

**BACHELOR OF TECHNOLOGY**  
**(B. TECH.)**

**Civil Engineering**

**SYLLABUS**

Effective From  
2017-18

Department of Civil Engineering  
Faculty of Engineering & Technology  
Jamia Millia Islamia  
New Delhi-110025  
[www.jmi.ac.in](http://www.jmi.ac.in)

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## **Preface**

The revision of the curriculum is a continuous process. The program curriculum has been modified in consultations with all the stakeholders while keeping the vision and mission statements of the department as the guiding principle. The old curriculum is reviewed in the light of program objectives (POs) set forth by the NBA and Program Specific Objectives (PSOs) formulated by the department to identify the gaps and maintain the balance in the composition of basic and engineering sciences, humanities/ management, professional courses and their distributions in core and electives along with seminars/internships and projects. A broad framework was formed for distribution of courses for various specialisations in the light of Model Scheme of Instructions and Syllabi for UG Civil Engineering Degree proposed by AICTE New Delhi. The program curriculum of reputed institutes like IITs, NITs etc. were obtained and compared with our curriculum. The syllabi of Indian Engineering Services (IES) of UPSC and GATE were collected, and incorporated in the department curriculum. Feedback from stakeholders e.g. alumni, students, parents, industry and employers was obtained. Committees were formed and duties were assigned to faculty members to prepare the syllabi of each course for different specialisations such as structural engineering, hydraulics and water resources engineering, environmental engineering, geotechnical engineering, transportation engineering and geomatics. I wish to acknowledge the hard work put in by the faculty members and stakeholders in the updating and revision of curriculum. I also wish to convey my sincere thanks to the subject experts who gave their valuable inputs in finalizing this syllabus.

(Prof. Gauhar Mahmood)  
HOD, Civil Engineering

## **Department of Civil Engineering: A Brief Overview**

The department of Civil Engineering is one of the oldest and the largest department in the Faculty of Engineering & Technology. The department has produced several eminent engineers who have made important contributions in the planning and execution of many important civil engineering projects in India as well as abroad.

The department offers B. Tech. course in Civil Engineering. The department also offers Master's programme with specialisations in Environmental Engineering and Earthquake Engineering. These courses are supported with strong doctoral programmes in all the major specialisations of Civil Engineering. The department is known for its reputed faculty with expertise in diverse fields. Presently, the department has 22 highly qualified, experienced and dedicated faculty members, actively participating in research and consultancy work. The department has established a state of the art experimental facilities and laboratories in different fields of civil engineering. It has received the prestigious funding under FIST from DST and SAP from UGC.

The faculty also renders technical advice on live engineering problems to various government and private sector companies throughout the country. These live projects are effectively used as training desk for our students at undergraduate and postgraduate levels. RITES, Military Engineering Services, Municipal Corporations of Delhi, Faridabad, Gurgaon, Gaziabad, NOIDA, PWD, CPWD, DDA, HUDA, Jal Nigam etc. regularly hire services for technical advice and vetting of designs of infrastructure projects.

International and national conferences, seminars and special lectures are a regular feature of the department to impart education and training. The department has active collaboration with academics and industry such as University of Applied Sciences Erfurt (Germany), Wessex Institute (UK), University of Waterloo (Canada), Asian Institute of Technology (Bangkok) and Steel Authority of India (INDIA).

Leading MNCs and public sectors are regular recruiter of our students and many students have been selected in Engineering Services. Large numbers of students qualify the GATE examination with good ranks to go for higher studies. Several of our alumni pursued higher education in foreign countries like USA, UK, Germany, Canada, Australia and France and have been appointed as faculty members and consultants abroad. The department strongly believes in continuous efforts to strive for excellence by exploring new frontiers of knowledge, imparting the latest technical knowledge to the students and conducting high quality research. The department has formulated the curriculum for the B. Tech. program in consultation with various stake holders keeping in mind the current industry practices and future scenarios in civil engineering.

## **FACULTY OF ENGINEERING & TECHNOLOGY JAMIA MILLIA ISLAMIA, NEW DELHI**

### **VISION**

To become a leading engineering institute through knowledge creation, acquisition and dissemination for the benefit of society and industry.

### **MISSION**

1. To develop a center of excellence by imparting quality education to produce technically sound and research oriented professionals to face the emerging challenges of society and industry.
2. To enhance knowledge by innovative teaching, engaging in cutting edge research and developing linkage with industry.
3. To impart ethical, social and environmental values to produce competent engineers for the service of mankind.
4. To inculcate technological capabilities through continuous interaction with academia and industry in emerging areas for sustainable development.

## **DEPARTMENT OF CIVIL ENGINEERING**

### **VISION**

To emerge as center of excellence for education and research in Civil Engineering and to produce professionally competent and ethically sound engineers of global standards, ready to serve the community and the nation with dedication.

### **MISSION**

- M.1 To provide rigorous hands on civil engineering education through learner centric teaching pedagogy.
- M.2 Establish state-of-the art facilities for teaching and research in civil engineering domain.
- M.3 Motivate students to develop low-cost and sustainable ethical solutions to problems faced by the society.
- M.4 Provide opportunities to students to enable them to develop leadership and interpersonal skills.

### **Programme Educational Objectives (PEOs)**

The department of civil engineering in consultation with stake holders has formulated Programme Educational Objectives (PEOs) that are broad statements describing the career and professional accomplishment that the programme is preparing its graduates to achieve in few years, subsequent upon to receiving the degree. The PEOs of B. Tech. program in civil engineering are as follows:

1. Graduates shall apply professional skills for successful careers dealing with analysis, design and management of infrastructural projects, both in India and abroad.
2. Graduates shall use civil engineering concepts so as to formulate, analyse and solve civil engineering and allied problems using the principle of mathematics and science.
3. Graduates shall deliver a comprehensive and balanced understanding of several branches of civil engineering such as structural engineering, geotechnical engineering, transportation engineering, hydraulic and water resources engineering, environmental engineering and interdisciplinary areas.
4. Graduates shall demonstrate high ethical standards, effective oral and written communication skills, and ability to work as part of teams on multidisciplinary projects in diverse professional environments, and should be able to relate engineering issues to the society and nation.
5. Graduates shall acquire academic excellence, leadership and management skills, and engage in life-long learning to be successful in professional and entrepreneurial world.

### **Program Outcomes (POs)**

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

### **Program Specific Outcomes (PSOs)**

Upon successful completion of the Bachelor of Technology Program in Civil Engineering, the students should be able to:

PSO1: Analysis and design of foundations and superstructures for residential and commercial buildings using commercial software

PSO2: Design of hydraulic structures, highways, railways, airways, docks and harbors

PSO3: Design, test and evaluate water, sewerage and industrial effluent conveying and treatment systems

PSO4: Survey, map and plan layouts for buildings, roads, and hydraulic structures using modern tools such as the total station

## COURSE STRUCTURE

### B. Tech. (Civil)

#### Semester I

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
AS-101	Communication Skills	3	--	--	3	3
AS-151	Language Lab	--	--	2	2	1
AS-102	Engineering Physics - I	2	1	--	3	3
AS-152	Engineering Physics Lab. - I	--	--	2	2	1
AS-103	Engineering Chemistry - I	2	1	--	3	3
AS-153	Engineering Chemistry Lab. - I	--	--	2	2	1
AS-104	Engineering Maths - I	3	1	--	4	4
CE-101	Basics of Civil Engineering	2	1	--	3	3
ME-101	Basics of Mechanical Engineering	2	1	--	3	3
EE-101	Basics of Electrical Engineering	2	1	--	3	3
ME-151	Workshop Practice	--	--	4	4	2
ME-102	Engineering Mechanics Lab	--	--	2	2	1
<b>Total</b>		<b>16</b>	<b>6</b>	<b>12</b>	<b>34</b>	<b>28</b>

#### Semester II

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
AS-201	Human Resource Management	3	-	-	3	3
AS-202	Engineering Physics - II	2	1	--	3	3
AS-252	Physics Lab. - II	--	--	2	2	1
AS-203	Engineering Chemistry & Environmental Science	2	1	--	3	3
AS-253	Chemistry Lab. - II	--	--	2	2	1
AS-204	Engineering Maths. - II	3	1	--	4	4
AS-205	Innovative Technology & Biosciences	3	-	--	3	3
EC-201	Basics of Electronics and Comm.	2	1	--	3	3
CS-201	Fundamentals of Computing	2	1	--	3	3
ME-250	Engineering Graphics	--	--	4	4	2
<b>Total</b>		<b>17</b>	<b>5</b>	<b>8</b>	<b>30</b>	<b>26</b>



**Semester III**

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
CE-301	Solid Mechanics	2	1	0	3	3
CE-302	Fluid Mechanics	2	1	0	3	3
CE-303	Civil Engineering Materials	3	0	0	3	3
CE-304	Surveying	3	0	0	3	3
CE-305	Engineering Geology	3	0	0	3	3
AS-301	Engineering Maths III	3	1	0	4	4
CE-351	Solid Mechanics Lab	0	0	2	2	1
CE-352	Fluid Mechanics Lab	0	0	2	2	1
CE-353	Civil Engineering Materials Lab	0	0	2	2	1
CE-354	Surveying Lab	0	0	2	2	1
CE-355	Engineering Geology Lab	0	0	2	2	1
<b>Total</b>		<b>17</b>	<b>3</b>	<b>10</b>	<b>30</b>	<b>24</b>

**Semester IV**

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
CE-401	Structural Analysis I	2	1	0	3	3
CE-402	Hydraulics	2	1	0	3	3
CE-403	Building Construction	3	0	0	3	3
CE-404	Geomatics	2	1	0	3	3
CE-405	Estimating and Costing	3	0	0	3	3
CE-410	Numerical Analysis and Computer Programming	3	1	0	4	4
CE-451	Structural Analysis Lab	0	0	2	2	1
CE-452	Hydraulics Lab	0	0	2	2	1
CE-453	Civil Engineering Drawing	0	0	4	4	2
CE-454	Geomatics Lab	0	0	2	2	1
CE-460	Computer Lab	0	0	2	2	1
<b>Total</b>		<b>15</b>	<b>4</b>	<b>12</b>	<b>31</b>	<b>25</b>

**Semester V**

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
CE-501	Structural Analysis II	2	1	0	3	3
CE-502	Design of Structure I	3	0	0	3	3
CE-503	Design of Structure II	3	0	0	3	3
CE-504	Open Channel Flow	2	1	0	3	3
CE-505	Soil Mechanics	3	1	0	4	4
CE-506	Environmental Engineering I	2	1	0	3	3
CE-552	Design of Structure I Lab	0	0	2	2	1
CE-553	Design of Structure II Lab	0	0	2	2	1
CE-555	Soil Mechanics Lab	0	0	2	2	1
CE-556	Environmental Engineering Lab I	0	0	2	2	1
CE-557	Survey Camp	0	0	2	2	1
<b>Total</b>		<b>15</b>	<b>4</b>	<b>10</b>	<b>29</b>	<b>24</b>

**Semester VI**

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
CE-601	Structural Analysis III	2	1	0	3	3
CE-602	Design of Structure III	2	1	0	3	3
CE-603	Engineering Hydrology	2	1	0	3	3
CE-604	Geotechnical Engineering	2	1	0	3	3
CE-605	Environmental Engineering II	3	0	0	3	3
CE-606	Transportation Engineering I	3	0	0	3	3
CE-655	Environmental Engineering Lab II	0	0	2	2	1
CE-666	Transportation Engineering Lab	0	0	2	2	1
CE-667	Software Lab	0	0	2	2	1
<b>Total</b>		<b>14</b>	<b>4</b>	<b>6</b>	<b>24</b>	<b>21</b>

**Semester VII**

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
CE-701	Design of Structure IV	2	1	0	3	3
CE-702	Irrigation Engineering	3	0	0	3	3
CE-703	Foundation Engineering	3	0	0	3	3
CE-704	Engineering Economics & Construction Management	3	1	0	4	4
CE-705	Environmental Engineering III	2	1	0	3	3
CE-706	Transportation Engineering II	2	1	0	3	3
CE-751	Advance Structural Design Lab	0	0	2	2	1
CE-754	Cons Management Lab	0	0	2	2	1
CE-757	Summer Practical Training	0	0	2	2	1
CE-760	Project	0	0	8	8	4
<b>Total</b>		<b>15</b>	<b>4</b>	<b>14</b>	<b>33</b>	<b>26</b>

**Semester VIII**

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
CE-801	Elective-I	3	1	0	4	4
CE-802	Elective-II	2	1	0	3	3
CE-803	Elective-III	2	1	0	3	3
CE-850	Seminar	0	0	2	2	1
CE-860	Project	0	0	16	16	8
<b>Total</b>		<b>7</b>	<b>3</b>	<b>18</b>	<b>28</b>	<b>19</b>
<b>Grand Total</b>		<b>116</b>	<b>33</b>	<b>90</b>	<b>239</b>	<b>193</b>

**SEMESTER I**  
**COMMUNICATION SKILLS**  
**AS-101**

**L: 3 T: 0 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. Developing the concepts of communication skills/soft skills
2. Developing the syntactical concepts of grammar
3. Command over professional/technical writing skills
4. Developing a sense interpretation through literature and its social/political and ethical aspect
5. Proficiency in language handling/delivery through English phonetics and accent mechanism

**SYLLABUS**

**Unit-I: The Art of Communication**

English Communication, Technical, Verbal & Non-Verbal Communication, Barriers in Communication, The Art of Communication; Reading, Writing, Listening, Speaking and Strategies to overcome challenges in effective communication.

**Unit-II: Fundamentals of English Syntax**

Basics of Parts of Speech, Determiners, Use of tenses, Transformation of sentences, Active- Passive; Direct-Indirect; Simple-Compound-Complex sentences, Use of Prepositions, Discourse Markers, Subject Verb Concord, Use of Conjunctions, Use of Verbs.

**Unit-III: Writing**

Formal & informal letters, unmade communication and Demand Communication Note Making, Report writing, Book Reviews, Abstracts and Research Proposals, creative writing, Email correspondences, Résumé writing, Executive summary.

**Unit-IV: Word Vocabulary & Phonetics**

Word formation, foreign roots (Etymology), Suffix, Prefix, Antonyms, Synonyms, Homonyms, one word substitution, Idioms and Phrases, Acronyms, IPA Symbols, Vowels and Consonants, Place and Manner of Articulations, Phonetic transcription and Accentuation (theoretical insight).

**Unit-V: Literature**

**Poetry**

Where the Mind is Without Fear-  
Rabindranath Tagore  
The Express- Stephan Spender  
Amalkanti-Nirendranath Chkrabarti  
Road Not taken- Robert Frost

**Prose**

Of Studies- Francis Bacon,  
Vanishing Animals- Gerald Durrell  
Fitin : Old man and the Sea – E Hemmingnoy  
The Child- Munshi Premchand  
Soapnut Leaves- Chaaso

**Text Books:**

1. The Joy of Reading: Orient Blackswan Pvt. Ltd, New Delhi
2. Fluency in English: Macmillan Publishers, New Delhi
3. Intermediate Grammar Usage and Composition :M.L.Tikoo and Subramanian , Orient Blackswan Pvt. Ltd, New Delhi
4. A Text Book of English Phonetics for Indian Students: T. Balasubramanian, Macmillan Publishers, New Delhi.
5. Practical English Usage: Michael Swan, Oxford University Press.

**Suggested Reading:**

1. The Oxford Guide to effective Writing and Speaking Skills: John Seely, Oxford University Press
2. English Pronouncing Dictionary: Daniel Jones, Cambridge University Press.
3. Technical communication Principles and Practice: Meenakshi Raman and Sangeeta Sharma, Oxford.

## **ENGINEERING PHYSICS – I**

### **AS-102**

**L: 2 T: 1 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. Enhancing the concepts of conservative and non-conservative forces
2. Understanding the basics of optics and introduction to lasers including their applications in field
3. Expanding the concepts of electromagnetism and its various applications
4. Exploring the basics of quantum ideas: photoelectric effect, Compton effect, Planck's hypothesis etc.
5. Understanding the physics of solids.

**SYLLABUS****UNIT-1: Physics of Motion**

Inertial and non-inertial frames, conservation principles of momentum and energy; many particle systems, rocket motion, simple harmonic motion, damped harmonic motion.

**UNIT-II: Optics**

Two views about nature of light, concept of coherence, interference of light, single slit and N-slits diffraction, hydrogen atom spectrum, diffraction grating and spectral resolution.

**UNIT-III: Electromagnetism**

Cylindrical coordinates, Gradient, divergence and curl, line integral, surface integral and volume integral, Lorentz force, Gauss's law, Ampere's Law, Maxwell's equations, electromagnetic waves and Poynting vector.

**UNIT-IV: Quantum Ideas**

Difficulties of classical Physics, Planck hypothesis, wave particle duality, photoelectric effect, Compton effect, uncertainty principle and its implications, wave packets, group velocity and phase velocity, Davisson Germer experiment.

### **UNIT-V: Physics of Materials**

Classifications of materials, crystal structure, unit cell and lattice parameters, Miller indices, Bragg's law and X-ray diffraction, classical free electron theory, its success and failures, Wiedemann Franz law, Maxwell Boltzmann distribution.

#### **Text Books:**

1. Physics by Halliday and Resnick
2. Modern Physics by Mani Mehta
3. Modern Physics by Beiser

#### **Reference Books:**

1. Relativity by Resnick
2. Optics by Ghatak

## **ENGINEERING CHEMISTRY-I AS-103**

**L: 2 T: 1 P: 0 Cr: 3**

### **COURSE OUTCOMES**

1. Understanding the instrumental methods of analysis
2. Exploring the chemical methods and phase rule
3. Expanding the knowledge of electrochemistry and surfactants
4. Understanding the mechanism, classification, properties and applications of polymers
5. Understanding composites and nanomaterials

### **SYLLABUS**

#### **UNIT-1: Chemical And Instrumental Methods of Analysis**

Gravimetric Analysis; Digestion and its Importance, Favorable Conditions for Precipitation, Volumetric Methods of Analysis; Expression of concentration of solutions Acid-Base (pH metry and conductometry), Redox, Precipitation and Complex metric Titrations. Chromatography; Definition and Different Types of Chromatography, Fundamentals of Spectroscopy; Principles and Applications of UV-Visible, Infra-Red and Atomic Absorption Spectrometry.

#### **UNIT-II: Electrochemistry and Surfactants**

Electrolytic and Galvanic cell, Electrode Potential, Standard Electrode Potential, EMF series, Nernst Equation, Cell emf Measurement, Reversible and Irreversible cell, Thermodynamic Overview of Electrochemical Processes, Conductance, Cell Constant and its Determination. Surface Active Agents, Soaps, Types and Advantages of Detergents, Critical Miceller Concentration, Hydrophilic and Hydrophobic Interactions, HLB values, Friccohesity of Surfactant Solutions.

#### **UNIT-II: Molecular Structure and Phase Rule**

Valence Bond Theory, Molecular Orbital Theory, Molecular Orbital of Polyatomic Molecules, Molecular orbital Theory of Solids, crystal structure, Semiconductors and Superconductors. Phase Rule; Phase Rule Applications to One and Multiple Component systems, Fe-C Phase Equilibrium Diagram, Types of Alloys, Ferrous and Nonferrous Alloys.

#### **UNIT-IV: Polymers**

Basics of polymer chemistry, Molecular weight, Glass transition temperature and Melting point, Methods of polymerization, Structure property relationship, Thermoplastics and Thermosets, Fabrication of polymers-Compression, Injection, Extrusion and transfer Moulding. Synthesis,

Properties and uses of polyethylene, Polyvinyl Chloride, Poly Methyl Methacrylate, Urea formaldehyde resin and Melamine formaldehyde resin, Elastomers and Conducting polymers.

#### **UNIT-V: Nanomaterials and Composites**

General Introduction, Fullerenes, Carbon nanotubes, Nanowires, Electronic and Mechanical properties, Synthesis of nanomaterials, Top down and Bottom up approaches, Applications of nanomaterials. Adhesives and their classification, Composites; their Compositions, Characteristics and types.

#### **Text Books:**

1. Instrumental Methods of Analysis by Willard Meritt, Dean, Settle, CBS Publishers
2. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Company (P) Ltd.
3. Engineering Chemistry: A textbook of Chemistry for Engineers, Wiley, India

#### **Reference Books:**

1. Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd

## **ENGINEERING MATHEMATICS – I AS-104**

**L: 3 T: 1 P: 0 Cr: 4**

#### **COURSE OUTCOMES**

1. Tracing the curve and understanding its behaviour at the point of infinity(Asymptote).
2. Learning the concepts of successive differentiation and the expansion of functions in form of series.
3. Finding maxima and minima of a function of two and more variables and the concept of Eigen values.
4. A study of ordinary differential equations and its applications.
5. Learning the concepts of partial differential equations with applications.

#### **SYLLABUS**

##### **UNIT-I: Curve Tracing & Applications Of Definite Integrals**

Two Dimensional curve tracing in Cartesian, polar and parametric forms, Double points & points of inflexion, Oblique and parallel asymptotes, Finding length, volume and surface area of the curve in Cartesian, polar and parametric forms.

##### **UNIT-II: Techniques of One Variable Calculus & Partial Differentiations**

Leibnitz's theorem;  $n^{\text{th}}$  derivative of  $F(x)$  at  $x=0$ , Maclaurin's expansion of  $F(x)$ , Formation of Intrinsic and pedal equations, Partial derivatives and their geometrical interpretation, Total derivative, Total differential coefficient, change of variables i.e. use of Jacobians.

Curvature and radius of curvature in Cartesian, polar and parametric and implicit forms, Radius of curvature at the origin, centre and chord of curvature, and evolutes of the curves.

##### **UNIT-III: Calculus Of Several Variables & Linear Algebra**

Taylor's expansion of a function of one & two variables, Leibnitz's rule for differentiation under the

sign of integration, Maxima and minima of a function of two and more variables including Lagrange's method.

Consistency of a system of simultaneous linear equations using rank, Eigen values and Eigen vectors of a square matrix, Properties of Eigen values, Applications of Cayley-Hamilton theorem and diagonalization of a matrix, vector space, basis, linear dependence and independence of vectors, Linear transformations and related problems

#### **UNIT-IV: Ordinary Differential Equations**

Orthogonal and Isogonal trajectories of a family of curves, Complementary function, particular integral and general solution of ordinary linear differential equations of higher order with constant and variable coefficients (Cauchy and Legendre forms).

Method of variation of parameters Method of undetermined coefficients and solutions of simultaneous differential equations with constant coefficients.

#### **UNIT-V: Partial Differential Equations**

Introduction to partial differential equations, Change of independent variables in P.D.E., Complete solution of homogeneous and non-homogeneous L.P.D.E. of higher order with constant and variable coefficients, Solutions of one dimensional wave equation, one dimensional heat conduction equations and two dimensional Laplace (Cartesian and polar forms) equation using method of separation of variables.

#### **Text/ Reference Books:**

1. A.B. Mathur & V.P. Jaggi : A text book of "Engg. Maths. & Advanced Engg. Mathematics"
2. V.P. Mishra: "Concept of Engineering Mathematics" (Revised Edition)
3. B.S. Grewal: "Engineering Mathematics & Higher Engineering Mathematics"
4. B.V. Ramana: "Higher Engineering Mathematics".
5. R.K. Jain and S.R.K. Iyengar : "Advanced Engineering Mathematics", 4<sup>th</sup> Edition
6. J.S. Bindra & K.S. Gill, S.K. "Applied Mathematics" Kataria & Sons, Ansari Road, Darya Ganj, Delhi-110002

## **BASICS OF CIVIL ENGINEERING CE-101**

**L: 2T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

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

1. determine the engineering properties of the materials and solids.
2. analyze the internal forces for statically determinate and compound members.
3. apply the concept of compound stresses for axial, flexure, shear and torsion.
4. apply the concept of principal strain and strain tensor for the analysis of different structural members.
5. apply the concepts of shear force, bending moment, axial force for statically determinate beams.

#### **SYLLABUS**

##### **Unit-I: Stresses & Strains:**

Introduction, normal stress & strain, shear stress & strain, relationship between stress and strain, Uniaxial tension test: Stress-Strain diagrams for different materials, Mechanical properties of materials: isotropy, homogeneity, continuity, elasticity, brittleness, yielding, plasticity, work hardening, ductility, hardness, toughness, creep, relaxation, fatigue; Uniaxial deformations: Saint Venant's principle, principle of superposition, free body diagrams, bars of uniform cross sections.



**Unit-II: Uniaxial Deformations:**

Bars of variable cross sections, compound/ composite bars, temperature stresses.

**Unit-III: Analysis of Stresses:**

Tensor notations, equilibrium equations, transformation of stresses, invariants of stress tensor, plane stress condition, principal stresses, maximum shear stress and their planes, Mohr's circle.

**Unit-IV: Analysis of Strains:**

Transformation of strains, invariants of strain tensor, plane strain condition, principal strains, maximum shear strain and their planes; Strain Rosettes; Stress –Strain relationship, generalized Hooke's law, relation between elastic constants.

**Unit-V: Structures and Their Forms:**

Loads, idealization of structures, supports and connections, elastic and linear behaviour of structures, determinate and indeterminate structures, SF & BM: relation between B.M., S.F. and loads, S.F. & B.M. diagrams in statically determinate simply supported (without overhang) and cantilever beams subjected to concentrated loads and UDL

**Text Books**

1. Engineering Mechanics of Solids By E.P. Popov, Pearson Education.
2. Solid Mechanics by S.M.A. Kazimi, Tata McGRAW HILL.
3. Mechanic of Materials by R.C. Hibbeler, Pearsons Education

**Reference Books**

1. Mechanics of Materials by Beer &Jonhson, Dewolf, McGRAW HILL.
2. Strength of Materials by S. Timoshenko, CBS Publisher
3. Strength of Materials by R. K. Rajput, S Chand

## **BASICS OF MECHANICAL ENGINEERING ME-101**

**L: 2 T: 1 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. Understanding various thermodynamic systems, properties and other related concepts
2. Expanding the knowledge of reversible and irreversible cycles
3. Learning the basics of first law and second law equations and related theories with numerical
4. Studying the kinematics of fluid flow
5. Understanding the dynamics of fluid flow

**SYLLABUS****Unit-1:**

Thermodynamics systems, Properties, Thermal equilibrium, Zeroth Law of thermodynamics and concept of temperature. Work, displacement work in various Quasi-state systems, First law of thermodynamics, application to cyclic process, Internal energy, Enthalpy. Pure substance, control volumes, Application of first law to non-cyclic process, Steady Flow energy equation.

**Unit-II:**

Reversible and Irreversible process, Second law of thermodynamics, Kelvin-Planck and Clausius statement and their equality. Entropy generation, Entropy balance equation for closed and open systems.

#### **Unit-III:**

First law and second laws equations, Maxwell's relation, Carnot cycle. Definition and properties of fluids, Classification of fluids, Normal and shear stresses in fluids.

#### **UNIT-IV:**

Kinematics of fluid flow; Types of flow, flow pattern, Velocity and rotation, acceleration of fluid particle, velocity potential function, Differential equation of conservation of mass.

#### **Unit-V:**

Dynamics of ideal fluids flow; Euler's equation of motion, Bernoulli's equation and its application, Flow measuring device, Venture-meter, orifice-meter and nozzle meter, pilot-static tube, hydraulic co-efficient, Flow through pipes, Major and Minor losses in pipe flow.

#### **Text books:**

1. Engineering Thermodynamics by: P. K. Nag, TMH.
2. Fundamental of classical thermodynamics by: Wan- Wylen&sontag, John wiley&sons.
3. Engineering thermodynamics by: Spalding & code.
4. Engineering Mechanics: Statics and Dynamics: by J. L. Meriam and L. G. Kraige, John Wiley & Sons, Inc.
5. Engineering Mechanics: Dynamics: 12th Edition by R. C. Hibbeler, Prentice Hall
6. Engineering Mechanics: by K.L. Kumar, Tata Mc Graw Hill.

## **BASICS OF ELECTRICAL ENGINEERING EE-101**

**L: 2 T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES:**

1. To analyse circuit systems using direct application of Kirchoff current and voltage laws along with Ohms law
2. To understand basic concept of “j” operator, RLC series circuit, reactive power, true power and apparent power
3. To prepare the students to have basic knowledge of transformers, the equivalent circuit model of single phase transformers, transformer parameters using open circuit and short circuit tests, compute transformer efficiency and voltage regulation
4. Construction and understanding of working principles of DC generators and motors
5. The ability to select a suitable measuring instrument for a given application like PMMC and MI

#### **SYLLABUS**

##### **Unit-I:**

Fundamentals of electric circuits, Kirchhoff's laws, mesh analysis, node analysis, delta-star and star-delta conversion, classification of network elements, Thevenin's theorem, Norton's theorem maximum power transfer theorem, superposition theorem.

**Unit-II:**

Single phase AC circuits, average and effective values of sinusoids, solution of R,L,C series circuits, the j operator, complex representation of impedances, phasor diagram, concept of power factor, power factor improvement, power in complex notation, solution of parallel and series-parallel circuits, resonance. Introduction to balance three phase AC circuits.

**Unit-III:**

Ampere's circuital law, B-H curve, solution of magnetic circuits, hysteresis and eddy current losses. Relays as an application of magnetic force. Transformers- construction, e.m.f. equation, ratings, phasor diagram for no load and full load, equivalent circuit, regulation and efficiency calculations, open circuit and short circuit tests, Introduction to Auto-Transformer.

**Unit-IV:**

Introduction to Electromechanical Energy Conversion, DC motors- construction, e.m.f. and torque equations, characteristics of DC generators and motors, speed control of DC motors. DC motor starter- working principle, ratings. Introduction to three phase induction motor, Introduction to alternator and synchronous motor and their applications.

**Unit-V:**

PMMC instruments, shunts and multipliers, multi-meters, moving iron ammeters and voltmeters, dynamometer wattmeter, AC watt-hour meters, extension of instrument ranges.

**Text Book:**

1. D.C. Kulshrestha, "Basic Electrical Engineering", Tata McGraw Hill.
2. T.K. Nagsarkar&M.S.Sukhija, "Basic Electrical Engineering", Edition 2008, Oxford University Press.

**Reference books:**

1. V. Del Torro, Electrical Engineering Fundamentals, Second Edition, Prentice Hall of India Pvt. Ltd.
2. E. Hughes, Electrical Technology, English Language Book Society Publication with Longman.
3. H. Cotton, Advanced Electrical Technology, Issae Pitman, London.
4. S.S. Parker, Problems in Electrical Engineering, Asia Publications.
5. I. J. Nagarath, "Basic Electrical Engineering", 2nd Edition, Tata McGraw Hill.

## WORKSHOP PRACTICE ME-151

**L: 0 T: 0 P: 4 Cr: 2**

**COURSE OUTCOMES:**

1. To instil fundamentals of materials, properties, various tools and their specifications employed in various shops/trades
2. To understand science and engineering of every task and tool employed in each shop/trade
3. To understand the drawing and specification of various tasks/jobs; plan, operate and acquire tools to make jobs as per specifications
4. Encourage student to use web/computing resources and relate the completed task with real life processes
5. Educate them for safety and security while performing assigned tasks in group of small size, prepare the record of tasks and submit

**SYLLABUS****Unit-I: Foundry**

Mould cores, core prints, gates runner, risers, chaplets, common defects in casting, defects due to mould, metal pouring, solidification.

### **Unit-II: Metal Joining**

Oxy acetylene gas welding equipment, types of flame, electric arc and contact welding, electrodes and equipments for AC and DC welding, electrode coating functions and constitutes, common welding defects.

### **Unit-III: Metal Cutting Operation And Tools**

Common metal cutting machine like lathe, milling, shaper, slotter and drill, lathe operations like turning, chamfering, facing, taper turning and knurling, material for lathe tools and other tools, bench grinder and use.

### **Related Labs:**

1. Gas welding: simple joint like joint.
2. Electric Arc Welding: Simple joints like butt joint.
3. Tin Smithy: Mechanical joining, jobs like box, tray, funnel and soldering of joints.
4. Turning: Plane turning, taper turning, threading, knurling, facing and chamfering on the same job.
5. Shaping: Surface finishing at right angles.
6. Milling: Making a slot two or three surface finishing at angles of 1200C.
7. Drilling: Making drilled holes in plates or flats and grinding the corner of a plate to round.

### **Text books/ Reference books:**

1. Elements of Workshop Technology by, Choudhary Vol. 1 & 2. Media promoters and publisher, 1996.
2. Workshop Technology, Vol. 1-3 by W A J Chapman, ELB. S

**SEMESTER II**  
**HUMAN RESOURCE MANAGEMENT**  
**AS-201**

**L: 3 T: 0 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. Forming a foundation of human resource management
2. Understanding the procedure of acquisition of human resources
3. Making clear the importance of appraisals and evaluation in human resource
4. Learning importance of training and development of human resource
5. Analysing the management of job stress and employee health and well being

**SYLLABUS**

**Unit-I: Foundation of Human Resource Management (HRM):**

Meaning, definition, nature and scope, characteristic, objectives, Opportunities and challenges in HRM, HRM functions.

**Unit-II: Acquisition of Human Resources**

Human Resource Planning (HRP): need, objectives, determinates, HRP models, HRP process, type of HRP, benefits; Job Analysis (JA): sources, methods, process, uses, importance; job description, job specification; Recruitment and selection: sources, process, barriers, objectives, objectives of selection, selection tests, interview, induction, placement and employee socialization.

**Unit-III: Appraising and evaluating Human Resources**

Performance Appraisal (PA) and feedback: approaches, methods/techniques of PA, process of PA, interview, elements, designing and conducting PA; Job Evaluation (JE): principles, process, methods of JE, importance and limitations.

**Unit-IV: Development of Human Resources**

Human Resource Development (HRD): functions, benefits, importance, barriers to HRD; Training and Development: models, methods, training process, training evaluation and barriers.

**Unit-V: Employees Health & Well being – Job stress and Job Burnout: Nature, Causes and consequences**

Stress: Nature, Causes and consequences; Management of Stress: Personal and organizational based strategies; Burnout: Nature, symptoms, causes, relationship with stress, burnout and job satisfaction management of burnout.

**Text Books:**

1. Gary Dessler (2015), Human Resource Management, Person Prentice Hall of India, New Delhi
2. VSP Rao, Human Resource Management, Text & Cases (2<sup>nd</sup> edition), Excel Books, New Delhi

**Reference Books:**

1. Tapomony Deb, (2009), Managing Human Resource and Industrial Relations (First edition), Excel Books, New Delhi
2. John M. Ivancevich (2005), Human Resource Management 93<sup>rd</sup> edition) Tata McGraw Hill Publishing Co. Ltd., New Delhi

## **ENGINEERING PHYSICS – II**

### **AS-202**

**L: 2 T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

1. Learn to apply relativity in describing physics of motion
2. Appreciate the importance of lasers and grasp the physical bases
3. Learn the calculation methods of quantum theory
4. Apply quantum ideas to explain behaviour of materials
5. Appreciate physics conservation laws and be acquainted with new areas

#### **SYLLABUS**

##### **Unit-I: Relativity**

Difficulties of classical theory, idea of ether, Michelson Morley Experiment, Galilean transformations, postulates of special theory of relativity, Lorentz transformations, Einstein velocity addition theorem, time dilation, length contraction, relativistic mass, momentum and energy, natural units, principle of equivalence.

##### **Unit-II: Lasers**

Principle of laser action, Einstein's transition probabilities, lifetime of transitions, rate equation for atomic transition, optical resonators, ruby laser, He-Ne laser, general characteristics of lasers, applications of lasers.

##### **Unit-III: Quantum Theory**

Schrodinger equation, time dependent and independent forms, wave function, probabilistic interpretation, one-dimensional problems, particle in a box, elementary treatment of harmonic oscillator, potential barrier and possibility of tunnelling.

##### **Unit-IV: Physics of Materials**

Bose Einstein statistics, Fermi Dirac statistics, semiconductors, intrinsic and extrinsic, carrier concentration, origin of energy gap, Kronig Penney model, Basics of semiconductor devices and applications, Electrical & optical properties.

##### **Unit-V: Frontiers of Physics**

Basic interactions, symmetry, invariance and conservation laws, elementary particles and their classification, accelerator physics and applications, last Nobel prize in Physics, its back ground, significance and possibilities of future developments.

#### **Text Books:**

1. Physics by Halliday Resnick
2. Modern Physics by Mani Mehta
3. Modern Physics by Beiser

#### **Reference Books:**

1. Relativity by Halliday Resnick
2. Optics by Ghatak:

# ENGINEERING CHEMISTRY & ENVIRONMENTAL SCIENCE

## AS-203

**L: 2 T: 1 P: 0 Cr: 3**

### COURSE OUTCOMES

1. Understanding importance of use of water in industries, softening methods and problems on water treatment
2. Understanding basis of fuels analysis and their combustion
3. Exploring the corrosion and protection
4. Understanding environment and pollution
5. Understanding environmental biochemistry

### SYLLABUS

#### Unit-I: Water Treatment

Water Quality Parameters (BIS & WHO Standards), types of hardness, Units, Determination of hardness by EDTA method, Alkalinity of water & its significance, Numerical problems, Problems with boiler feed water and its treatment; Scale & Sludge formation, Boiler corrosion, Caustic Embrittlement, Priming & foaming, Softening methods; Lime-soda, Zeolite & Ion Exchange processes, Numerical problems, Chlorination of water, Coagulation, Sedimentation and Desalination.

#### Unit-II: Energy Resources

Types of fuels, Calorific values, (HCV & LCV) and determinations by Bomb and Boys gas calorimeter, Numerical problems, Coal; Types of coal, Analysis of coal, Liquid Fuel; Refining of petroleum, Knocking, Octane and Cetane Values, Pollution from fossil fuels, Combustion and Problems. Renewable; (Solar Cells, Rechargeable Batteries, Fuel Cells) and Non-renewable of energy; (Wind Energy, Geothermal Energy, Ocean Energy) resources of Energy.

#### Unit-III: Corrosion And Its Protection

Corrosion; Definition and its scope, Chemical Corrosion, Electrochemical Corrosion, Mechanism of Chemical and Electrochemical Corrosion, Types of Corrosion; Intergranular Corrosion, Soil Corrosion, Waterline Corrosion, Differential Aeration Corrosion, Galvanic and Concentration Cell Corrosion, Factors affecting corrosion, Protection of corrosion.

#### Unit-IV: Environmental Chemistry

Environment and its Segments, Zones of Atmosphere, Air Pollution: Air pollutants and their resources; Aerosol and its Types, RSPM, SPM, Acid rain, Green House Effect, Global warming, Ozone Layer Depletion, Water Pollution; Sources of water pollution, Sewage Treatment, Determination and Significance of COD, BOD, TOC. Noise Pollution, Soil Pollution, Radioactive Pollution and e-Waste.

#### Unit-V: Environmental Biotechnology

Biotechnology and its applications, fermentation, production of alcohol and vitamins, Biotechnology for environmental Protection, Biological indicators, biosensors, bioremediation, Phytoremediation, bio-pesticides, bio-fertilizers, bioreactors, Social issues, biodiversity and its conservation.

#### Text Books:

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Company (P) Ltd.
2. Engineering Chemistry: A textbook of Chemistry for Engineers, Wiley, India

#### Reference Books:

1. Adsorption: Remediation of Heavy Metals and Organic Pollutants by Firoj Ali Ansari and

Masood Alam, Lambert Academic Publishing

2. Removal of Heavy Metals and Ground Water Pollution in Delhi, India

## **ENGINEERING MATHEMATICS – II**

### **AS-204**

**L: 3 T: 1 P: 0 Cr: 4**

#### **COURSE OUTCOMES**

1. Tracing of 3D curves and evaluation of multiple integrals by change of variables/change of order of integration.
2. Learning the concepts of non-linear ordinary and partial differential equations.
3. Study of analytical functions, residues and conformal mapping.
4. Solutions of system of differential equations, integral equation, Integro-differential equations, difference equations using Laplace transformation.
5. Learning of theory of Fuzzy Mathematics with its applications.

#### **SYLLABUS**

##### **Unit-I: Solid Geometry & Multiple Integrals**

Formation of equations of cylinder and cone under the given geometrical conditions, Tracing of some quadric (or Conicoids) three dimensional surfaces.

Evaluation of multiple integrals by change of order of integration, Change of variables i.e. Use of Jacobian & Applications of multiple integrals in finding plane area, mass, centre of gravity, centre of pressure, moment of inertia, product of inertia, curved surface area and volume.

##### **Unit-II: Ordinary & Partial Differential Equations**

Ordinary point and regular singular point, Series solutions of ordinary differential equations of second order with variable coefficients (polynomials) by the method of Frobenius; Lagrange's method of undetermined multipliers for the solution of linear partial differential equations of first order solution of non-linear partial differential equations of first order by means of transformations and Charpits methods.

##### **Unit-III: Complex Analysis**

Analytical function, C-R equations in Cartesian and polar forms, Geometrical representation of  $w=F(z)$ , Determination of conjugate harmonic function, Milne – Thomson method and related problems; Evaluation of complex integrals using Cauchy's integral theorem, Cauchy's integral formula for the  $n^{\text{th}}$  order derivative of an analytic function.

Taylor series, Maclaurin series and Laurent series expansions of functions, Conformal mapping, sufficient condition for conformality of  $W=f(z)$ , some standard transformations; zeros, singularities and residues of an analytic function, Application of Cauchy's residue theorem in solving contour integrals and evaluation of real definite integrals using residue method.

##### **Unit-IV: Laplace Transform & Its Applications**

Laplace and inverse Laplace transforms of some well-known elementary functions and Special functions, Change of scale property, First and second shifting theorems, Laplace transforms of Derivative, Integral,  $t^n f(t)$ ,  $f(t)/t$ , Convolution theorem & Periodic function.

Applications of Laplace and inverse Laplace transform in finding the particular solutions of ordinary linear differential equations with constants and variable coefficients, system of differential equations, integral equation, Integro-differential equations, difference equations and, conversion of differential equations into integral equations & vice versa.

##### **Unit-V: Fuzzy Mathematics**

Fuzzy set, elements of Fuzzy logic, Relations including operations, reflexivity, symmetry and



transitivity, Pattern classification based on fuzzy relations, fuzzy analysis including metric spaces, distance between fuzzy sets, area perimeter, height, width of fuzzy subsets, continuity & integrals.

#### **Text/ Reference Books**

1. A.B. Mathur & V.P. Jaggi: “**Engineering. Mathematics & Advanced Engineering Mathematics**” ( two volume)
2. V.P.Mishra: “**Concept of Engineering Mathematics**” (Revised Edition)
3. B.S. Grewal: “**Engineering Mathematics & Higher Engineering Mathematics**”, 43<sup>rd</sup> Edition
4. B.V. Ramana: “**Higher Engineering Mathematics**”.
5. R.K. Jain and S.R.K. Iyengar : “**Advanced Engineering Mathematics**” 4<sup>th</sup> Edition

## **INNOVATIVE TECHNOLOGY & BIOSCIENCES**

### **AS – 205**

**L: 3 T: 0 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

1. Understanding the concept of nanotechnology
2. Learning the applications of nanotechnology in multiple disciplines
3. Understanding the concepts of biological sciences, genetics, biological indicators and biosensors
4. Exploring the field of advanced biological sciences and biotechnology
5. Exploring nano-biotechnology and its various applications

#### **SYLLABUS**

##### **Unit-I: Introduction to Nanotechnology**

Introduction to Nanotechnology, Theoretical Basis of nanotechnology, Quantum confinement and size effect, Classification of Nanomaterials: Nanowires, Quantum Wells and Quantum Dots, Properties of Nanomaterials, Carbonaceous Nanomaterials and their examples. Molecular Nanotechnology, Green Nanotechnology.

##### **Unit-II: Applications of Nanotechnology**

Microelectromechanical Systems (MEMS) & Nanoelectromechanical Systems (NEMS), Nanorobotics, Nanofluidics, Micro-gears and Nano-gears, Nanocomposites and their applications, Nanomaterials for Civil Engineers, Nanopaints, Light and flexible Civil Engg. Structures based on carbon Nanomaterials, Nano-memories. Nano-sensors. Nano-transistors, Introduction to organic electronics.

##### **Unit-III: Introduction to Biological Sciences**

Introduction to the cell as a unit of life, Principles involved in the maintenance of life processes, Ultra-structure and function of cellular components-Prokaryotic and Eukaryotic cells, cell wall, plasma membrane, endoplasmic reticulum, Biomolecules-Carbohydrates. Lipids, Amino Acids, proteins, Nucleic Acids, Tissue Systems. Metabolism, Chromosomes and Cell Division. Basic Genetics-biological indicators, biosensors, Mutation-causes, types and effect.

##### **Unit-IV: Advanced Biological Sciences**

Introduction to microbiology, Industrial microbiology, introduction to immunology, Introduction to molecular genetics, Structure of RNA and DNA, Concept of Gene, Gene regulation, Basic concepts of biotechnology: Totipotency and cell manipulation, Classifications of biotechnologies.

**Unit-V: Nanobiotechnology**

Introduction to Nanobiotechnology, Nanobiotechnology in medicine: regenerative medicine, Targeted drug delivery. Nanotechnology in pharmacy, Nanobiotechnology in Ayurveda, Alternative medicines. Nanobiotechnology in Agricultural, industrial Nanobiotechnology, Nanobiotechnology in imaging, Cancer treatment using Nanotechnology.

**Text Books:**

1. Nano the Essential by T. Pradeep
2. The Cell by Bruce Alberts

**Reference Books:**

1. Molecular Biology by Karp

## **BASICS OF ELECTRONICS & COMMUNICATION ENGINEERING EC-201**

**L: 2 T: 1 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. Studying semiconductor diodes and their various characteristics
2. Expanding the ideas: construction and working of BJTs and introducing JFET
3. Exploring various types of operational amplifiers
4. Understanding the idea of feedback and thus studying various electronic instruments
5. Learning various parameters of communication systems

**SYLLABUS****Unit-I: Semiconductor Diodes:**

P-N junction diode, V-I characteristics, static and resistance, linear and non-linear applications of diodes; half wave, full wave and bridge rectifiers, zener diode, characteristics and its use as a voltage regulator, AND, OR, NAND, NOR and Ex-OR gates.

**Unit-II: Transistors (Bjt & Jfet):**

Bipolar junction transistor (BJT), biasing and amplifier action, load line analysis of transistor amplifier, BJT amplifier configurations and their comparison using small signal h-parameter model, Junction field Effect transistor (FET), biasing and amplifier action.

**Unit-III: Operational Amplifier:**

Op-am- basics, practical op-amp circuits, inverting and non-inverting amplifier, summing amplifier, integrators and differentiators.

**Unit-IV: Feedback And Electronic Instruments:**

Feedback concept, Barkhausen Criteria of oscillation, Wein Bridge and phase shift oscillator, cathode Ray oscilloscope (CRO), electronics multimeters.

**Unit-V: Communication Systems:**

Introduction to modulation, amplitude modulation generation of AM waves, demodulation of AM wave, introduction to FM.

**Text Books:**

1. Boylestad & Nashelsky, Electronic Devices and Circuit Theory, 9<sup>th</sup> Ed, Pearsons
2. Dinesh Prasad, Basic of Analog Electronics, Scitech Publications

**Reference Books:**

1. Sedra and Smith, Micro Electronic Circuits, 6<sup>th</sup> Ed, Oxford Press

## **FUNDAMENTAL OF COMPUTING CS- 201**

**L: 2 T: 1 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. Students will able to understand the basics of computer, generation & types of computer, its components and number system
2. Students will able to understand the concept of algorithms, flowchart and c programming language
3. Students will able to develop c programs for string manipulation, sorting and searching techniques
4. Students will able to describe the functions, structure and different types of operating systems
5. Students will able to understand basics of networking, internet and database management systems

**SYLLABUS****UNIT-1: BASICS OF COMPUTERS**

Computer fundamentals, Bits and Bytes, CPU, Memory, Types of memory, Input and output devices, I/O devices, Operating system, applications software's, system software. Number system, decimal number system, Binary number system, octal number system, hexadecimal number system. Generation of computer, Classification of computer,

**UNIT-II: C PROGRAMMING**

Algorithms, flow chart, The C character set, constants, variable, keywords, operator and expressions, decision controls, if and else, conditional operator, for loop, while loop and do-while loop,, switch case, user defined functions, call by value and by reference, array, and single dimensional, 2D matrix, multidimensional arrays

**UNIT-III: SEARCHING AND SORTING**

Strings, library string functions, pointers and structures, searching and sorting, linear search, binary search, sorting techniques: bubble sort, selection sort

**UNIT-IV: OPERATING SYSTEM**

OS definition, role of OS in computer system, multi programming, time sharing OS, multitasking OS, multiprocessing OS, real time system OS , client server computing, distributed OS, function of OS (user interface, GUI, program execution, I/O management, Resource management,

**UNIT-V: NETWORKING & DBMS**

Network, communication models, transmission media, connection topologies, LAN, WAN, MAN, ISO-OSI model of networking, Internet, ISP, WWW, Email, URL, Web browsers, websites, intranet, DBMS, DBMS applications, Advantage of DBMS, Data abstraction.

**Books:**

1. “Computer Fundamentals & Programming in C”, ReemaThareja, Oxford University Press
2. Ashok Kamthane, “Programming with C “.
3. M N Doja, “Introduction to Computers and Information Technology”
4. C Programming by YaswantKanetkar

## **ENGINEERING GRAPHICS ME-250**

**L: 0 T: 0 P: 4 Cr: 2**

**COURSE OUTCOMES**

1. Student will able to understand basics of drawing and design of engineering components
2. Student will able to understand scaling of designs
3. Student will able to understand the different view of any object
4. Student will able to understand detail construction of any object
5. Student will able to understand sheet metal work

**SYLLABUS****Unit-I: Orthographic Projection**

Conversion of pictorial/ isometric views into orthographic views of machine block. Identification of surface in orthographic views. Some practice on auto-Cad package.

**Unit-II: Isometric Projection**

Isometric scale, isometric projection of solids, missing line and missing views. Isometric view of simple objects when their orthographic views are given. Preparation of isometric views using Auto-Cad package.

**Unit-III: Sectioning**

Conventional representation in section of engineering materials. Methods of sectioning, sectional views of machine components, brackets, bushed bearing and foot step bearing. Unit IV FASTENERS: Sketches of different types of threads, permanent fasteners (riveted and welded joints), temporary fasteners (nut and bolt assembly, studs, keys. etc.)

**Unit-V: Building Drawings**

Symbols of electrical and sanitary items. Terminology used in building drawing, plan and elevation of 2/3- rooms building using Auto-CAD package, from corrosion, refractories, their manufacturer and properties: neutral, acid and basic refractors; glass its types and manufacture.

**Text Books**

A.N. Siddiqui, Z.A. Khan and Mukhtar, Engineering Graphics with Primer on Autocad

**Reference Books**

N.D. Bhutt, Engineering Drawing

## **SEMESTER - III**

### **SOLIDS MECHANICS CE-301**

**L: 2 T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

Upon successful completion of the course, students should be able to:

1. analyse behaviour of structural elements subjected to different types of stresses
2. analyse different types of beams subjected to bending action
3. apply theory of pure bending to determine stresses in different types of structural elements
4. determine slopes and deflection in beams using Macaulay's and direct integration methods
5. analyse compression members under axial and flexural loading

#### **SYLLABUS**

##### **Unit-I: Thin Cylindrical shells**

Longitudinal and hoop stresses, volumetric strains; Thick Cylinders: Lamé's equations, stresses due to internal and external pressure; Torsion: Circular and noncircular shafts, power transmitted by shafts; Concept of strain energy and resilience; Theories of failure.

##### **Unit-II: Shear force and Bending moment**

SF and BM Diagrams for simply supported over-hanged and cantilever beams subjected to moments and varying loads; SF, BM & Torque Diagrams for inclined beams & brackets subjected to concentrated load, udl, moments and varying loads.

##### **Unit-III: Bending in beams**

Bending theory, bending equation, bending stresses in rolled steel and built up sections; Shear stresses in beams: shear flow, shear centre, variation of shear stresses in beam cross-section.

##### **Unit-IV: Deflection of beams**

Direct integration and Macaulay's methods for simply supported and cantilever beams subjected to concentrated loads, uniformly distributed loads, varying loads and moments.

##### **Unit-V: Columns and struts**

Columns and struts subjected to compression and bending, middle third & middle fourth rules, core or kernel of sections, masonry column, dams and retaining walls; Long columns: Euler's, Rankine's and Secant formulae.

#### **Text Books**

1. Engineering mechanics of solids, E. P. Popov, Pearson Education.
2. Solids Mechanics, S. M. A. Kazimi, Tata McGRAW HILL.
3. Mechanics of Materials, R. C. Hibbeler, Pearsons.

#### **References:**

1. Mechanics of Materials, Beer & Johnston, Dewolf, McGRAW HILL.
2. Strength of Material, S. Timoshenko.
3. Strength of Materials, R. K. Rajput.

# **FLUID MECHANICS**

## **CE-302**

**L: 2 T: 1 P: 0 Cr: 3**

### **COURSE OUTCOMES**

At the end of the course, the student should be able to:

1. develop relationships between different fluid properties and apply them to practical problems
2. analyze the stability of floating and submerged bodies using the principle of floatation.
3. apply the concepts of kinematics to solution of fluid flow problems.
4. apply the concepts of rotational mechanics for the analysis of source, sink, doublet, and flow past stationary and rotating cylinders.
5. apply Bernoulli's energy equation to solve real world problems.

### **SYLLABUS**

#### **Unit-I:**

Introduction: Real and ideal fluids, concept of continuum approximation, properties of fluids, equation of state, coefficient of compressibility, bulk modulus of elasticity, Newtonian and non-Newtonian fluid, surface tension, capillarity, concept of viscosity, effect of temperature on viscosity.

#### **Unit-II:**

Fluid Static: Pascal's law, devices based on Pascal's law, hydrostatic law, pressure variation in isothermal and adiabatic condition; Manometers: Simple and differential manometers, relative equilibrium; Forces on submerged plane, inclined and curved surfaces; Buoyancy; Stability of floating and submerged bodies, meta center and meta centric height.

#### **Unit-III:**

Fluid Kinematics: Kinematics of fluid Motion, Eulerian and Lagrangian description, type of motion, concept of control volume and control surface, streamline, path line, streak line and stream tube, continuity equation in Cartesian coordinate and polar coordinate, one and two dimensional flows, acceleration of fluid element, linear momentum equation and its application- forces on pipe bends.

#### **Unit-IV:**

Fluid Rotation: Circulation and Vorticity, angular velocity in terms of velocity field, irrotational flow, velocity potential and stream function, flow net and its uses, free and forced vortex motion.

#### **Unit-V:**

Fluid dynamics: Navier- Stoke's equation, Euler's equation of motion and integration along streamline; Bernoulli's equation, physical significance of different heads, Bernoulli's equation for isothermal and adiabatic flow; Application of Bernoulli's equation: pitot tube, venturi meter, orifice meter, Concept of kinetic energy, and momentum correction factors; Flow through an orifice; Time required for emptying of tank.

### **Textbook**

1. Frank. M. White, Fluid Mechanics, McGraw-Hill, 7<sup>th</sup> edition, 2011.

### **References book**

1. John F. Douglas, Janusz M. Gasiorek, John A. Swaffield, and Lynne B. Jack. Fluid Mechanics, Pearson, 2012
2. Bruce R. Munson, Donald F. Young, and Theodore H. Okiishi, Fundamentals of Fluid Mechanics, 5th Edition, John Wiley and Sons, 2006
3. Robert W. Fox, Philip J. Pritchard, Alan T. McDonald, Introduction to Fluid

Mechanics, Wiley, 6th ed., 2003

4. A.K. Jain Fluid Mechanics, Standard Publishing House, Delhi,

## **CIVIL ENGINEERING MATERIALS CE-303**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course, students should be able to:

1. understand the properties of different types of cement.
2. design concrete mixes and conduct tests on cement and aggregates.
3. use different types of special concretes in construction of structures.
4. understand and use properties of bricks, stones and wood in building construction.
5. understand and use properties of flyash, paints, varnishes, gypsum and water proofing materials in building constructions.

### **SYLLABUS**

#### **UNIT-1: Cement**

Compounds and proportions, types of Portland cement, pozzolanic cement, high alumina cement and other types, hydration mechanism and hydration products, setting and hardening, curing, strength of hardened cement, grade of cement, tests on cements, relevant BIS codes.

#### **UNIT-II: Aggregates**

Properties of coarse & fine aggregates, tests on aggregates, relevant BIS code provisions, concrete: Ingredients of concrete, properties of fresh and hardened concrete, strength of concrete, W/C ratio of porosity, additives and their types, concrete mix design.

#### **UNIT-III: Special Concretes**

Reinforced cement concrete, polymer concrete, fibre reinforced concrete, ferrocement, light weight concrete, roller compacted concrete, ready mix concrete, self compacting concrete, high performance concrete, bacterial concrete.

#### **UNIT-IV: Bricks & Stones**

Forms of bricks, properties of bricks and stones, tests on bricks and stones, relevant BIS codes, timber: structure of wood, defects in timber, seasoning, preservation, plywood and its manufacturing.

#### **UNIT-V: Other materials**

Fly ash paints & varnishes, gypsum, tar, bitumen & asphalt, nano materials, smart materials, composite materials, geosynthetics, heat & sound insulating materials, water proofing materials.

#### **Textbook**

1. Building Materials by S.K. Duggal
2. Engineering Materials by S.C. Rangwala
3. Concrete Technology by M L Gambhir
4. Properties of concrete by A M Neville

#### **Reference Books**

1. Engineering Materials by R K Rajput

2. Civil Engineering Materials by Neil Jackson
3. Design of concrete mixes by Krishna Raju N, CBS publishers
4. Concrete Technology by Neville A.M and Brooks. J.J. PEARSON education.
5. Concrete properties and manufacturing by Akroyd T.N.W, Pergamon press

## **SURVEYING**

### **CE-304**

**L: 3 T: 0 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

At the end of course work, a student will be able to:

1. apply different techniques of measurement of distances and elevations to solve real world problem.
2. establish horizontal control for detailed mapping and civil engineering structures.
3. produce contour and topographical maps of an area for civil engineering projects.
4. compute quantity of earthwork and establish stakes on the ground for setting out of structures.
5. set out circular and vertical curves on the ground.

#### **SYLLABUS**

##### **Unit-I:**

Concept of plane and geodetic surveying, classification of surveying, basic principles, measurement of horizontal distance by conventional methods, sources of errors; Concept and principle of leveling, instruments for leveling, types of spirit leveling, methods of booking and reduction of levels, errors in leveling.

##### **Unit-II:**

Concept of traversing, types of meridians and bearings; measurement of horizontal and vertical angles, traverse measurement and computation, omitted measurements.

##### **Unit-III:**

Fundamentals of plane table surveying, instruments employed, working operation, methods, errors; introduction and importance of tacheometry, stadia and tangential methods; importance of topographical survey, concept and characteristics of contours, methods and uses of contours.

##### **Unit-IV:**

Computation of area by different methods, estimation of volume of earthwork; Setting out of building and tunnel; Reconnaissance, preliminary and detailed survey for canals, highways, railways, sewer lines.

##### **Unit-V:**

Elements and geometry of horizontal curve, setting out of simple curve by linear and angular methods, compound, reverse and transition curves; Basics of vertical curves, setting out of vertical curve.

#### **Text Books**

1. Elementary Surveying, Charles D. Ghilani, Paul R. Wolf. 14th Edition, Prentice Hall, 2014.
2. Surveying and Leveling, T. P. Kanetkar and S.V.Kulkarni Vol.1 & 2, VidhyarthiGriha, Prakashan,Pune



**Reference Books**

1. Plane and Geodetic Surveying for Engineers, David Clark and Jackson J. E., CBS Publications and distributors, New Delhi. Advanced Surveying, Agor, Khanna Publications, Delhi.
2. Surveying-Bannister, Raymond and Baker, Pearson Education

**ENGINEERING GEOLOGY  
CE-305****L: 3 T: 0 P: 0 Cr: 3****COURSE OUTCOMES**

Upon successful completion of the course, students should be able to:

1. get the knowledge of earth and its mineral matter
2. get the knowledge of rock and its physical and engineering properties
3. get the knowledge of tectonic activity with details of earthquake
4. get the knowledge of natural land use and soil
5. get the knowledge of site investigation for various types of Civil Engineering projects\

**SYLLABUS****Unit-1:**

Study of the internal structures such as crust, mantle and core of the earth. Mineral matter and physical properties of the rock forming minerals like metallic and nonmetallic minerals. Significance of minerals in Civil Engineering practices.

**Unit-II:**

Study of rocks, mode of formation and Classification of Igneous rocks. Physical and Engineering properties of igneous rocks. Relevance of Igneous rocks in civil engineering practices. Mode of formation and classification of Sedimentary Rocks. Physical and Engineering properties of Sedimentary rocks. Relevance of sedimentary rocks in Civil Engineering practices. Mode of formation and classification of metamorphic rocks. Physical and Engineering properties of metamorphic rocks. Relevance of metamorphic rocks in civil engineering practices.

**Unit-III:**

Study of Tectonic activity of the earth. Explanation of Fold, Fault, Joint and unconformities. Types of Fold, Fault, Joint and unconformities. Relevance of Fold, Fault, Joint and unconformities in Civil Engineering practices.

**Unit-IV:**

Weathering and erosion. Natural agencies of Weathering and Erosion. Types of Weathering. Formations of various types of landforms. Glacial land forms, wind landforms and fluvial landforms. Significance of various landforms in Civil Engineering practices. Formations of various types of soils.

**Unit-V:**

Site investigation Techniques. Geological Investigation for Dam site and reservoir, bridges, tunnels and building. Landslide and land subsidence. Study of earthquake, classification of earthquake, earthquake zoning in India. Rocks as engineering material. Hydrologic cycle and study of ground water.

**Textbooks**

1. A Text Book of Geology by P. K. Mukharji
2. Geology for Engineers By Dr. D.S. Arora
3. Engineering Geology Prabin Singh

4. Geology for Engineers by Krenin& Judd

### References

1. Geology and Engineering, by Legeet, McGrawHill Book Company, 1998.
2. Geology for Engineers, by Blyth, ELBS, 1995

## ENGINEERING MATHS III AS-301

**L: 3 T: 1 P: 0 Cr: 4**

### COURSE OUTCOMES

Upon successful completion of the course, students should be able to:

1. use integrals to solve physical problems based on Green's Theorem, Gauss Divergence Theorem, and Stoke's Theorem.
2. learn problems based on conditional probability, Law of total probability and Baye's Theorem using different distributions.
3. learn the applications of Fourier series and Fourier transforms in solving numberless problems related to Civil Engineering.
4. learn linear programming and optimization to solve industry problems.
5. find out feasible solution of engineering problems for convergence and divergence.

### SYLLABUS

#### Unit-I: Vector Calculus & Higher Calculus

Review of gradient, Curl, Divergence and directional derivatives: Line, Surface and volume integrals, Green's theorem in xy- plane, Gauss divergence theorem and Stoke's curl theorem (without proof), and related problems.

Extremals of functions (by mean of Euler- Poisson equation), Isoperimetric problems, Beta and Gamma functions, Dirichlet & Liouville's multiple integrals, Representation of a definite integrals in Legendre & Jacobi forms of Elliptic Integrals of first, second and third kind.

#### Unit-II: Probability & Statistics

Review of Theorems on Probability, conditional probability; Law of total probability, Baye's Theorem and related problems; Random variable and Probability distribution, mean & variance of Binomial & Poisson distributions, Normal, Gamma and Beta distribution and related problems, Moments, Moments generating functions, measures of Skewness & Kurtosis, Correlation and Regression Analysis.

#### Unit-III: Fourier Series & Fourier Transforms

Fourier's series (full range and half range) for arbitrary period, Representation of a function in terms of Fourier integral, Fourier Sine integral and Fourier Cosine integral, Infinite complex Fourier transform, Finite & infinite Fourier sine & cosine transforms and their inverse transforms, Properties of different transforms and associated theorems, application in integral equations and boundary value problems.

#### Unit-IV: Difference Equation & Linear Programming

Complementary function, particular integral and general solutions of linear difference equations with constant and variable coefficients, Formulation of LP problems, solution of LPP using graphical method and simplex method. Construction of dual of LPP, Optimization of LPP by dual simplex method and solution of transportation problems.

**Unit-V: Convergence And Divergence Of Infinite Series & Special Functions**

Generating functions, Recurrence relations and orthogonal properties for Bessel's functions  $J_n(x)$  and Legendre's polynomials  $P_n(x)$ , Jacobi series, Fourier-Bessel series and Fourier-Legendre series, Differential equations reducible to Bessel form, Rodrigue formula for  $P_n(x)$  and related problems. Test for convergence and divergence of infinite series using comparison test, D'Alembart's ratio test, Logarithmic test, Raabe's test, Cauchy  $n^{\text{th}}$  root test, Leibnitz test for convergence of alternating series, Absolute & conditional convergence and uniform convergence.

**Text/ Reference Books:**

1. A.B. Mathur & V.P. Jaggi : Advanced Engineering Mathematics
2. B.S. Grewal: Higher Engineering Mathematics, 43<sup>rd</sup> Edition
3. R.K. Jain and S.R.K. Iyengar : Advanced Engineering Mathematics, 4<sup>th</sup> Edition
4. H.C. Taneja : Engineering Mathematics Volume I, II.
5. Erwin Kreyszig : Advanced Engineering Mathematics, 10<sup>th</sup> Edition

# SEMESTER – IV

## STRUCTURAL ANALYSIS-I CE-401

**L: 2 T: 1 P: 0 Cr: 3**

### COURSE OUTCOMES

Upon successful completion of the course a student should be able to:

1. understand the concept of load calculations for structural analysis
2. identify determinate, indeterminate, stable and unstable structures
3. apply different methods for the determination of slope and deflection in determinate structures
4. determine forces in determinate trusses, beams and frames
5. plot influence lines for beams trusses and three-hinged arches.

### SYLLABUS

#### Unit-I: Forms of Structures

beams, trusses, arches, cables, industrial frames, multistory building frames, shell structure etc.; Loads: DL, imposed loads (LL, WL, seismic load, snow load, erection load etc.); Idealization of structures; types of supports; stability and static determinacy & indeterminacy to beams & frames; free body diagram; Arch structures: 3-hinged parabolic & circular arches, thrust, radial shear and bending moment diagram, spandrel braced arches.

#### Unit-II: Deflection of beams

Moment area method, conjugate beam method, application of these methods to statically determinate beams & frames; Flexural stiffness of beam with far end pinned & fixed, carry over factor, fixed beams, propped cantilever beam.

#### Unit-III: Energy methods

Forms of elastic strain energy, axial stress, shearing stress, multi-axial state of stress; Impact load, suddenly applied load, gradually applied load, static load, quasi-static load; Strain energy in members: axial loaded members, under bending, under shearing, circular members under torsion; Law of conservation of energy: virtual work, virtual work on rigid body, virtual work on elastic body; Betti's law and Maxwell's law of reciprocal deflection, application of virtual work on beams (application of product integral table); flexural stiffness of beam with far end pinned; Deflection of statically determinate rigid frames.

#### Unit-IV: Deflection of pin jointed plane trusses

Method of virtual work; Unit load method; Castigliano's theorems, application of Castigliano's theorems to brackets, lamp posts & curved members; Deflection of truss due to temperature variation; fabrication error and camber.

#### Unit-V:

Influence Line for Statically determinate structures: Influence Lines, Influence Lines for Beams, Qualitative Influence Lines, and Influence Lines for trusses and three-hinged arches.

#### Textbook

1. Structural Analysis, by R. C. Hibbeler, Pearsons
2. Structural Analysis by C. S. Reddy, Tata McGrawHill

## References

1. Intermediate Structural Analysis by C. K. Wang, Tata McGrawHill
2. Structural Analysis by Pandit & Gupta, Tata McGrawHill
3. Structural Analysis, by T.S., Thandavamoorthy, Oxford Higher Education

## HYDRAULICS CE-402

**L: 2 T: 1 P: 0 Cr: 3**

### COURSE OUTCOMES

At the end of the course, the student should be able to:

1. apply concepts of similitude to model investigation
2. analyse laminar and turbulent flow through circular pipes
3. apply momentum equation for the solution of practical problem
4. analyse pipe flow problems through network of pipes
5. design and conduct experiments on pumps and turbine.

### SYLLABUS

#### Unit-I

Dimensional and Model Analysis: Dimensional analysis and its utility; Buckingham's pi-theorem and Raleigh's method and their application to fluid flow problems; Dimensionless parameter in fluid flow and their relevance; Similarities: Application of dynamic similarity to model investigations, scale ratio for distorted model.

#### Unit-II

Laminar flow: Flow through circular pipes, flow through parallel plates, power absorbed in viscous flow, concept of friction factor, Reynolds's number and its significance; Boundary Layer: Boundary layer along a thin plate and its characteristics, laminar and turbulent boundary layer, laminar sub-layer; Displacement, energy and momentum thickness, separation of boundary layer and its control, drag and lift.

#### Unit-III

Turbulent Flow: Nature of turbulent flow and its origin, Reynolds's stress, Prandtl's mixing length hypothesis; Momentum integral equation; Hydro dynamically smooth and rough boundaries, Velocity distribution for turbulent flow in smooth and rough pipes; Friction factor in smooth and rough pipes, Moody's diagram, and Colebrook's equation.

#### Unit-IV

Pipe flow: Hazen William & Darcy Weisbach equation, minor and major losses, Pipes in series and parallel; Concept of equivalent length, Dupuits equation, , two reservoir problem, pipe network, Hardy cross method, Time of emptying a reservoir through a weir, power transmission through pipes, water hammer.

#### Unit-V

Turbine: General layout of hydroelectric power plant, impulse and reaction turbines, efficiency of turbines, classification based on discharge, head and specific speed, unit power and unit discharge.

Pumps: Reciprocating Pumps, working principal of both double and single reciprocating pump, indicator diagram frictional loss, centrifugal pump, their advantages over reciprocating pump, classification of centrifugal pump, operation of centrifugal pump in series and parallel.

### **Textbook**

1. Robert L Daugherty, Fluid Mechanics with Engineering Applications, McGraw-Hill

### **References book**

1. John F. Doughlas, Janusz M. Gasiorek, John A. Swaffield, and Lynne B. Jack. Fluid Mechanics, Pearson, 2012
2. Bruce R. Munson, Donald F. Young, and Theodore H. Okiishi, Fundamentals of Fluid Mechanics, 5th Edition, John Wiley and Sons, 2006
3. Modi, P. N. and Seth, S. M. Hydraulics and Fluid Mechanics, Standard Publishing House, Delhi, 2009
4. A.k. Jain Fluid Mechanics, Standard Publishing House, Delhi,

## **BUILDING CONSTRUCTION CE-403**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

At the end of the course, the student should be able to:

1. understand various types of foundation, their functions and essential requirements
2. understand different types of masonry structure and their construction methods
3. apply the knowledge of different types of floors, roofs, stairs and escalators in civil engineering
4. understand various types of doors, windows, lintels, arches, building finishes and formworks with their applications
5. apply the knowledge of damp proofing treatment and sound insulation techniques in buildings

### **SYLLABUS**

#### **Unit -I: Foundation**

Functions of Foundations, Essential requirements of a good Foundation, Types of Foundations; Shallow Foundations, Deep Foundations.

#### **Unit -II: Masonry**

Stone Masonry and Brick Masonry, Different terms used in Masonry, Bond and its types, Composite Masonry, Panel Walls, Load Bearing Walls, Compound Walls, Cavity Walls, Partition Walls.

#### **Unit -III: Floors and Roofs**

Flooring: General Considerations, Different types of Floorings, Flat-Floor and Flat-Roof Construction, Different types of Upper Floors.

**Sloped Roofs:** Types of Sloped Roofs.

**Stairs and Escalators:** Requirements of a good stair, Location and Types.

#### **Unit -IV: Doors and Windows**

Doors, Windows and Ventilators; Location, Size, Classification and details.

**Lintels and Arches:** Different types.

**Building Finishes:** Plastering, Pointing, Painting and Polishing, White/Colorwashing, Plastic Paints.

**Formwork:** Shuttering and Scaffolding.

### **Unit -V: Damp Proofing and Water Proofing**

Treatment of Floors, Walls and Basement, Miscellaneous Topics- Fire Protection, Thermal and sound Insulation of Buildings.

#### **Textbook**

1. Building Construction by BC Punmia & AK Jain
2. Building Construction by PC Varghese
3. Building Construction & Material by Gurcharan Singh
4. Building Construction by Sushil Kumar

## **GEOMATICS CE-404**

**L: 2T: 1 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course, a student should be able to:

1. apply the fundamentals of astronomy for mapping to solve real world problem.
2. establish control points and prepare maps on different coordinate and projection systems.
3. apply modern electronics and satellite technology of measurement of distances and coordinates for civil engineering projects.
4. apply basic concepts and principles of photogrammetry for mapping.
5. study dynamic changes on the earth surface using different types of satellites products and overlaying techniques.

### **SYLLABUS**

#### **Unit-I:**

Field Astronomy: Astronomical terms, coordinate systems, solution of astronomical triangle; kinds of time, conversion of time; corrections to the observed altitude; determination of azimuth and latitude.

#### **Unit-II:**

Triangulation: concept, figures and systems; trigonometrical leveling: plane and geodetic observations; concept of map, coordinate systems, and projections

#### **Unit-III:**

Electronic distance measurement (EDM): importance, principle, classification; applications of total station; global navigation satellite system (GNSS): introduction, principle and applications

#### **Unit-IV:**

Photogrammetry: introduction, geometric characteristics of aerial photograph, scale of a vertical and tilted photograph; determination of horizontal ground length from photo-coordinates; relief displacement; flight planning; image parallax and stereoscopy.

**Unit-V:**

Remote Sensing: Introduction, principles, electromagnetic energy and its interaction with matter; sensors and platforms, image interpretation. Geographic information system (GIS): Overview, definition, components, data models.

**Text Books**

1. Elementary Surveying, Charles D. Ghilani, Paul R. Wolf. 14th Edition, Prentice Hall, 2014.
2. Surveying-Bannister, Raymond and Baker, Pearson Education
3. Remote Sensing and Image Interpretation by Lillesand and Kiefer, John Wiley & Sons, Inc.
4. Principles of Geographic Information Systems by Burrough, P.A. and McDonnell R.A., Oxford: Clarendon Press.

**Reference**

1. Surveying and Leveling, T. P. Kanetkar and S.V.Kulkarni Vol.1 & 2, VidhyarthiGriha, Prakashan, Pune
2. Plane and Geodetic Surveying for Engineers, David Clark and Jackson J. E., CBS Publications and distributors, New Delhi.
3. Advanced Surveying, Agor, Khanna Publications, Delhi. An Introduction to Geographical Information

## **ESTIMATING AND COSTING CE-405**

**L: 3T:0 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. Students will be familiar with planning of residential buildings.
2. Students will be able to understand the various methods for estimation of buildings.
3. Students will be familiar with the contract system in the civil engineering.
4. Students will be able to understand the computation of earth work and different types of earth works
5. Students will be able to understand the importance of valuation in construction, rent fixation and tenders.

**SYLLABUS****Unit-I: Introduction**

Definition of estimate, Quantity Survey, plinth area, covered area and floor area estimates, data required for the preparation of estimate, types of estimate, methods of estimating, long wall short wall method and center line method, units of measurements and degree of accuracy in estimating (as per 27- 1984)

**Unit-II: Building Estimates**

Preliminary estimates of building by given plinth area, floor area and covered area, various forms used in estimating, estimation of two room building by long wall short wall method and center line method.

**Unit-III:**

Analysis of rates, purpose of analysis rate, to fix up rate per unit of an items, requirement of rate of analysis for materials and labor (skilled & unskilled), factors affecting rate of analysis of rate for concrete work, brick work and plastering.



**Unit-IV:**

Estimate of multistory building, tender, tender notice, tender form, tender documents, notice inviting tender (NIT), global tender, informal tender, unbalanced tender, abstracting, methods of taking out quantities, computation of earth work.

**Unit-V:**

Importance of valuation in construction, credential of valuer, classification of value- definition, assessed value, book value, market value, salvage value, scrape value and capitalized value, valuation & purpose of valuation, terms used in valuation.

**Textbook**

1. Estimating and costing by B N Datta, S S Dutta and Co.
2. Estimating and costing for civil Engineering by G S Birdie
3. Building Drawing by Shah, Kale and Patki
4. Estimating and Costing in Civil Engineering Theory and Practice, by Dutta B.N

## NUMERICAL ANALYSIS AND COMPUTER PROGRAMMING CE-410

**L: 3 T: 1 P: 0 Cr: 4**

**COURSE OUTCOMES**

1. Students will be able to interpolate values of a function at a given intermediate value to formulate most of the application problems in science and engineering.
2. Student will be able to interpolate values of successive derivations of a tabulated function and single integral as well as multiple integral provides.
3. Students will be able to find roots of algebraic and transcendental non-linear equations involving one and more variables.
4. Students will be able to solve complex system of simultaneous linear equations and to fit variety of curves.
5. Students will be able to solve higher order differential equation numerically and boundary value problems.

**SYLLABUS****Unit-I: Interpolation With Equal & Unequal Intervals Of The Argument**

Newton-Gregory, Gauss, Stirling and Bessel Formulae, Aitken & cubic spline interpolation methods for equal intervals; Newton's divided difference and Lagrange's formulae for unequal intervals; Inverse interpolation using Lagrange's formula, method of successive approximation and double interpolation.

**Unit-II: Numerical Differentiation & Numerical Integration**

Numerical successive differentiation using Forward, Backward, Central difference interpolation formulae. Newton's divided difference formula. Review of Trapezoidal, Simpson's 1/3 and 3/8 rules, Numerical integration using Boole's rule, Weddle's rule, Gauss-Legendre, Lobatto, Radau and Gauss-Chebyshev rules. Errors in Quadrature formulae, Romberg integration and Numerical double integration.

**Unit-III: Numerical Solutions Of Algebraic & Transcendental Equations**

Bisection, Regula-False position, Newton-Raphson & Graeffe's Root-Squaring method for the solution of non-linear algebraic & transcendental equations involving one variable, rate of

Convergence and error analysis of the methods, Newton-Raphson method for the solution of a system of non-linear equations of two variables.

#### **Unit-IV: Numerical Solution Of A System Of Simultaneous Linear Equations & Curve Fitting**

Gauss Elimination & Gauss-Jordan methods, Ill conditioned linear system, Gauss-Seidal and Crout methods for the solution of a system of linear equations in four unknowns; General curves (linear, quadratic, exponential and other non-linear functions) fitting using methods of least squares.

#### **Unit-V: Numerical Solutions Of Ordinary Differential Equations & Boundary Value Problems**

Numerical approximate solutions of a system of simultaneous and higher order differential equation using Taylor's series method, Picard's method and Runge-Kutta fourth order method; Runge-Kutta, Fehlberg method, Modified Euler and Milne methods; Solution of boundary value problems using finite differences method and cubic spline method.

#### **Textbook**

1. M.K. Jain, S.R.K. Iyengar & R.K. Jain: "Numerical Methods for Scientific and Engineering Computation", 4th Edition, New
2. Age International Publisher, Daryaganj, New Delhi-01
3. S.S.Sastry: "Introductory Methods of Numerical Analysis", 4th edition, Prentice Hall of India, Jhilmil House, Patparganj, New Delhi.
4. Steven C. Chapra & Raymond P. Canal, "Numerical Methods for Engineers", Tata McGraw Hill Book Co.
5. V. Rajaraman, "Computer Oriented Numerical Methods", Prentice Hall of India Pvt. Ltd.
6. Madhumangal Pal, "Numerical Analysis for Scientists & Engineers, Theory & C Programs", Narosa Publishing House, Daryaganj, New Delhi – 110002.
7. Shanta Kumar M, "Computer Based Numerical Analysis", Khanna Publishers, Delhi – 110002.
8. B.S. Grewal, "Numerical Methods in Engineering & Science with Programming in C/C++", Khanna Publishers.
9. Radhey S. Gupta; "Elements of Numerical Analysis", Macmillan India Ltd.

# SEMESTER – V

## STRUCTURAL ANALYSIS-II CE-501

**L: 2 T: 1 P: 0 Cr: 3**

### COURSE OUTCOMES

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

1. analyse indeterminate beams, frames and trusses (degree one & two) by using Force/ Flexibility/ Compatibility/ Consistent Deformation Methods.
2. analyse the beams for symmetrical/ unsymmetrical bending; and analyse cables; suspension bridges with three & two hinged stiffening girders.
3. analyse continuous beams/ intermediate beams and frames (sway problems) by using Three Moment Theorem and Slope Deflection Methods.
4. analyse fixed beams/ portal frames by Column Analogy method and analyse Indeterminate Trusses, Mill Bents, portal frames, continuous beams and building frames by Cantilever and Portal methods.
5. analyse different structures by developing Stiffness/ Displacement matrices.

### SYLLABUS

#### Unit-I: Introduction:

Force / flexibility / compatibility / consistent deformation method of analysis ;Superposition, compatibility & equilibrium, flexibility coefficients, flexibility matrices, application of the method to indeterminate beams, frames and trusses to degree one & two.

#### Unit-II: Unsymmetrical bending

Introduction, double symmetric beams with skew loads, pure bending, shear flow and shear center; Analysis of cables; Analysis of suspension bridges with three & two hinged stiffening girders.

#### Unit-III: Indeterminate Structures

Continuous beam- Three Moment Theorem; Slope deflection method and its application to analysis of indeterminate beams & frames, yielding of supports, sway problems.

#### Unit-IV: Column analogy method

Application to fixed beams, properties of symmetrical analogous column, analysis of portal frames. Approximate analysis of statically indeterminate structures: Indeterminate Trusses, Mill Bents, portal frames, continuous beams and building frames, cantilever method and portal method.

#### Unit-V: Stiffness/ Displacement method

Development of stiffness matrix for pin jointed structure and frames, development of method for a structure having forces at all degrees of freedom, development of method for a general case, direct stiffness method.

#### Textbook

1. Intermediate Structure Analysis By C.K. Wang, Tata McGraw-Hill.
2. Structure Analysis By Pandit & Gupta, Tata McGraw-Hill.
3. Basic Structural Analysis By C.S. Reddy, Tata McGraw-Hill.
4. Structure Analysis By Thandavamoorthy, Oxford

#### References

1. Structure Analysis By Norris & Wilbur.
2. Basic Concepts of Structure Analysis By Beaufait, F.W.

3. Examples in Structural Analysis By William M. C. McKenzie.

## **DESIGN OF STRUCTURE I**

### **CE-502**

**L: 3 T: 0 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

Upon successful completion of the course student should be able to:

1. understand the importance of RC structural design basic concept, working stress method.
2. apply the theory of limit state design of RCC structural members using first principles.
3. have adequate understandings of relevant Shear.
4. gain knowledge about Indian standards, use of design charts & table for design of beams and slabs.

#### **SYLLABUS**

##### **Unit-I:**

Characteristic strength, stress-strain relationship for concrete and steel, IS specifications (IS 456, 875 & 1893), characteristic imposed loads, DL, EL & WL. Design philosophies – Working stress method and limit state method. Strength and serviceability requirements, Analysis and design for flexure of singly / doubly rectangular and flanged beam sections – by working stress method.

##### **Unit-II:**

Analysis and design for flexure of singly / doubly rectangular and flanged beam sections – by limit state method. Serviceability limit states for deflection and cracking, requirements for curtailments and detailing of reinforcement, minimum / maximum tension and compression reinforcement, minimum & maximum spacing of bars; Introduction and use of design aid (SP-16), calculation of deflection.

##### **Unit-III:**

Bond stress: flexural & anchorage bond stress, design bond stress, development length, anchorage length; Behaviour of beams in shear, design for shear & torsion as per limit state method; Reinforcement detailing.

##### **Unit-IV:**

Complete design of a cantilever and simply supported beam with and without overhang; Design of continuous beams with Rectangular, T & L sections; Introduction to slabs: rectangular slab, one way simply supported & continuous slab and their design; Comparison of manual design with the software available.

#### **Textbook**

1. R. C. C. Design by Pillai and Menon, Tata McGraw Hill
2. Reinforced Concrete Design by S. N. Sinha, Tata McGraw Hill
3. Limit State Design by P. C. Verghese, Prentice Hall
4. Reinforced Concrete Limit State Design, Ashok K Jain Namechand & Bros Rorkee

#### **References**

1. Structural Analysis by Norris, Wilbur
2. “Code of Practice for Plain and Reinforced Concrete”, BIS, New Delhi, IS456-2000.

3. “Design Aids for Reinforced Concrete to IS 456”, Special Publication (SP16), BIS New Delhi, 1980.
4. “IS: 1343- 1980, IS Code Of Practice For Prestressed Concrete”, BIS, New Delhi, 1980

## **DESIGN OF STRUCTURE II**

### **CE-503**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course student should be able to:

1. learn the concept of analysis and design of steel structures.
2. analyze and design of bolted and welded connections.
3. analyze and design of tension members with different failure criteria.
4. analyze and design of columns/built up columns with various configurations and end conditions.
5. analyze and design of laterally supported and unsupported beams.

### **SYLLABUS**

#### **Unit-I: Design of Connections**

Common steel structure, advantages and disadvantages of steel structures, type of steel, rolled steel sections, special considerations in steel design, design philosophy, limit state design, design strength, deflection and serviceability limits, stability checks; Riveted, bolted and welded connections, classification of bolts and types of bolted connections, **IS 800-2007** specifications for design of bolted connections, worked examples on design of bolted joint, shear capacity and tension resistance of bolts (**IS-1364**), design examples of fillet and butt weld connections, design of eccentric bolted and welded connections.

#### **Unit-II: Design of Tension members**

Design strength of tension member due to yielding of gross section, rupture strength of critical section and block shear, tension splices and lug angles; design of bolted and welded connections for ties subjected to both bending and axial tension.

#### **Unit-III: Design of Compression members**

Shape of compression members, buckling class of cross-section, slenderness ratio, design compressive stresses and strengths, use of IS800-2007 tables for design stresses, design of compression members, design of laced and battened columns, design of column splices; Column bases: design of slab base and gusseted base.

#### **Unit-IV: Design of Beams**

Behavior of beam in flexure, section classification, plastic moment carrying capacity of a section, bending and shear strengths of laterally supported beams, design of laterally supported beams, deflection limits, web buckling and web crippling, design of built-up beams, design strength of laterally unsupported beams, effective lengths for lateral torsional buckling, design of laterally unsupported beams.

### **Textbook**

1. Limit State Design of Steel Structures, SK Duggal, Tata Mac-Graw-Hill Publication-2010.
2. Limit-State-Design of Steel Structures by N. Subramaniam, Oxford University Press-2009
3. Strength of Materials by B C Punmia.

## References

1. IS 456-2000: Code of practice for plain and R. C. BIS, New Delhi.
2. I.S.800:2007,"Code for general construction in steel structures," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
3. I.S.875 (part I to part V)," Code Of Practice For. Design Loads," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
4. I.S.226," Steel for general structural purposes," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
5. I.S.808:1989,"Code for Classification of Hot Rolled Steel ," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
6. I.S.226," Steel for general structural purposes," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
7. I.S.808:1989,"Code for Classification of Hot Rolled Steel ," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
8. I.S.816:1969," Code of practice for use of metal arc welding for general construction in mild steel," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.

## OPEN CHANNEL FLOW CE-504

**L: 2 T: 1 P: 0 Cr: 3**

## COURSE OUTCOMES

Upon successful completion of the course a student should be able to:

1. understand geometrical properties of channel sections of different shape.
2. apply the concept of specific energy in the analysis of channel transitions.
3. understand and analyze flow profiles on different sloped channels.
4. analyze rapidly flow problems with focus on practical applications to real-world problems.
5. understand the importance of devices used in the measurement of flow through channels.

## SYLLABUS

### Unit-I

Introduction: classification of open channel flow. Geometric properties of channel section, Velocity and Pressure distribution in Channel Flow, Kinetic energy and momentum correction factors. Uniform flow, Application of Manning's and Chezy's formulae.

### Unit-II

Specific Energy: Critical Flow, Specific Energy and Force. Transitions in channels, channel with a hump, transition with change in width, choking flow. Channel conveyance, section factor for critical flow and uniform flow computations. Most economical section of a channel.

### Unit-III

Gradually varied flow: Gradually varied flow equation, assumptions and different forms of the equation, characteristics and classification of flow profiles. Analysis of flow profiles on mild, steep, horizontal and adverse slopes. Solution of the gradually varied flow equation, Graphical integration method, Direct step method.

### Unit-IV

Rapidly varied Flow: Hydraulic Jump, its definition and types. Momentum equation for the jump, characteristics of jump in horizontal rectangular channel, computation of energy loss and length, location of jump, and pressure distribution, energy dissipaters

### **Unit V**

Measuring devices in open channel: Flow in channels with sharp & broad crested weir. Flow measurement with non rectangular weirs; Triangular, circular and parabolic weir. Discharge using linear proportional weir, Sutro weirs, Quadratic weir, Ogee spillway and sluice gate.

### **Textbook**

1. Open channel flow by V.T Chow. McGraw Hill.

### **References**

1. Flow in Open channels by K Subramanya. Tata McGraw- Hill.
2. Flow in Open channels by RangaRaju. Tata McGraw- Hill.

## **SOIL MECHANICS CE-505**

**L: 3 T: 1 P:0 Cr: 4**

### **COURSE OUTCOMES**

At the end of the course work, the students will be able to:

1. understand soil identification, index properties and their determination, and phase diagram of the soil.
2. solve 1-D, and 2-D problems of flow through soils.
3. calculate vertical stresses in the soils due to overburden and applied loads
4. interpret compaction and consolidation characteristics of different soils.
5. evaluate shear strength parameters of the soils and their application in geotechnical problems.

### **SYLLABUS**

#### **Unit-1: Classification and Properties**

Origin and formation of soils, Soil Structure and Fabric, Three Phase System and Phase Relationships, Classification: Unified and IS Classification System, Index Properties

#### **Unit-II: Flow Through Soils**

Permeability, one dimensional flow, Darcy's Law, Two dimensional flow, Flow nets, uplift pressure, piping

#### **Unit-III: Stresses in Soil**

Total, Neutral and Effective Stresses, Seepage Force, Quicksand condition, Stress Distribution under applied loads: Boussinesq's and Westergaard's Equations, Newmark's Chart

#### **Unit-IV: Compaction and Consolidation**

Compaction: Lab and Field Compaction, Proctor Compaction Tests; Compressibility, One dimensional consolidation and its time rate.

#### **Unit-V: Shear Strength and Lateral Earth Pressure**

Shear Strength: Mohr-Coulomb strength criteria, Direct and Triaxial shear tests, Vane Shear Test, Unconfined Compression Test, Drainage Conditions, Stress Paths, Shear Strength Parameters.

**Textbook**

1. Soil Mechanics and Foundation Engineering by K R Arora, Standard Publishers Distributor
2. Soil Mechanics and Foundation by Punmia, Jain and Jain; Laxmi Publications (P) Ltd.
3. Engineering Properties of Soils by S K Gulati, Tata McGrawhill

**Environmental Engineering – I**  
**CE-506****L: 2 T: 1 P: 0 Cr: 3****COURSE OUTCOMES**

Upon successful completion of the course a student should be able to:

1. understand various important parameters required for design of water supply systems
2. understand design of various components of water supply systems
3. understand important water quality parameters
4. understand basic principles and design philosophies of various treatment operations and process
5. understand advanced methods of water treatment

**SYLLABUS****Unit-I:**

Water demand: Types of demands, factors affecting per capita demand, variations in demand; Population forecasting; Sources of water supply: estimation of water quantity, factors governing the selection of source; Water conservation measures.

**Unit-II:**

Intakes: Types of intakes, factors governing the location of intake; Reservoirs: types of reservoirs, capacity of reservoir; Water distribution system: requirements of a good distribution system, methods of distribution, layout and design of water supply systems; Pipes: types of pipes for transporting water, pipe appurtenances, testing of pipelines.

**Unit-III:**

Water Quality: Physical chemical and microbiological water quality parameters and their significance; Water borne diseases and their control; drinking water quality criteria and standards; Natural processes occurring for self-cleansing of water bodies; Engineered systems of water treatment

**Unit-IV:**

Aeration: Mechanics of gas transfer, types of aerators, applications of aeration; Sedimentation: theory of sedimentation, design of sedimentation tank, types of sedimentation tanks; Coagulation: theory of coagulation, types of coagulants and coagulant aids, and flocculation, design of flocculation tank.

**Unit-V:**

Water softening: Chemical precipitation, ion exchange; reverse osmosis; Filtration: theory of filtration, types of filters and their classification, filter operations; disinfectioning: types of disinfectants, chlorination; Site selection for treatment plant; layout considerations for treatment plant; Operation and maintenance of treatment plants.

**Textbooks**

1. Modi PN, Water Supply Engineering (Environmental Engineering-I), Standard Book House, 2010



## 2. Garg Santosh Kumar, Water Supply Engineering

### References

1. Qasim Syed R, Motely Edward M, Zhu Guang, Water Supply Engineering, Prentice Hall of India 2006
2. Peavy Howard S, Rowe Donald R, Tchobanoglous George, Environmental Engineering, McGraw Hill Education (India) Pvt Ltd 2013
3. Sincero Arcadio P, Sincero Gregoria A, Environmental Engineering – A Design Approach, Prentice Hall of India 2010
4. Gray NF, Water Technology – An Introduction for Environmental Scientists and Engineers, Elsevier, 2nd Ed.
5. Davis Machenzie L, Water and Wastewater Engineering – Design Principles and Practice, McGraw Hill Education (India) Pvt Ltd 2014
6. CPHEEO, Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, Government of India.
7. Walter J, Weber Jr, Physicochemical Processes for Water Quality Control, John Wiley & Sons, 1972

**SEMESTER – VI**  
**STRUCTURAL ANALYSIS III**  
**CE-601**

**L: 2 T: 1 P: 0 Cr: 3**

**COURSE OUTCOMES**

1. To analyze structures subjected to rolling loads.
2. To analyze beams, portal frames and gable frames using moment distribution method
3. To analyze beams using plastic theory
4. To apply basic concepts of structural dynamics for the analysis of structures
5. To analyze the behavior of two-hinged and fixed arches

**SYLLABUS**

**Unit-I: ILD and its application**

Single concentrated load, UDL (shorter and longer than span), two concentrated loads, series of concentrated loads for maximum shear force at a section, BM under a given load, maximum BM at a given section, absolute maximum shear & moment in beams; Muller Breslau principle and its application

**Unit-II: Moment distribution method**

Member stiffness factor, joint stiffness factor, carry over factor, distribution factor, procedure for analysis, application to continuous beams and frames with and without sway, symmetrical and unsymmetrical frames

**Unit-III : Plastic Analysis**

Basis of plastic theory, bending of beams symmetrical about both axes, fundamental conditions for plastic analysis, rigid plastic analysis, analysis of beams and frames

**Unit-IV: Structural Dynamics**

Introduction, various terms used in the vibration analysis: Simple harmonic motion, free or natural vibrations, damping, damping coefficient, mass and stiffness.

**Unit-V: Two-hinged and hingeless arch**

analysis of symmetrical arch, temperature effect, elastic centre method

**Text Books**

1. Intermediate Structural Analysis by C. K. Wang, Tata McGrawHill
2. Structural Analysis by Pandit & Gupta, Tata McGrawHill
3. Strength of Materials by B C Punmia
4. Structural Analysis by B C Punmia

**Reference Books**

1. Structural Analysis by Norris, Wilbur
2. Structural Dynamics by M Mukhopadhyaya
3. Dynamics of Structures by Chopra
4. Earthquake Resistant Design of Structures By Pankaj Agarwal and Manish Shrikhande, Publication, Prentice Hall of India Pvt. Ltd.
5. Seismic Analysis of Structures by T K Datta, Wiley

**Software or other Requirement**

1. STAAD Pro

## **DESIGN OF STRUCTURE III**

### **CE-602**

**L: 2 T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

Upon successful completion of the course, a student should be able to:

1. assess the load criteria and design of RCC slab and staircases.
2. design reinforced concrete short and long columns subjected to uni-axial and bi-axial compression.
3. select the most suitable section shape and size for Plate girder and design according to specific design criteria.
4. analyse and design roof trusses & estimation of wind load. Design of gantry girder for different loading combinations.

#### **SYLLABUS**

##### **Unit-I: Design of slabs and stairs**

Various type of slabs and their behavior, design of two- way rectangular slabs with different boundary conditions, use of moment coefficients, provision for corner reinforcement; Design of stairs.

##### **Unit-II: Design of Columns**

Columns, various cross sections, effective length, slenderness ratio, short and long columns, design of columns under axial compression, uni-axial and bi-axial compressions, uses of interaction curves of SP16 for column design.

##### **Unit-III: Plate girder**

Elements of plate girder, self weight of plate girder, economical depth, size of flanges, shear buckling resistance of web, end panel design, anchor forces, design of connections between flanges and web plates, design of bearing and intermediate stiffeners, and their connections with web; Design of plate girders.

##### **Unit-IV: Roof Trusses**

Types of roof trusses, loads on trusses: wind load estimation, snow load, live load and load combinations, bracings, spacing of trusses, purlins, sheetings, analysis of trusses, grouping of members, design of members, bolted joints and end bearings.

##### **Unit-IV: Gantry Girder**

Loads for gantry girders, position of moving load for maximum effect, profile of gantry girders, limitation on vertical deflection, design procedure of gantry girder.

#### **Textbook**

1. Limit State Design of Steel Structures, SK Duggal. Tata Mac-Graw-Hill Publication-2010.
2. Limit-State-Design of Steel Structures by N. Subramaniam-2009, Oxford University Press.
3. Limit State Design of Concrete Structures by Verghes, Vol. 1.

#### **References**

1. Reinforced Concrete Design, by S U Pillai and Devdas Menon, Tata-McGraw-Hill Publishing Company Limited, New Delhi.
2. Comprehensive Design of RCC Structures, by B C Punmia, A K Jain and A K Jain, Laxmi Publications (P) Ltd, New Delhi
3. Design of Reinforced Concrete Structures, by SRamamrutham, Dhanpat Rai Publishing Company, New delhi,
4. Limit State Theory and design of reinforced Concrete, by V L Shah and S R Karve, Structures Publications, Pune, 2011

5. Reinforced Concrete Structures, by Park R and Paulay T, John Wiley & Sons, Inc., New York, 1975
6. IS 456: 2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi

## **ENGINEERING HYDROLOGY**

### **CE-603**

**L: 2 T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

Upon successful completion of the course students should be able to:

1. understand various components of hydrological cycle
2. estimate various abstractions from precipitation such as evapotranspiration and infiltration
3. derive relationship between rainfall and runoff using statistical techniques and plot stage-discharge relationship
4. derive unit hydrographs of different durations, and develop synthetic unit hydrographs
5. apply the technique of flood routing for the mitigation of floods in channels

#### **SYLLABUS**

##### **Unit-I**

Precipitation: Hydrologic cycle, World's Water balance, Types and Forms of precipitation. Measurement of precipitation. Adequacy of rain gauges. Average rainfall over an area.

##### **Unit-II**

Evaporation: Evaporation process, Transpiration, Evapotranspiration, measurement of evapotranspiration- Thornwaite and Balaney criddle methods. Evaporation Control. Infiltration: Infiltration Process, factors affecting infiltration, measurement of infiltration, infiltration indices

##### **Unit-III**

Surface Runoff: Factors affecting runoff. Rainfall – runoff relationships, empirical equations. Flow duration Curve. Stream Gauging: Measurement of stage, velocity. Direct and indirect methods of stream flow measurement. Rating curve, Stage discharge relationship.

##### **Unit-IV**

Hydrograph: Introduction, Base flow separation. Unit hydrograph. Derivation of unit hydrograph for simple and complex storms. Unit hydrograph of different durations.

##### **Unit-V**

Flood: Flood flow formulae, Design flood Frequency analysis using external type and log Pearson type III distribution. Flood Routing: Basic equation, Hydrologic storage routing in reservoirs and channels.

#### **Textbook**

1. Engineering Hydrology by K Subramanya, Tata McGraw- Hill.

#### **References**

1. Elementary Hydrology by V. P. Singh, Prentice Hall
2. Hydrology for Engineers by Linsely R. k. Tata McGraw- Hill.

3. Hand book of Applied Hydrology by V.T. Chow. Tata McGraw- Hill.

## **GEOTECHNICAL ENGINEERING CE-604**

**L: 2 T: 1 P: 0 Cr: 3**

### **COURSE OUTCOMES**

The student will be able to

1. compute lateral earth pressures exerted.
2. analyse stability of slopes.
3. calculate bearing capacity of the shallow foundation by using different theories.
4. interpret the data obtained from the geotechnical investigations.
5. judge the appropriate use of geotextiles to improve their properties as per the requirement.

### **SYLLABUS**

#### **Unit- I**

Lateral earth pressures; Rankine's Theory for lateral earth pressure computation (active and passive cases), effect of surcharge loading, water table fluctuations and soil stratification, computation of total lateral thrust and location of resultant earth pressure on earth retaining wall, estimation of depth of unsupported vertical cut in Cohesive backfills.

#### **Unit -II**

Stability of slopes; basis of analysis, different factors of safety, finite and infinite slopes, types of slope failures, stability analysis of infinite slopes of cohesionless and cohesive soils, stability analysis of finite slopes with Swedish circle method and Taylor's stability chart/number and improving stability of slopes. Causes of landslides and remedial measures.

#### **Unit- III**

Introduction to foundation & bearing capacity of soils; basic definitions-ultimate, net-ultimate, net safe and safe bearing capacities, allowable bearing pressure, load-settlement curve, types of shear failures of foundation soils, Terzaghi's bearing capacity theory for a shallow strip footing, ultimate bearing capacity for local shear failure, comparison of Terzaghi's & Meyerhof's Theories, effect of water table fluctuations, shape size and depth of footing, eccentric and inclined loading on bearing capacity of shallow foundation.

#### **Unit -IV**

Purpose extent and methods of site investigation, Boring and sampling techniques, Samplers Boring records – Ground water observations, Plate load test, Penetration tests (standard penetration test Static & Dynamic Cone penetration test IS Codes: 1888 (Pt-I), 2131, 4968 (Pt-I, III) Geophysical methods; Seismic and soil resistivity method.

#### **Unit- V**

Types of geotextiles, applications in separators, reinforcement, filtration/drainage, erosion control etc. Construction methods of retaining walls with reinforced backfill. Shallow foundations on reinforced earth (improving bearing capacity and reducing settlement).

### **Textbook**

1. Soil Mechanics and Foundation Engineering by K R Arora, Standard Publishers Distributor.

2. Soil Mechanics and Foundation Engineering by Punmia, Jain and Jain; Laxmi Publications (P) Ltd.
3. Engineering Properties of Soils by S. K. Gulati, Tata McGraw Hills.

### **References**

1. Principles of Geotechnical Engineering by B. M. Das & Khaled Sobhan, CENGAGE Learning Custom Publishing.
2. Soil Mechanics by T.W. Lambe and R.V. Whitman, John Wiley & Sons.
3. NPTEL Lectures on Soil Mechanics and Geotechnical Engineering.

## **ENVIRONMENTAL ENGG - II CE-605**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

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

1. understand the importance of wastewater treatment and reuse & safe disposal.
2. have adequate understanding of the mechanisms of wastewater treatment
3. have understanding of disposal of treated effluent and its reuse
4. understand the importance of sludge treatment and its reuse
5. analyze and design the treatment facility and safe sludge handling

### **SYLLABUS**

#### **UNIT-1: Wastewater Engineering**

An overview; constituents in wastewater, different sources of wastewater: domestic, industrial and storm water; types of sewerage and drainage system; Estimation of wastewater flow rates and its variations: Estimation of peak, average and lean flow; drainage discharge; Hydraulics of sewers; Design of wastewater collection systems; Design of storm water drains, Rainwater harvesting system and its design

#### **UNIT-II: Wastewater Characteristics**

Physical, chemical and microbiological characteristics of wastewaters; typical characteristics of sewage: decay of sewage relative stability, population equivalent, effluent discharge standards; Eutrophication; Response of streams to biodegradable organic waste: dissolved oxygen balance and its modeling, factor affecting stream flow rejuvenation

#### **UNIT-III: Classification of Treatment Process**

Primary, secondary and tertiary treatment; types of screens and its design, assessment of head loss through screen, classification of grit chambers, its application and design, oil and grease removal; Design of primary and secondary clarifiers/ sedimentation tank; Tertiary Treatment: Polishing techniques used after secondary treatment/ effluents

#### **UNIT-IV: Secondary/ Biological Treatment of Sewage**

Theory of biological treatment: Microbial growth kinetics, suspended and attached growth systems: Aerobic Treatment-Activated Sludge Process and its modifications, Trickling Filter/Bio Towers and Rotating Biological contractors; Anaerobic Treatment-Upflow Anaerobic Sludge Blanket Process

### **UNIT-V: Sludge Management and its Disposal**

Regulation for reuse and disposal of solids; Sludge thickening and its digestion; Low cost sanitation: decentralized wastewater treatment - stabilization ponds, aerated lagoons, oxidation ditch; Reuse of treated effluents; Concepts of zero discharge

#### **Textbook**

1. Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill
2. Introduction to Environmental Engineering, Davis & Cornwell, McGraw Hill
3. Wastewater Engineering Treatment & Reuse, Metcalf & Eddy, McGraw Hill, USA
4. Environmental Engineering- A design Approach, Sincero & Sincero, Prentice Hall of India
5. Wastewater Treatment Plants: Planning, Designing and Operation, S.R. Qasim, CRC Press, USA
6. Wastewater Treatment for Pollution Control and Reuse, Soli J. Arceivala & Asolekar, Tata McGraw Hill, India
7. Post Treatment of Anaerobically Treated Effluents, V.K. Tyagi, Abid Ali Khan, Anwar Khursheed, A.A. Kazmi, Ng Wun Jern, IWA Publishing, UK

## **TRANSPORTATION ENGINEERING CE-606**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course students should be able to:

1. gain knowledge on highway planning, alignment surveys and project preparation.
2. learn basic concepts of highway geometrics and geometric design of roads and intersections.
3. understand basic concepts, analysis and design of traffic flow and traffic facilities.
4. gain knowledge of different highway materials and their characteristics. Design of mix and flexible pavements using IRC Codes.
5. design the rigid pavements using IRC Codes. Gain knowledge of construction, maintenance and drainage of highways.

### **SYLLABUS**

#### **Unit-I: Introduction**

Importance of Transportation, Different modes of transportation, Brief history of road development around the world. Twenty year road development plans, Necessity of highway planning, Road patterns, Preparation of Master Plan and its phasing, Highway alignment, Engineering and other surveys for highway location, Highway projects evaluation.

#### **Unit-II: Highway Geometric Design**

Introduction Design speed, Highway cross – section elements, Analysis of sight distances, Design of horizontal and vertical alignments – all pertinent elements, Types of intersection, Principles of intersection design.

#### **Unit-III: Traffic Engineering**

Traffic characteristics, traffic studies – volume, speed, origin and destination, parking and accident studies, Traffic controls- traffic signs, marking and traffic signals, Highway capacity, Signal design.

**Unit-IV: Highway Materials**

Subgrade soil, aggregates and bituminous material; different tests on these materials. Bituminous mix design, pavement types, Soil stabilized roads. Pavement design: Introduction, Design parameters, Design of flexible pavement (IRC method).

**Unit-V:**

Design of rigid pavement (IRC method), construction of WBM road, bituminous pavements and cement concrete pavement, Highway maintenance and drainage.

**Textbooks**

1. Highway Engineering by Khanna, Justo and Veeraragavan, Nem Chand and Bros, Roorkee.
2. Transportation Engineering by Chakroborty and Das, PHI.
3. Relevant IRC codes.

**References**

1. Transportation Engineering and Planning by Papacostas and Prevedouros, PHI.
2. Pavement analysis and design by Y H Huang, Pearson Prentice Hall.
3. Specifications for roads and bridges by MoRTH (Ministry of Road Transport and Highways, Govt of India, V Revision)



# **SEMESTER – VII**

## **DESIGN OF STRUCTURE IV CE-701**

**L: 2 T: 1 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course a student should be able to:

1. design different types of footings and retaining walls
2. design different types of water tanks
3. design different types of bridges and culverts
4. analyse and design prestressed concrete structures

### **SYLLABUS**

#### **Unit-I: Foundation and their types**

Detailed design of Isolated and combined footing, design of wall footings. Retaining walls: Cantilever and Counter fort type, their design using limit state method.

#### **Unit-II: Water tanks**

Design criteria, material specifications and permissible stresses; IS 3370 (Pt. 1, Pt.2, Pt. IV) 2009; Design of circular and rectangular water tanks resting on ground & underground using working stress approach, cracking width in immature concrete and mature concrete in flexure and direct tension.

#### **Unit-III: Bridges**

Introduction, various types, super-structures, sub-structures, IRC loadings; Design of deck slab of culvert, Design of T-beam Bridge. Introduction to prestress concrete bridge.

#### **Unit-IV: Prestressed concrete**

Methods and systems, anchorages, prestress losses, analysis and design of sections for flexure based on working stress.

#### **Textbook**

1. Pillai S. Unnikrishna and Menon Devdas, Reinforced Concrete Design, McGraw-Hill, 3<sup>rd</sup> edition, 2015.

#### **References**

1. Lin, T.Y. and Burns H. Ned, Design of Prestressed Concrete Structures, Wiley, 2012
2. Victor D. J. 5th Edition, Essentials of Bridge Engineering, Wiley, 2006
3. Raju N. Krishna, Design of Reinforced Concrete Structures, CBS Publishers and Distributors Pvt Ltd, 4th ed., 2016
4. Sharma N., Reinforced Cement Concrete Design, Katson Books, 2014.

# **IRRIGATION ENGINEERING**

## **CE-702**

**L: 3 P: 0 T: 0 Cr: 3**

### **COURSE OUTCOME**

Upon the completion of course, students will be able to

1. underline the irrigation needs and planning ;
2. estimate water requirements of crops and irrigation water requirements;
3. design the canal system and identify the needs of various hydraulic structures;
4. analyze the subsurface flow and be able to design weir, canal falls, cross drainage works;
5. assess the remedial measures for water logging and design of lined canal.

### **SYLLABUS**

#### **Unit- I:**

Irrigation in India – Necessity, scope of irrigation, irrigation schemes, ongoing projects, engineering aspects of project planning; Water application – crop types, water requirements and its estimation, water application efficiencies and techniques of field irrigation.

#### **Unit-II:**

Design of Alluvium Channels, Silt theories – problems of silting and scouring, Kennedy's theory, design procedure, drawbacks, Lacey's silt theory, channel design procedure, drawbacks, Comparison between Kennedy's and Lacey's theory, Lacey's non-regime equation, L-section of a channel, balancing depth, Use of Garret's diagram, Cross-section of irrigation channels.

#### **Unit-III:**

Weirs and barrages – components, functions, causes of failure; Bligh's creep theory, Lanes's weighted creep theory, Khosla's theory, pressure calculations, Design – sloping glacis weir and protection works,.

#### **Unit-IV:**

Water logging – effects of water logging, causes of water logging and their remedial measures. Canal lining – advantages, types of lining, and design of lined channels. Regulation works. Canal falls, types of falls, Design of Sarda type fall.

#### **Unit-V:**

Cross-Drainage works, Types of works, factors affecting the suitability of CD works, classifications of aqueducts and siphon aqueducts, Design- maximum flood discharge, water way, transitions, head losses, uplift pressures etc.

### **Textbooks**

1. Irrigation, Water Resources and Power Engineering by P.N. Modi , Standard Book House, Delhi , Latest edition.
2. Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publishers, Latest edition

### **References**

1. Irrigation and Water Resources Engineering by G.L. Asawa, New Age International Publishers
2. Theory and Design of Irrigation Structures by ByVarshney and Gupta, Vol. I and II,
3. Hydraulic Structures by Novak, P. , AIB Moffat and Nalluri and R Narayanan, Taylor and Francis
4. NPTEL

# **FOUNDATION ENGINEERING**

## **CE-703**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course a student should be able to:

1. analyse and design of earth retaining structures.
2. interpret soil investigation data and be able to calculate bearing capacity of foundations.
3. design shallow foundations.
4. design deep foundations viz. pile foundations, well foundations.
5. understand soil dynamics and analyse the foundations subjected to dynamic loadings.

### **SYLLABUS**

#### **Unit-I: Earth Retaining Structures-1**

Introduction to Coulomb's earth pressure theory and other graphical methods for cohesive and granular soil. Classification of earth retaining structures (Rigid and Flexible). Analysis of Retaining Walls: Cantilever, Counterfort and Buttress.

#### **Unit -II: Earth Retaining Structures-2**

Analysis of Sheet pile walls, bulkheads, and anchored sheet pile. Stability Analysis and Design of Braced Excavations.

#### **Unit- III: Shallow Foundations**

Types and general requirements of shallow foundation; Bearing capacity consideration, settlements of foundations, I.S. Code recommendations. (I.S. 6403, 8009). Design of shallow foundations.

#### **Unit- IV: Deep Foundations**

Types, purpose and classification of pile foundations: Construction of piles, pile load test, load capacity and settlement of piles; Design of Pile foundations, use of relevant I.S. Code (I.S. 2911: Part I-IV); Well foundation: Types, element and construction well foundation, principles of design.

#### **Unit- V: Soil Dynamics & Machine Foundations**

Introduction to soil dynamic, definitions, spring mass system, single degree of freedom system, free and forced vibration of damped and undamped systems; Types & criteria for design of machine foundations. Analysis and design of block foundation; Vibration isolation (active and passive method).

### **Textbook**

1. Design of foundation and Retaining Structures By S. Prakash, G Ranjan& S Saran; SaritaPracashan, Meerut
2. Soil Dynamics By Shamsheer Prakash; McGra Hill, London
3. Soil Mechanics and Foundations By B C Punmia& Ashok Kumar Jain; Laxmi Publications, Delhi
4. Environmental Engineering – A Design Approach, Sincero&Sincero, Prentice Hall of India

### **References**

1. Basic and applied soil mechanics, Gopal Ranjan and Rao A.S.R., New Age International Publishers
2. Geotechnical Engineering, Venkatramiah, New Age International Publishers
3. Geotechnical Engineering, Shashi K. Gulhati and Manoj Dutta, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Foundation Engineering, Leonards G.A., McGraw Hill
5. Foundation Design, Teng W.C., PHI

# **ENGINEERING ECONOMY& CONSTRUCTION MANAGEMENT**

## **CE-704**

**L: 3 T: 1 P: 0 Cr: 4**

### **COURSE OUTCOMES**

Upon successful completion of the course students should be able to:

1. understand and calculate economic equivalence and to be able to Identify and use some excel functions commonly applied in engineering economics.
2. evaluate most engineering project proposals using a well-accepted economic analysis techniques.
3. understand structure of construction organization and its functions, labour laws and to be able to understand the use and selection of construction equipment
4. learn the application of basic network technique of PERT in construction management.
5. Learn the application of basic network technique of CPM in construction management.

### **SYLLABUS**

#### **Unit-I:**

Basic concepts of engineering economics, cash flow diagram, minimum attractive rate of return, single payment, uniform series and gradient series factors – their derivation and use, nominal and effective interest rates, use of multiple factors, depreciation and depletion, present worth comparison of equal and different lived alternatives.

#### **Unit-II:**

Capitalized cost calculation, annual worth (AW) evaluation using salvage sinking fund, salvage present worth and capital recovery plus interest method, comparing alternatives by AW, rate of return evaluation by present worth and AW method, benefit/ cost ratio analysis

#### **Unit-III:**

Overview of construction industry, structure of construction organization and its functions, management functions and responsibilities, labour relations, construction equipment: power shovel hoe, bulldozer, dumper, trailers, and tractors, rollers, sheep foot roller, batching plants.

#### **Unit-IV:**

Planning, scheduling , basic network techniques, Gantt charts, PERT Network, time estimates, probability distribution, time computations, earliest expected time, latest allowable occurrence time, network analysis, slack, critical path.

#### **Unit-V:**

CPM network, floats, crashing a network, introduction to precedence networks.

### **Textbooks**

1. Engineering Economy by Leland T. Blank, Anthony J. Tarquin, McGraw-Hill Book Company, New Delhi.
2. PERT and CPM by L.S.Srinath ,Affiliated East-West Press Pvt. Ltd, New Delhi.

### **References**

1. Construction Planning, Equipment and Methods by Robert L. Peurifoy, William B. Ledbetter, Clifford J. Schexnayder, McGraw-Hill Book Company, New Delhi.
2. Fundamentals of Construction Management and Organization by Kwaku A. Tenah Jose M. Guevara Reston Publication Co., Inc.,A Prentice-Hall Company Reston, Virginia

3. Construction Planning, Equipment and Methods by Robert L. Peurifoy, William B. Ledbetter, Clifford J. Schexnayder, McGraw-Hill Book Company, New Delhi.C

## **ENVIRONMENTAL ENGINEERING III**

### **CE-705**

**L: 2 T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

Upon successful completion of the course a student should be able to:

1. understand the significance of air pollution and its impact identification
2. analyze and solve problems of air pollutants dispersion
3. design solutions for air pollution control devices
4. identify, formulate, and analyse problems related to solid waste and its management
5. analyze the impacts of projects on environment and its management plan

#### **SYLLABUS**

##### **Unit-I: Air pollution**

Meteorology, plume rise, plume behavior, dispersion of pollutants, factors affecting dispersion, Gaussian dispersion model, assumptions, applications and limitations.

##### **Unit-II: Introduction to air pollution control devices**

Particulate and gaseous contaminants, constructional features, working principle, design of control devices for particulate and gaseous contaminants.

##### **Unit-III: Solid wastes**

Physical and chemical characteristics of solid waste, generation, collection and disposal of solid waste, land filling operations.

##### **Unit-IV: Noise pollution**

Definition, fundamental concepts, sources and effects of noise, measurement techniques, noise pollution control and current standards.

##### **Unit-V: Introduction to environmental impact assessment**

Objectives, attributes of EIA, different techniques of EIA, impact assessment and environmental management plan.

#### **Textbooks**

1. Environmental Pollution Control engineering by CS Rao, Published by Wiley Science
2. Air Pollution: Its Origin And Control by Wark Kenneth Jr. , Wayne T. Davis, Cecil F. Warner Printice Hall
3. Air Pollution Control Engineering, 2nd Edition by Neol De Nevers, Mc Graw Hill
4. Environmental Engineering, Howard S Peavy , Donald R Rowe , George Tchobanoglow, Published by Tata McGraw-Hill, New Delhi

#### **References**

1. Textbook Of Noise Pollution And Its Control by S.C. Bhatia, Atlantic Publisher
2. Introduction To Environmental Engineering And Science by Glibert M. Masters published By Dorling Kinderslay India
1. Environmental Impact Assessment by PR Trivedi, PHP Publisher

2. An Introduction to Ecology and Environmental Science by P.C. Prabhu, C. Udayasoorian, G. Balasubramanian by Abhijit Publications

## **TRANSPORTATION ENGINEERING II**

### **CE-706**

**L: 2 T: 1 P: 0 Cr: 3**

#### **COURSE OUTCOMES**

Upon successful completion of the course students should be able to:

1. build concept in different means of public and private transportation, sustainability and design of public transit network .
2. understand basic concepts, analysis and design of railway track.
3. understand basic concepts, analysis and design of railway track geometrics, stations, yards, signaling and metro railway.
4. analyse and design aspects of airports, runway, taxiway and air traffic control.
5. understand basic concepts of water transportation and bridge engineering.

#### **SYLLABUS**

##### **Unit-I:**

Urban transportation problems, Transportation and urban growth, Mass transit system, Comparison of different transit modes, Transit and environment, Transit and urban sustainability, Route design and scheduling of transit system.

##### **Unit-II:**

Introduction of railways, Railway Track, gauge, Track components – Rail, rail fittings, fixtures, Sleepers and ballast requirements and specification per kilometer of track, Formation and cross-section details, drainage, track defects.

##### **Unit-III:**

Geometric design of track, Points and Crossing, Station and Yards, Level crossing, Signaling and control, Suburban Railways, Metro railways system, Modernization of railways, Underground Railways and Tunneling.

##### **Unit-IV:**

Aircraft Characteristics, airport planning, site selection and configuration, Obstruction and zoning, Runway and taxiway design, Basic runway length and corrections, geometric design elements, Visual aids – marking and lighting, air traffic control and aids, Airport capacity.

##### **Unit-V:**

Sea Port, Harbors, Types and selection of site, Break-waters, Jetties, Wharves. Navigation aids: Buoys and light houses, Inland water transportation.

Components and classification of bridges, site investigation, waterway design.

#### **Textbook**

1. Urban Mass Transportation Planning, A. Black, McGraw Hill.
2. Railway Engineering by Chandra and Agarwal, Oxford University Press.
3. Railway Engineering by Saxena and Arora, Dhanpat Rai Publications.
4. Air Transportation Planning and Design by Saxena, CBS Publisher.

#### **References**

1. Planning and Design of Airports by Horonjeff and McKelvey, McGraw Hill.

2. Dock and Harbour Engineering, Oza and Oza, Charotar Publisher.
3. Bridge Engineering, Ponnuswamy, Tata McGraw Hill.

# **SEMESTER-VIII**

## **SYLLABUS FOR ELECTIVESEARTHQUAKE RESISTANT DESIGN CE 801**

**L: 4 T: 0 P: 0 Cr: 4**

### **COURSE OUTCOMES**

Upon successful completion of the course students should be able to:

1. understand the concept of strong seismic motion and dynamics of structure.
2. understand the effects and behaviour of structures under earthquake.
3. gain adequate knowledge on seismic terminology and lateral forces on structures
4. learn ductile detailing of RCC structures, earthquake resistant design of masonry buildings as well as retrofitting

### **SYLLABUS**

#### **Unit-I:**

Strong motions and Dynamics of Structure: Strong motions, Introduction, Terminology of Strong Motion, Nature of Ground Motion: source effect, Path effect, site effect. Amplitude, peak ground acceleration, vertical acceleration, seismometer and other seismic instruments.

Dynamics of Structure, modelling of Structure, lumped mass approach, equation of Motion, mathematical and structural modelling, System of Multiple Degrees of Freedom, Responses Spectrum.

#### **Unit-II:**

Effects and Behavior of structures under Earthquake: Introduction, Natural time period of site and structure, Liquefaction of soil, Restoring force, Damping, Effects of Structural Irregularities (vertical, plan and mass). Seismoresistant Building Architecture, Building Characteristics. Introduction of IS 1893:2002, Design Philosophy, Use of IS 1893:2002 and Determination of Design Lateral Forces: Equivalent Static Lateral force Method.

#### **Unit-III:**

Determination of Lateral Forces: Use of IS 1893:2002, Determination of Design Lateral Forces: Response Spectrum Method, Time History Method.(eigen values and eigen vectors, modal participation factors, modal mass, Use of ABS, SRSS, CQC methods)

#### **Unit-IV:**

Ductile detailing of RCC Structures, Earthquake Resistant Design of Masonry Buildings and Retrofitting: Ductility Considerations: Introduction, Assessment of Ductility, Factors Affecting Ductility, Ductility Factors, Ductile Detailing as per Use of IS 13920: 1993, Load transfer mechanism of joints

Earthquake Resistant Design of Masonry Buildings and Retrofitting: Behavior of masonry building under earthquake, lateral Load Analysis of Masonry Buildings. Design of brick masonry wall under vertical and laterals loads, concepts of Repair, Restoration and Strengthening of existing buildings, Methods of Retrofitting

### **Textbook**

1. Earthquake Resistant Design of Structures by Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
2. Elements of Structural Dynamics by Glen V. Berg, Prentice Hall Englewood Cliffs, New Jersey
3. Dynamics of Structures by Anil K. Chopra, Pearson Education
4. Geotechnical Earthquake Engineering by Steven L. Kramer, Pearson Education



# **WATER RESOURCES ENGINEERING**

## **CE 802**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

1. Apply the concept of sustainable development to the management of water resources projects
2. Analyze water resource systems using linear and dynamic programming, and conduct financial analysis of projects
3. Analyze and design components of flood control infrastructure with environmental and societal considerations
4. Identify, formulate, analyze, and solve problems related to hydropower production
5. Apply appropriate techniques for the analysis and design of complex river training works

### **SYLLABUS**

#### **Uni-I:**

Water resources of India, global water resources, surface and ground water resources, multipurpose uses of water purposes served by water resources development projects, impact of climate change on water resources, single and multipurpose projects, consumptive, non-consumptive, and partial consumptive use, firm yield, secondary yield, estimation of reservoir yield and storage capacity of reservoirs

#### **Unit-II:**

Sediment transport: Mechanism of sediment transport, sediment load, bed load, suspended load, reservoir sedimentation, trap efficiency, capacity-inflow ratio, measures for control of reservoir sedimentation, estimation of useful life of reservoir

#### **Unit-III :**

Floods and their management, Probable maximum flood, standard project flood, flood estimation techniques, classification of methods of flood control, flood plain management, flood damages, methods for estimation of flood damages, national policy on flood control

#### **Unit-IV:**

General arrangement of hydroelectric projects, hydropower development of India and the world, major hydroelectric projects in India, comparison with thermal and nuclear plants, issues related to hydropower production, firm and secondary power, power duration curves, reliability of hydropower production, illustrative examples

#### **Unit-V:**

River morphology; classification of rivers and river training works, methods of river training works, marginal embankments, guide bunds, groynes, cutoffs, bank pitching and launching aprons, design of guide bunds.

#### **Textbooks:**

1. Water Resources Engineering, R. K. Linsley et al.
2. Water Resources Engineering, Larry W Mays
3. Water Resources Engineering, S K Garg
4. Water Resources Engineering, P. N. Modi

#### **References**

1. Water Resources Engineering, Ralph A. Wurbs, Wesley P. James, Prentice Hall

2. Applied Hydrology, V. T. Chow et al.
3. Water Resources Systems Planning and Management“,Chaturvedi, M.C. Tata McGraw HillPub. Co., N Delhi
4. Water Resources Systems“,Hall. W.A. and Dracup, Tata McGraw Hill Pub. N Delhi

## **GROUND WATER ENGINEERING CE803**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course, a student should be able to:

1. learn different terminologies related with groundwater hydrology.
2. learn techniques of groundwater balance.
3. understand the principle and design of rain water harvesting structures.
4. understand the techniques of drilling techniques.

### **SYLLABUS**

#### **Unit-1:**

Hydrologic Cycle , Concept of Groundwater in Hydrologic Cycle, Sub Surface Strata Analysis as Aquiclude, Aquitord , aquifuge and Aquifers Explanation of Unconfined, semi –confined and Confined Aquifers, Perched Aquifers. Geophysical methods for Groundwater Exploration , Resistivity System, Application of Schlumberger and Wenner’s configurations.

#### **Unit-II:**

Groundwater Balance Study. Concept of Gross Recharge, Recoverable recharge , Draft and Status of Groundwater Analysis using NABARD’s Norms and Local Norms . Numerical problems on Groundwater balance Equation and Status of Groundwater Stage of development. Analysis of Categories of Groundwater as White Category,Grey and Black Category.

#### **Unit-III:**

Principle and Definition of Rainwater Harvesting. Classification and Determination of Rainwater Harvesting. Numerical Problems on Rainwater Harvesting. Feasibility and Design of Rainwater Harvesting. Case Study on Rainwater Harvesting.

#### **Unit-IV:**

Introduction of Drilling techniques. Drilling in Alluvium and Soft Rock area, Reverse Rotary Drilling and Direct Rotary drilling methods,Calayx method, Drilling in Hard Rock area, DTH method and Woodex Method, Percussion Drilling. Geophysical Logging and Tube well design.

### **Reference**

1. Groundwater Hydrology: Devid Keith Todd,
2. Hydrogeology : K.R. Karanth
3. Groundwater : H. M. Ragunath

# **CONSTRUCTION PROJECT MANAGEMENT**

## **CE-804**

**L: 4 T: 0 P: 0 Cr: 4**

### **COURSE OUTCOMES**

Upon successful completion of the course students should be able to:

1. understand basic concepts of project management, project organization, and estimate project cost for the client
2. use construction planning and application of computers in scheduling and resource leveling
3. evaluate project cost and bidding strategy and management of resources.
4. apply basic concepts of project cost and risk in construction and project monitoring

### **SYLLABUS**

#### **Unit-I:**

Basic concepts of project management, project organization, client's estimation of project cost, construction contract

#### **Unit-II :**

Construction planning: Ladder network, precedence network, the line of balance, network technique advantages, Project scheduling and resource levelling, network crashing and cost-time trade-off. Computer applications in scheduling and resource levelling.

#### **Unit-III:**

Contractor's estimation of cost and bidding strategy, Construction equipment management, Construction material management.

#### **Unit-IV:**

Project cost and value management, risk in construction, Project monitoring and control system. Computer applications in Monitoring and reporting, construction quality management, construction safety management

#### **Textbooks**

1. Construction Project Management, Theory and Practice by Kumar NeerajJha, Pearson Education, New Delhi.
2. Scheduling Construction Projects by Sanra Christian Weber, Pearson Education, New Delhi.

#### **References**

1. Peter Fewings, "Construction Project Management", Taylor and Francis,U.K.
2. Peurifoy, R.L., Ledbetter, W.B.andSchexnayder, C., " Construction Planning,Equipment and Methods ", 5th Edition, McGraw Hill, Singapore, 1995.
3. Sharma S.C. " Construction Equipment and Management ", Khanna Publishers New Delhi, 1988.
4. Deodhar, S.V. " Construction Equipment and Job Planning ", Khanna Publishers, New Delhi, 1988.
5. Dr. Mahesh Varma, " Construction Equipment and its Planning and Application ",Metro-politan Book Company, New Delhi-, 1983.
6. Prasanna Chandra, " Pojects-Planning Analysis Selection Implementation & Review Fourth Edition ",Tata Mc Graw Hill Publishing Co., Ltd., New Delhi., 1995.
7. Joy.P.K.,, " Total Project Management - The Indian Context (Chapters 3- 7) ", New Delhi ,Macmillan India Ltd., 1992.
8. United Nations Industrial Development Organisation (UNIDO) " Manual for the preparation of Industrial Feasibility Studies ", (IDBI Reproduction) Bombay, 1987.

# **ARCHITECTURE AND TOWN PLANNING**

## **CE805**

**L: 3 T: 0 P: 0 Cr: 3**

### **COURSE OUTCOMES**

Upon successful completion of the course students should be able to:

1. understand the brief history and basic principle of architecture.
2. understand basic architectural design.
3. apply the basic concepts of town planning.
4. implement the concept of land use and town planning.
5. understand master plan and its implications.

### **SYLLABUS**

#### **Unit-I:**

Brief history of Architecture, Egyptian, Greek, Roman and Indian architecture. Evolution of various structural forms. Impact of materials on building forms and construction techniques.

#### **Unit-II:**

Philosophy of architectural design: scale, form, texture, balance, skyline, unity, harmony, contrast, proportion. Colour in architecture, site selection and orientation of residential buildings.

#### **Unit-III:**

Evolution of human settlements: Factors and Forces. Utopian concepts of city planning: garden city, vertical city, broad acre city, linear city, Super Block and neighbourhood unit concepts.

#### **Unit-IV:**

Concepts for spatial arrangement of land uses: concentric zone, sector and multiplenuclei concepts, and their applicability to Indian conditions Density in residential and non-residential areas. Land use classification system. Surveys for town planning.

#### **Unit-V:**

Master plans; case studies: one for a new town plan and one for master plan of an existing city. Zoning and sub-division regulations and building byelaws. Agencies for implementation of master plans. Public participation. Problem of slums. Approaches for environmental improvement of slums.

#### **Textbooks**

1. A history of Architecture by Sir Banister Flechure.
2. A General History of Architecture by Bruce All Sopp.
3. Architecture by John Gloag.
4. The principles of Architecture Composition by Howard Robertson.
5. Indian Architecture by Percy Brown.
6. The Urban Pattern. City Planning and Design by Arthur B. Galion and Simon Eisner.