and Control: - (i) Traffic regulations and various means of control. (ii) One-way streets- advantages and limitations. (iii) Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals,

fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

MODULE-IV-Street Lighting: - (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.

MODULE-V-Accident Studies & Mass Transportation: - (i) Accident Studies: Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country. **9**

BOOKS AND REFERENCES

Text books/References:

1. Kadiyali, L.R. Traffic Engineering and Transport Planning.Khanna Publishers, Delhi.
2. Matson, Smith, W.S. andHurdF.W. Traffic Engineering.
3. Pingnataro, G.J. Principles of Traffic Engineering
4. Drew, D.R. Traffic Flaw Theory
5. MchsneW.R. and RoessR.P. Traffic Engg.
6. Wohl and Martin, Traffic System Analysis for Engineering & Planners.

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Programme Structure	**B. Tech (Civil Engineering)**
Subject Code	**ETCE821C**
Course Name	**Industrial Waste Treatment**
Course Credits	**3 (T) = 3**
Total Course Credit	**172**

Abbreviations: T-Theory, P-Practical

1.Course Overview:

This course on Industrial Waste Treatment provides a comprehensive overview of the principles and practices essential for managing and treating industrial waste effectively. Covering various aspects, the course delves into the types, sources, and characteristics of industrial waste. Students will learn about the environmental and health hazards posed by untreated industrial waste and explore sustainable methods for its treatment and disposal.

Emphasis is placed on understanding the relevant regulations, technologies, and best practices involved in treating industrial waste. Through case studies and practical examples, students will gain insights into real-world applications and develop the skills necessary for designing and implementing efficient industrial waste treatment systems. This course equips students with the knowledge and tools needed to address the challenges of industrial waste management and contribute to a cleaner, safer environment.

2. **Prerequisite:**

Students should have a foundational understanding of chemistry, environmental science, and engineering principles is necessary. Familiarity with basic chemical reactions, environmental regulations, and process engineering will provide a foundation for studying Industrial Waste Treatment. Additionally, knowledge of water and wastewater treatment processes is beneficial.

3.Objective of the Syllabus:

The objective of the syllabus of course Industrial Waste Treatment is to provide students with a comprehensive understanding of the principles, processes, and technologies involved in treating industrial waste. Through theoretical knowledge and practical applications, the syllabus aims to equip students with the skills necessary to identify, assess, and manage various types of industrial waste. Additionally, it seeks to cultivate an

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awareness of the environmental, economic, and social implications of industrial waste treatment, fostering a sense of responsibility towards sustainable and eco-friendly practices.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Will develop the Understanding of Problem of Water Pollution
CO2	Will develop the Understanding of Measurement of Waste Water Volume
CO3	Will understand to learn the procedure for Conventional Methods of Treatment of Waste Water
CO4	Will developed the understanding of Combined Treatment of Waste Water Sewage
CO5	Will understand about the Treatment Methods for Different Industries

5.Syllabus:

MODULE-I-Problem of Water Pollution: - Effects of wastes water on streams, land, sea and sewage treatment plant, Natural purification of streams, Oxygen sag curve, Allowable organic load on streams classification of stream, Stream standards and effluent standards, Requirement of water for different purposes.

MODULE-II-Measurement of Waste Water Volume: -Sampling of waste waters, grab and composite samples. analysis of waste water. Bio-chemical oxygen demand, chemical oxygen demand and pH value of waste, Toxicity of waste by bioassay method. Pretreatment of Wastes: Volume and strength reduction, Salvage of materials, Recovery of by products, Reuse of waste water.

MODULE-III-Conventional Methods of Treatment of Waste Water: -Removal of suspended solids, Removal of inorganic and organic dissolved solids, Sludge disposal, Advance methods of treatment: such as Reverse osmosis, Ion exchange, Electro-dialysis, Algal harvesting etc. Low-cost treatment plants, Common effluent treatment plant, Design and operation.

MODULE-IV Combined Treatment of Waste Water Sewage: - Energy requirement optimization and budget, Municipal regulation, Sewer rental charge, Instrumentation in waste water treatment plants, Collection of data, Operation and maintenance of plants, Water pollution control board.

MODULE- V-Treatment Methods for Different Industries: -Brief study of industrial processes and treatment methods of waste water from common industries, such as textile, dairy, paper and pulp, tannery, distillery, hazardous wastes- Impact handling and disposal.

BOOKS AND REFERENCES

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Text books/References:

1. Nemerow,N.L.Liquid Waste of Industries- Theories, Practice and Treatment.Wesley Publishing Co.
2. Besselievre E.B. and Max Schwartz, Treatment of Industrial Waste.McGraw Hill Book Company.
3. Metcalf & Eddy, Waste Water Engg. - Treatment Disposal & Reuse. Tata McGraw Will, New Delhi.
4. Arceivala,Waste Water Treatment. Tata McGraw Will, New Delhi

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Elective II

Programme Structure	**B. Tech (CIVIL ENGINEERING)**
Semester	**8th**
Subject Code	**ETCE822A**
Course Name	**Structural Dynamics & Earthquake Engineering**
Course Credits	**3 (L) = 3**
Total Course Credit	**172**

Abbreviations: L-Lecture, P-Practical

1.Course Overview:

To learn about the concepts of Structural Dynamics and Earthquake engineering, this is the advance of Structural mechanics and RCC design of structures in nowadays scenarios.

2.Prerequisite: To understand about application of fundamental concepts of mathematics, laws of mechanics, Structural Mechanics and Structural analysis.

3.Objective of the Syllabus:

This course Structural Dynamics and Earthquake engineering is an essential part of Civil engineering education. These objectives aim to provide students with a comprehensive understanding of construction and design of earthquake design structures and its maintenance, preparing them for further study or careers in fields such as Civil engineering, Structural Engineer, Bridge engineer etc.

4.Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understanding about Undamped and Damped, Response to Harmonic and periodic excitations.
CO2	Know about Numerical Evaluation of Dynamic Response, Time stepping methods, Analysis of Nonlinear Response, Introduction to frequency domain analysis.
CO3	Understanding about Elements of Seismology, seismographs Earthquake Response of structures - Nature of dynamic loading resulting from earthquake.

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CO4	Understanding about Multiple DOF Systems, free and forced vibrations-undamped and damped, Modal and Response
CO5	Know about Earthquake Resistant Design of Structures, Design of structures for strength & serviceability, Ductility and energy absorption.

5.Syllabus:

MODULE –I- Single DOF Systems: -Undamped and Damped, Response to Harmonic and periodic excitations, Response to Arbitrary, Step, Ramp and Pulse Excitations.

MODULE –II Numerical Evaluation of Dynamic Response: - Time stepping methods, methods based on Interpolation of Excitation, Newmark's and Wilson - q method, Analysis of Nonlinear Response, Introduction to frequency domain analysis.

MODULE –III Elements of Seismology: - Definitions of the basic terms related to earthquake (magnitude, intensity, epicenter, focus etc.), seismographs Earthquake Response of structures - Nature of dynamic loading resulting from earthquake, construction of Response spectrum for Elastic and Inelastic systems.

MODULE –IV Multiple DOF Systems: - Stiffness and Flexibility matrices for shear buildings, free and forced vibrations-undamped and damped, Modal and Response History Analysis, Systems with distributed mass & elasticity.

MODULE –V Earthquake Resistant Design of Structures: -Design of structures for strength & serviceability, Ductility and energy absorption, Provisions of IS: 1893 and IS: 4326 for aseismic design of structures, Code for ductile detailing IS: 13920.

BOOKS AND REFERENCES:

1. Chopra A.K., Dynamics of structures-Theory and Applications to Earthquake Engineering, Prentice Hall of India, New Delhi.
2. Berg G.V. Elements of Structural Dynamics, Prentice Hall of India, Englewood Cliffs, NJ
3. Paz Mario, Structural Dynamics, CBS Publishers, Delhi
4. Clough R.W. &Penzien J., Dynamics of structures McGraw Hill, New York.

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School of Engineering & Technology.
Department of Civil Engineering

Programme Structure	B. Tech (CIVIL ENGINEERING)
Semester	8th
Subject Code	ETCE822B
Course Name	PAVEMENT DESIGN
Course Credits	3 (L) = 3
Total Course Credit	172

Abbreviations: L-Lecture, P-Practical

1. **Course Overview:**
   To learn about the concepts of Pavement Design, this is the next part of traffic engineering in which design of flexible and rigid pavement and its maintenance is learnt. Evaluation and Strengthening of Existing Pavements is also covered in it.

2. Prerequisite:

There are no specific prerequisites for this course, although a basic understanding of math and mechanics is recommended. Familiarity with highway materials and components will also be beneficial.

3. Objective of the Syllabus:

This course Pavement Design is an essential part of Civil engineering education. These objectives aim to provide students with a comprehensive understanding of construction and design of pavements and its maintenance, preparing them for further study or careers in fields such as Civil engineering, Highway Engineer, etc.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understanding about Equivalent Single Wheels Load concepts and applications, Effect of load repetition, Effect of transient loads, Impact of moving loading.
CO2	Know about parts of the pavement structures and their functions, Stress distribution through various layers, group index method, CBR method, Burmister's method and North Dakota cone method.

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CO3	Understanding about Evaluation of subgrade, Modulus-K by plate bearing test and the test details, stress theory in rigid pavements, critical loading positions.
CO4	Understanding about Rigid Pavement Design, IRC method, AASHTO Method, Reliability analysis. Pavement Joints, filling and sealing of joints.
CO5	Know about Evaluation and Strengthening of Existing Pavements, Benkelman beam method, Rigid and flexible overlays and their design procedures.

5. Syllabus:

MODULE –I -Equivalent Single:- Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing.

MODULE –II Flexible Pavements: - Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory, Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

MODULE –III Rigid Pavements: -Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions

MODULE –IV Rigid Pavement Design: - IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis. Pavement Joints: Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

MODULE –V Evaluation and Strengthening of Existing Pavements: - Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Text books/References:

1. Principles of pavement design by E.J.Yoder& M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction

5. Srinivasan M. "Modern Permanent W

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Programme Structure	**B. Tech (CIVIL ENGINEERING)**
Semester	**8th**
Subject Code	**ETCE822C**
Course Name	**Air Quality Monitoring & Control**
Course Credits	**3 (L) = 3**
Total Course Credit	**172**

Abbreviations: L-Lecture, P-Practical

1 Course Overview:

To learn about the concepts of Air Quality monitoring and Control, this is the next part of Environmental engineering in which air pollutant, pollution and problems associated with air pollution is discussed. For measurement of air pollution and its controls is also included in it.

2. Prerequisite:

There are no specific prerequisites for this course, although a basic understanding of Chemistry and math is recommended. Familiar with air pollutant and its components will also be beneficial.

3. Objective of the Syllabus:

This course Air Quality monitoring and Control is an essential part of Civil engineering education. These objectives aim to provide students with a comprehensive understanding of Air pollution, effects and its control. Preparing them for further study or careers in fields such as Civil engineering, Environmental Engineer, etc.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)

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CO1	Understanding about Air Pollution Problem in Economics and social aspects, Sources of Air pollution, Effects of air pollution on health, animal, plants and materials.
CO2	Know about Natural Control of Air Pollution, Properties of typical air pollutants, air diffusion and concentration pollutants. Plums patterns and height of chimneys.
CO3	Understanding about Atmospheric chemistry, formation of secondary pollutants – PNN, PAN, PBN, Photolytic cycles, general diseases and toxicity of pollutants.
CO4	Understanding about Reduction and Control of Air Pollution, Sampling and Analyzing, design and operation of various air pollution control equipment's.
CO5	Know about Air pollution control legislation and Hygiene, Air pollution control legislation, public education pollution standards, Status of air pollution control.

5.Syllabus:

MODULE - I Air Pollution Problem: - Economics and social aspects, Historical episodes of air pollution, Sources of Air pollution, Effects of air pollution on health, animal, plants and materials.

MODULE - II Natural Control of Air Pollution: -Role of meteorological condition, Properties of typical air pollutants, air diffusion and concentration pollutants. General diseases caused by air pollutants, toxicity of various pollutants. Plums patterns and height of chimneys.

MODULE – III Atmospheric Chemistry: -Atmospheric chemistry, formation of secondary pollutants – PNN, PAN, PBN, Photolytic cycles, general diseases and toxicity of pollutants

MODULE – IV Reduction and Control of Air Pollution: -Sampling and Analyzing of Air Pollutants: Instruments pollution survey, standards of air pollution. Principle of air pollution control, site selection and zoning, various control methods, process and equipment changes, design and operation of various air pollution control equipments.

MODULE – V Air pollution control legislation and Hygiene: -Air pollution control legislation, public education pollution standards, Status of air pollution control in various countries, Industrial Hygiene: Concept and importance, factory Involved in environmental hazards, industrial ventilation occupational diseases, Control methods.

Text books/References:

1. Faith W.L, John Wiley & Sons,Air Pollution.

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2. McCabe L.C. Air Pollution. Mc. Graw Hill, International
3. Stern A.C. Air Pollution. Academic Press N. York
4. Raju, BSN,Fundamentals of Air Pollutions. Oxford & IBH Publishing Co. Pvt. Ltd.
5. Rao M.N. and Rao HVN, Air Pollution. Tata McGraw Hill
6. Wark and Warner,Air Pollution.

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Programme Structure	**B. Tech (CIVIL ENGINEERING)**
Semester	**8th**
Subject Code	**ETCE822D**
Course Name	**Advance Water Resources Engineering**
Course Credits	**3 (L) = 3**
Total Course Credit	**172**

Abbreviations: L-Lecture, P-Practical

2 Course Overview:

To learn about the concepts of Advance water resources engineering, this is the next part of engineering Hydrology in which Precipitation and its measurement, Flood Frequency Analysis, Risk Analysis, flood management, Reservoir Operation are studied.

2. Prerequisite:

There are no specific prerequisites for this course, although a basic understanding of hydrological terms and math is recommended.

3. Objective of the Syllabus:

This course Advance water resources engineering, is an essential part of Civil engineering education. These objectives aim to provide students with a comprehensive understanding of different water resources, its design and maintenance. Preparing them for further study or careers in fields such as Civil engineering, Hydraulics and hydrological Engineer, etc.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understanding about Precipitation and Measurement, Optimal Rain gauge Network Design, Depth Area-Duration Analysis, Flood Frequency Analysis, Risk Analysis.

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CO2	Know about Flood Management, Flood Routing through Reservoirs, Introduction to Stochastic Models in Hydrology like AR, ARMA, ARIMA etc.
CO3	Understanding about System Analysis, Need, Water Resources Systems, Optimization Techniques, Linear Programming, Use of LP in Water Resources.
CO4	Understanding about Dynamic Programming, Introduction, its utility in Resource Allocation and other Decision-Making Problems, Use of D. P. in Reservoir.
CO5	Know about Network Analysis, Network Methods, Project Optimality Analysis. Updating of Network, Utility in Decision Making.

5.Syllabus:

MODULE –I Precipitation and Measurement: -Optimal Rain gauge Network Design, Adjustment of Precipitation Data, Depth Area-Duration Analysis, Design Storm, Probable Maximum Precipitation, Probable Maximum Flood, Flood Frequency Analysis, Risk Analysis.

MODULE – II Flood: -Flood Management, Flood Routing through Reservoirs, Channels Routing Muskingum Method, Introduction to Stochastic Models in Hydrology like AR, ARMA, ARIMA etc. Concept of Correlogram.

MODULE – III System Analysis: - Need, Water Resources Systems, Optimization Techniques, Linear Programming, Feasible Solutions, Graphical Method, Simplex Method, Use of LP in Water Resources, Introduction to Reservoir Operation, Rule curves, Linear Decision Rule

MODULE – IV Dynamic Programming: - Introduction, its utility in Resource Allocation and other Decision-Making Problems, Optimal Operating, Policies, Use of D. P. in Reservoir, Operation.

MODULE –V Network Analysis: -Network Methods, Project Optimality Analysis. Updating of Network, Utility in Decision Making.

Text books/References:

1. Subramany K., Engg. Hydrology.
2. Philiphs&Ravindran, Operations Research
3. Hire D.S. & Gupta, Operation Research
4. Kottegoda N. T. Stochastic Water Resources Technology.
   Singh V.P. Elementary Hydrology

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