2019-2020

1.1.3 Average percentage of courses having focus on employability/ entrepreneurship/ skill development offered by the institution during the last five years (10)

Sl.No.	Programme Code	Programme name	Course name	Course code		Year of Introduction	Link to the relevant document
1	CE	CIVIL ENGINEERING	Technical English	118ENT01	Employability - This course will enhance the nuances of language skills where students can identify and rectify their errors in language.	2018-2019	
2	CE	CIVIL ENGINEERING	Engineering Mathematics-I	118MAT02	Employability-This course will help the students to model the real life problems	2018-2019	
3	CE	CIVIL ENGINEERING	Engineering Graphics	118EGT05	Employability- The fundamentals and application of Engineering Graphics drive the students as an Engineer since drawing is the language of Engineers.	2018-2019	
4	CE	CIVIL ENGINEERING	Enginering Practice Laboratory	118EPP08	Skill Development- This course will make the students to practice with basic engineering practices like carpentry, welding foundry, electrical and electronics.	2018-2019	
5	CE	CIVIL ENGINEERING	Communicative English	218ENT01	Employability - This course will help students develop their communication skillsskills	2018-2019	
6	CE	CIVIL ENGINEERING	Engineering Mathematics-II	218MAT02	Employability-This course will help the students to model the real life problems	2018-2019	
7	CE	CIVIL ENGINEERING	Engineering Mechanics	218EMT04	Employability- Concepts of Engineering Mechanics and its applications are enabling the students to perform better as an engineer during their employability.	2018-2019	
8	CE	CIVIL ENGINEERING	Physics for Civil Engineering	218BSE05	Employability - Content in the syllabus will help to Integrate the principles in the projects undertaken in field of Civil Engineering	2018-2019	
9	CE	CIVIL ENGINEERING	Problem Solving and Python Programming	218CDP05	Skill development - Course helps to learn the fundamental concepts in python language	2018-2019	
10	CE	CIVIL ENGINEERING	Engineering Mathematics-III	318MAT01	Employability-This course will help the students to model the real life problems	2019-2020	
11	CE	CIVIL ENGINEERING	Mechanics of Solids	318CET02	Employability-gain knowledge on stress,strain and material properties used in construction industry	2019-2020	
12	CE	CIVIL ENGINEERING	Mechanics of Fluids	318CET03	Employability-gain knowledge in behaviour and design of hyrdualic structures	2019-2020	
13	CE	CIVIL ENGINEERING	Construction Materials &Structural Geology	318CET04	Entrepreneurship--gain knowledge in various building materials and construction techniques and geology of earth	2019-2020	
14	CE	CIVIL ENGINEERING	Engineering Survey	318CET05	Entrepreneurship/Skill Develoment-gain knowledge in various surveying techniques and equipments whuich enhances employment opportunities	2019-2020	
15	CE	CIVIL ENGINEERING	Value Education Program	318CET06	Employability- to understand engineering ethics and human values which is important in career throughout	2019-2020	
16	CE	CIVIL ENGINEERING	Engineering Survey Laboratory	318CEP07	Skill Develoment-gain knowledge in various surveying techniques and equipments whuich enhances employment opportunities	2019-2020	
17	CE	CIVIL ENGINEERING	Building Materials & Construction Practices Laboratory	318CEP08	Skill Develoment-gain knowledge in testing of various building materials used in construction	2019-2020	
18	CE	CIVIL ENGINEERING	Building Planning & Drawing	318CEP08	Skill Develoment- gain knowledge in preparing plan and building drawings	2019-2020	
19	CE	CIVIL ENGINEERING	Numerical Methods	418MAT01	Employability-This course will help the students to model the real life problems	2019-2020	
20	CE	CIVIL ENGINEERING	Strength of Materials	418CET02	Employability-gain knowledge on deformation and strains under different load action and response in terms of forces and moments	2019-2020	
21	CE	CIVIL ENGINEERING	Applied Hydraulic Engineering	418CET03	Employability- Concepts of fluid mechanics and applications to fluid machinery will enable the students to perform better as an engineer during their employability	2019-2020	
22	CE	CIVIL ENGINEERING	Geotechnical Engineering	418CET04	Employability-to understand, soil as an engineering material the load- deformation behaviour, through its index and engineering properties	2019-2020	
23	CE	CIVIL ENGINEERING	Water Supply Engineering	418CET05	Employability-gain knowledge in water supply system	2019-2020	
24	CE	CIVIL ENGINEERING	3D Printing and Design	418CEE06	Entrepreneurship/Skill Develoment-gain knowledge in 3D Printing techniques whuich enhances the skill of the student	2019-2020	
25	CE	CIVIL ENGINEERING	Strength of Materials Laboratory	418CEP07	Skill Develoment-gain knowledgen in testing materials for strength	2019-2020	
26	CE	CIVIL ENGINEERING	Hydraulic Engineering Laboratory	418CEP08	Skill Develoment-gain knowledge on various hydraulic engineering problems like open channel flows and hydraulic machines	2019-2020	
27	CE	CIVIL ENGINEERING	Concrete Technology	515CET01	Employability- This course develops skills in concreting technology	2017-2018	
28	CE	CIVIL ENGINEERING	Structural Analysis - I	515CET02	Employability-gain basic knowledge on analysing structures	2017-2018	
29	CE	CIVIL ENGINEERING	Design of RCC Structures	515CET03	Skill Develoment-Design skill of RC memebers helps in design of safe and stable RC structures	2017-2018	
30	CE	CIVIL ENGINEERING	Water Supply Engineering	515CET04	Employability-gain knowledge in water supply system	2017-2018	

Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130

31	CE	CIVIL ENGINEERING	Foundation Engineering	515CET05	Employability-suggest and design a suitable foundation for a structure depending on the type of soil. Also understand and analyze different types of earth pressure and perform stability checks for retaining wall	2017-2018
32	CE	CIVIL ENGINEERING	Water Shed Management	515CEE04	Employability - gain knowledge in modern techniques and manage storm water and flood	2017-2018
33	CE	CIVIL ENGINEERING	Geotechnical Engineering Laboratory	515CEP07	Skill Develoment - knowledge on soil tests and investigations helps in civil engineering projects	2017-2018
34	CE	CIVIL ENGINEERING	Public Health Engineering Laboratory	515CEP08	Skill Develoment - gain knowledge on water testing and environmental pollutants	2017-2018
35	CE	CIVIL ENGINEERING	Extensive Survey Camp (Two Weeks)	515CEP09	Entrepreneurship/Skill Develoment-through hands on training and applications on survey methods and equipments helps in employability opportunities as a surveyor	2017-2018
36	CE	CIVIL ENGINEERING	Structural Analysis - II	615CET01	Employability-gain knowledge in analysis of structures to find design forces	2017-2018
37	CE	CIVIL ENGINEERING	Design of Steel Structures	615CET02	Skill Develoment-Design of steel structures as per IS codes is essential for a civil engineer. He can design steel structures such as beams, columns, roof truss, gantry girder, etc.	2017-2018
38	CE	CIVIL ENGINEERING	Sanitary Engineering	615CET03	Employability-gain knowledge to design various unit operations and processes for sewage treatment system and hence can handle waste water disposal issues	2017-2018
39	CE	CIVIL ENGINEERING	Transportation Engineering - II	615CET04	Employability-gain skills to plan and design Railways , Airports and Harbour structures	2017-2018
40	CE	CIVIL ENGINEERING	Irrigation Engineering	615CET05	Employability-design skills for irrigation structures enhance their placement opportunities in the Civil consultancy offices	2017-2018
41	CE	CIVIL ENGINEERING	Advanced Concrete Technology	615CEE01	Entrepreneurship-To know the properties of different materials used for making special concrete	2017-2018
42	CE	CIVIL ENGINEERING	Pre-fabricated Structures	615CEE02	Entrepreneurship-Prefabricated structures is the innovative construction practice and useful for placements	2017-2018
43	CE	CIVIL ENGINEERING	Earthquake Resistant Structures	615CEE03	Employability-knowledge on earthquake resistant structures wil enhance job opportunities in Large scale earthaquake resistant projects	2017-2018
44	CE	CIVIL ENGINEERING	Design of PSC Structures	615CEE04	Skill Develoment-Knowledge of prestressed concrete structures helpful in large span bridge and building construction projects	2017-2018
45	CE	CIVIL ENGINEERING	Smart Structures	615CEE05	Employability-Work with various types of Sensors used in smart structures	2017-2018
46	CE	CIVIL ENGINEERING	Concrete and Highway Laboratory	615CEP07	Skill Develoment-Find out the properties of cement,aggregate,bitumen,concrete.	2017-2018
47	CE	CIVIL ENGINEERING	Computer Aided Design - I	615CEP08	Entrepreneurship/Skill Develoment-gain knowledge on software used for drafting and it helps in employment opportunities	2017-2018
48	CE	CIVIL ENGINEERING	Irrigation Drawing	615CEP10	Skill Develoment- Design and draft the various components of the Tank. Design and draft the various irrigation impounding structures.	2017-2018
49	CE	CIVIL ENGINEERING	Environmental Engineering Drawing	615CEP11	Skill Develoment-gain knowledge on water testing and environmental pollutants	2017-2018
50	CE	CIVIL ENGINEERING	Steel Structural Drawing	615CEP12	Entrepreneurship/Skill Develoment -gain knowledge on software used for drafting and it helps in employment opportunities	2017-2018
51	CE	CIVIL ENGINEERING	Bridge Engineering Drawing	615CEP13	Skill Develoment-This course enhances the skill set in design of structural members in particular the desgin of members in a bridge	2017-2018
52	CE	CIVIL ENGINEERING	RCC Structural Drawing	615CEP14	Skill Develoment-gain knowledge on software used for drafting and it helps in employment opportunities	2017-2018
53	CE	CIVIL ENGINEERING	Estimation and Quantity Surveying	715CET01	Entrepreneurship/Skill Develoment -Knowledge in cost estimation and valuation enhances the job opportunity in the construction field	2018-2019
54	CE	CIVIL ENGINEERING	Ground Improvement Techniques	715CET02	Skill Develoment-Knowledge in ground improvement techniques helps to take up jobs related to Bridge constructions. Also aquires knowledge on the reinforcement details and the use of Geotextiles for filtration, drainage and separation in road and other works.	2018-2019
55	CE	CIVIL ENGINEERING	Rock Mechanics	715CEE03	Employability -gain knowledge on geological factor on rock and solve the field problems associated with rocks and have a knowledge of classification of rock mass	2018-2019
56	CE	CIVIL ENGINEERING	Total Quality Management	715CEE08	Employability-Concepts in TQM is required for Managerial concepts are being implement with no of quality enhancing Tools	2018-2019
57	CE	CIVIL ENGINEERING	Construction Planning & Project Management	715CEE13	Entrepreneurship-knowledge on Construction planning & scheduling helps in High profile construction companies	2018-2019
58	CE	CIVIL ENGINEERING	Architecture & Town Planning	715CEE15	Employability-Knowledge in Urban and regional planning helps in taking up smart city projects and grow as an entreprenuer	2018-2019
59	CE	CIVIL ENGINEERING	Computer Aided Design Laboratory - II	715CEP07	Entrepreneurship/Skill Develoment-gain knowledge on software used for drafting and it helps in employment opportunities	2018-2019

60	CE	CIVIL ENGINEERING	Employability Skills Laboratory	715CEP08	Entrepreneurship/Skill Develoment - gain field knowledge in vrious Civil Engineering subjects	2018-2019
61	CE	CIVIL ENGINEERING	Design Project	715CEP09	Entrepreneurship/Skill Develoment - Students develop their skills in doing research or desgin and enchance their technical report writing and presentation	2018-2019
62	CE	CIVIL ENGINEERING	Disaster Mitigation & Management	815CET01	Employability - gain knowledge about information technologies in disaster risk management. Also enhances awareness of Disaster Risk Management institutional processes in India	2018-2019
63	CE	CIVIL ENGINEERING	Repair & Rehabilitation of Structures	815CEE01	Entrepreneurship-knowledge on repair and rehabilitation of structures will enhance the jobs related to civil consultancy services	2018-2019
64	CE	CIVIL ENGINEERING	Valuation of Real Properties	815CEE05	Entrepreneurship - Analyse the valuation of residential, commercial and industrial buildings. Also gain comprehensive knowledge related to the investment of finance in real properties	2018-2019
65	CE	CIVIL ENGINEERING	Fundamental of Bridge structures	815CEE08	Skill Develoment-This course enhances the skill set in design of structural members in particular the desgin of members in a bridge	2018-2019
66	CE	CIVIL ENGINEERING	Project Work	815CEP05	Entrepreneurship/Skill Develoment-Students develop their skills in doing research or desgin and enchance their technical report writing and presentation	2018-2019

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Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

118ENT01	TECHNICAL ENGLISH	L	T	P	C
		2	0	0	2

OBJECTIVES:

The Course prepares first semester Engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineeringand technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks intheir areas of specialization.

UNIT I ***09***

Listening - Ink talks and gap exercises - **Speaking** – Asking for and giving directions - **Reading** – short technical texts from journals and newspapers - **Writing** - definitions – instructions – checklists – recommendations - **Vocabulary Development** - technical vocabulary - **Language Development** – parts of speech – articles – word formation.

UNIT II ***09***

Listening - longer technical talks - **Speaking** – process description - **Reading** – longer technical texts – **Writing** – graphical representation - **Vocabulary Development** - vocabulary used in formal letters/emails and reports - **Language Development** – tenses - voices - numerical adjectives – question tags.

UNIT III ***09***

Listening - listening to classroom lectures - **Speaking** – introduction to technical presentations - **Reading** – longer texts both general and technical and practice in speed reading – **Writing** – process description using sequence words and sentences - **Vocabulary Development** - Misspelled words – one-word substitution - **Language Development** - embedded sentences – singular and plural nouns compound nouns - editing

UNIT IV ***09***

Listening - Listening to documentaries and making notes - Speaking – mechanics of presentations - Reading – reading comprehension – **Writing** - email etiquettes - job application – cover letter – Résumé preparation - essay writing - **Vocabulary Development** – synonyms and antonyms – paraphrasing - **Language Development** – modals – conditionals.

UNIT V ***09***

Listening - TED talks - **Speaking** – brainstorming and debate – **Reading** – reading and understanding technical articles – **Writing** – reports - minutes of a meeting - **Vocabulary Development**- verbal analogies - phrasal verbs - **Language Development** - concord - reported speech.

TOTAL : 45 hr.

COURSE OUTCOMES:

At the end of the course learners will be able to:

CO1: Read technical texts and write area- specific texts effortlessly.
CO2: Listen and comprehend lectures and talks in their area of specialization successfully.
CO3: Speak appropriately and effectively in varied formal and informal contexts.
CO4: Understand the basic grammatical structures and its applications.
CO5: Write reports and winning job applications.

TEXT BOOKS:

1. Board of editors. **Fluency in English A Course book for Engineering and Technology**. Orient Blackswan, Hyderabad: 2016.
2. Sudharshana. N. P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.
3. Uttham Kumar. N. **Technical English I** (with work book). Sahana Publications, Coimbatore, 2016.

REFERENCES:

1. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi,2014.
2. Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015.
3. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
5. Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.

Students can be asked to read Tagore and Chetan Bhagat for supplementary reading.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	-	-	-	1	-	1	-	-	-	1	-	1	1	-
CO 2	1	2	-	-	-	-	1	-	1	-	-	-	1	-	1
CO 3	-	-	-	-	1	-	1	-	2	-	1	-	-	-	2
CO 4	1	-	1	-	-	1	-	1	-	-	2	-	-	1	-
CO 5	-	1	-	-	-	1	-	1	-	1	-	-	1	-	1

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Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

118MAT02	ENGINEERING MATHEMATICS-I	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the eigen value problems.
- To solve differential equations of certain types, including systems of differentialequations that they might encounter in the same or higher semesters.
- To understand the concepts of curvatures, evolutes and envelopes and to study themaxima and minima of any function.
- To learn the partial derivatives and apply the same to find maxima and minima.
- To solve certain linear differential equations using the Laplace transform techniquewhich has applications in control theory and circuit theory.

UNIT I ***MATRICES*** ***9***

Eigenvalues and eigenvectors of a real symmetric matrix –Properties – Cayley - Hamilton theorem (Statement only) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form –Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II ***DIFFERENTIAL CALCULUS*** ***9***

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolutes as envelope of normals.

UNIT III ***FUNCTIONS OF SEVERAL VARIABLES*** ***9***

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Jacobians – Taylor's expansion– Maxima and Minima – Method of Lagrangian multipliers.

UNIT IV ***ORDINARY DIFFERENTIAL EQUATIONS*** ***9***

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients-Applications to Engineering problems-Electric Circuits, Simple Harmonic Motions and bending of beams.

UNIT V ***LAPLACE TRANSFORM*** ***9***

Laplace transforms – Conditions for existence –Basic properties (without proof) – Laplace Transform of elementary functions, derivatives and integrals, unit step function and impulse functions, periodic functions. Definition of Inverse Laplace transform – Convolution theorem (Statement and applications only) – Initial and final value theorems (Statement and applications only) – Solution of linear ordinary differential equations of second order with constant coefficients using Laplace transform techniques.

TOTAL: 45hr.

Course Outcomes

After completing this course, the student will be able to

CO1: Develop the knowledge of basic linear algebraic concepts.
CO2: Determine the solutions of ordinary differential equations by various methods whichhave an application in their core subjects.
CO3: Acquire the basic knowledge of ordinary differential calculus.
CO4: Compute maxima and minima of a function.
CO5: Apply Laplace transform techniques to solve ordinary differential equations which havean application in many engineering fields.

TEXT BOOKS

1. **Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 10th edition NewDelhi 2016.**
2. **Grewal. B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications,Delhi, 2014.**

REFERENCES

1. T.Veerarajan, "Engineering Mathematics " Tata McGraw-Hill Publishing company, NewDelhi, 2014.
2. Kandasamy.P, Thilagavathy,K., &Gunavathi.K., "Engineering Mathematics for first year "., S.Chand & Company Ltd., New Delhi,2014.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., NewDelhi, 11th Reprint, 2010.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", NarosaPublications, New Delhi, 3rd Edition, 2007.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	-	-	-	-	-	-	-	-	-	1	1	2	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	1	-	-	1
CO 3	3	2	2	-	-	-	-	-	-	-	-	1	-	-	-
CO 4	2	3	1	-	-	-	-	-	-	-	-	1	-	-	-
CO 5	1	1	-	-	-	-	-	-	-	-	-	1	-	1	1

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Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

118PHT03	ENGINEERING PHYSICS	L	T	P	C
		2	0	0	2

Course objectives:

1. To understand the concept of properties of matter.
2. To understand the properties of sound and principles of quantization of energy.
3. To understand the properties of coherent light and its importance.

UNIT-I PROPERTIES OF MATTER 9

Elasticity – Stress – Strain diagram – Factors affecting elasticity – Twisting couple on a wire – Torsion pendulum – Young's modulus - cantilever – Uniform and Non uniform bending (theory and experiment)–Viscosity-Poiseuille's method for Coefficient of Viscosity (Qualitative).

UNIT-II ACOUSTICS AND ULTRASONICS 9

Classification of sound, loudness, intensity – Decibel – Weber Fechner Law – Reverberation and Reverberation time – derivation of Sabine's formula for Reverberation time (Growth and Decay)– Absorption coefficient and its determination.

Introduction of Ultrasonics – Production – magnetostriction effect – magnetostriction generator– piezoelectric effect – piezoelectric generator – Detection of ultrasonic waves, properties – Cavitation – Applications – Depth of sea – Non Destructive Testing.

UNIT-III QUANTUM PHYSICS 9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh–jeans' Law from Planck's theory – Compton Effect–derivation– Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Degeneracy and Non- degeneracy.

UNIT-IV LASER 9

Introduction – Principle of Spontaneous emission and stimulated emission – Population inversion – pumping – Einstein's A and B coefficients – derivation – Types of lasers – He-Ne, CO_2, Nd-YAG, Semiconductor lasers – homojunction – Applications of Laser.

UNIT-V WAVE OPTICS & FIBRE OPTICS 9

Interference – Air wedge (theory & experiment) – Polarization– Methods of polarizing light- Theory of plane circularly and elliptically polarized light.

Principle and propagation of light in optical fibers – Numerical aperture and Acceptance angle– Types of optical fibers (material, refractive index, and mode) – Fiber optical communication system (Block diagram) – Fiber optic sensors – Temperature & Displacement sensors (Qualitative).

Total Hours 45

Course Outcomes:

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

CO1: To understand properties of solids with different types of moduli and to gain knowledgeabout absorption coefficients of solids and different surfaces.

CO2: To understand basic concepts of high frequency sound waves and its applications.

CO3: To understand basic concepts of quantum mechanical behavior of wave and particlealong with applications.

CO4: To understand the concepts of production of laser and its behavior with diffractionprinciple of interference.

CO5: To apply the concept of polarization phenomenon and thereby its applications in fiberoptic communication.

Text Books:

1. R.K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi(2003)
2. Jayaprakash R.N, 'Engineering Physics - I', Dhanam Publications, Chennai, (2007).

Books for reference:

1. R. Murugeshan , Kiruthiga Sivaprasath , Modern Physics S. Chand publications 2016,New Delhi.
2. A. Ghatak Optics The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas,New York, NY 10020.
3. Dr.M.N.Avadhanulu,Introduction to Lasers: theory and applications S.Chand publications 2012,New Delhi.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	-	-	-	-	1	1	2	3	1	1	2	3	3
CO 2	2	1	-	2	1	-	1	-	3	3	1	-	3	2	1
CO 3	3	2	-	-	1	-	1	2	3	3	1	2	3	3	2
CO 4	3	3	1	1	1	-	1	-	2	3	1	-	2	3	3
CO 5	3	3	-	-	-	-	1	1	2	3	1	1	2	3	3

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Krishnagiri (Dt.), Tamil Nadu.

118CYT04	ENGINEERING CHEMISTRY	L	T	P	C
		2	0	0	2

OBJECTIVES:

1. To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
2. To recall the terminologies of electrochemistry and explain the function of batteries andfuel cells with its electrochemical reactions.
3. To understand the fundamentals of corrosion, its types and polymers with its applications.
4. Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I WATER AND ITS TREATMENT *9*

Hardness of water - types - expression of hardness - units - estimation of hardness of water byEDTA - numerical problems - boiler troubles (scale and sludge) - treatment of boiler feed water - Internal treatment (carbonate, colloidal, phosphate and calgon conditioning) external treatmentIon exchange process, zeolite process - desalination of brackish water - Reverse Osmosis.

UNIT II ELECTROCHEMISTRY AND ENERGY STORAGE DEVICES *9*

Electrochemical cell-single electrode potential-standard electrode potential-electrochemical series and its significance-EMF of a cell- Nernst equation -Electrodes-Reference electrodes-hydrogen, calomel, quinhydrone and glass electrodes. Determination of pH of a solution using a glass electrode. Batteries - primary and secondary cells, dry cell, alkaline, lead acid storage cell, Ni-Cd battery and lithium nano battery. Clean energy fuel cells - H2-O2 fuel cell.

UNIT III CORROSION SCIENCE *9*

Corrosion: definition - types of corrosion: chemical and electrochemical corrosion – Pilling Bedworth ratio - types of oxide layer (stable, unstable, volatile, porous) - hydrogen evolution and oxygen absorption mechanism for electrochemical corrosion - mechanism for rusting of iron. Types of electrochemical corrosion: Galvanic corrosion - differential aeration corrosion (pitting, waterline and pipeline). Galvanic series - applications. Factors influencing corrosion: nature of metal and environment. Corrosion control methods: sacrificial anode method - impressed current Cathodic protection method - electroplating - electroless plating.

UNIT IV POLYMERS AND ITS PROCESSING *9*

Advantages of polymers over metals. Monomers - polymers - polymerization - functionality – degree of polymerization - classification of polymers based on source and applications - Molecular weight determination. Types of polymerization: addition, condensation and copolymerization - mechanism of free radical polymerization. Preparation, properties and applications of thermosetting (epoxy resin and Bakelite) and thermoplastics (polyvinyl chloride and polytetrafluoroethylene). Compounding of plastics - injection and extrusion moulding methods.

UNIT V FUELS AND COMBUSTION *9*

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

OUTCOMES:

CO1: Attribute the internal and external treatment methods for the removal of hardness in water for domestic and industrial applications.
CO2: Construct an electrochemical cell and Identify the components and processes in batteriesand infer the selection criteria for commercial battery systems with respect to different applications.
CO3: Utilize electrochemical data to formulate an electrochemical half-cell and cell reactions for corrosion control processes.
CO4: Differentiate the polymers used in day to day life based on its source, properties and applications.
CO5: Analyse the three types of fuels based on calorific value for selected application.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand &Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company **(P) LTD, New Delhi, 2015**
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT,LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi,2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", CambridgeUniversity Press, Delhi, 2015.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	2	-	-	-	-	1	2	2	2	1	2	2
CO 2	3	3	3	3	-	-	-	-	1	1	2	3	1	1	2
CO 3	3	3	2	1	-	2	1	-	1	-	3	3	1	-	3
CO 4	3	2	3	2	-	-	1	-	1	2	3	3	1	2	3
CO 5	3	3	3	3	1	1	1	-	1	-	2	3	1	-	2

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118EGT05	ENGINEERING GRAPHICS (Common to all Non-Circuit Branches	L 2	T 0	P 4	C 3

OBJECTIVES:

1. To understand the graphical skills for drawing the object and the principle of free-hand sketchingtechniques.
2. To understand the principle of orthographic projection of points, lines and plane surfaces.
3. To study the principle of simple solids.
4. To understand the principle of section and development of solids.
5. To understand the principle of Isometric and Perspective projections.

Concepts and conventions (Not for Examination) **03**

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING **15**

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by Eccentricity method – Construction of cycloid

– Construction of involutes of square and circle – Drawing of tangents and normal to the above curves. **Free hand sketching:**

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES **15**

Projection of points and straight lines located in the first quadrant – Determination of true lengths andtrue inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS **15**

Projection of simple solids like prisms, pyramids, cylinders and cones when the axis is inclined to onereference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **15**

Sectioning of simple solids like prisms, pyramids, cylinders and cones in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **12**

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncatedprisms, pyramids, cylinders and cones Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL:75 Hours

COURSE OUTCOMES:

The student will be able to

CO1: Recognize the conventions and apply dimensioning concepts while drafting simple objects.

CO2: Draw the orthographic projection of points, line, and plane surfaces.

CO3: Draw the orthographic projection of simple solids.

CO4: Draw the section of solid drawings and development of surfaces of the given objects.

CO5: Apply the concepts of isometric and perspective projection in engineering practice.

TEXT BOOKS:

1. Ranganath G, Channankaiah and Halesh Koti, "Engineering Graphics", Second Edition, Sahana Publishers, 2015.
2. Bhatt. N.D., "Engineering Drawing" Charotar Publishing House, 53th Edition, 2014.

REFERENCE BOOKS:

1. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw HillPublishing Company Limited, 2017.
2. Gopalakrishnana. K. R, "Engineering Drawing" (Vol. I & II), Subhas Publications, 2014.
3. Basant Agarwal and C.M.Agarwal, "Engineering Drawing", Tata McGraw Hill, 2013.
4. Natrajan K. V, "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2012.
5. M.B.Shaw and B.C.Rana, "Engineering Drawing", Pearson Education India, 2011.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	-	1	-	1	1	-	1	2	1	-	-	1	1	-
CO 2	2	1	2	-	1	1	-	2	1	2	1	1	3	-	-
CO 3	2	1	3	2	3	-	-	2	2	2	1	1	3	1	1
CO 4	2	1	3	3	3	1	1	2	2	2	2	2	-	2	1
CO 5	2	-	1	1	-	2	1	2	1	1	2	-	1	1	-

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118ESE03	BASIC MECHANICAL, ELECTRICAL, ANDELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

Objectives:

1. The students should familiar with foundry and welding processes.
2. The students should familiar with working principle of IC engines and to gain the knowledge about various energy resources, refrigeration and air conditioning systems.
3. To learn the basics of electrical elements.
4. To introduce the fundamental concepts of DC and AC circuits.
5. To interpret the principle and characteristics of semiconductor devices.

PART-A (MECHANICAL)

UNIT – I INTRODUCTION TO FOUNDRY AND WELDING 8

Foundry: Introduction - Patterns –materials. Types of pattern and pattern allowances. Molding sand, types and properties, Molding procedure. Welding: Definition and Classification, Gas welding, Oxy Acetylene welding, Types of flames, advantages and disadvantages of gas welding. Resistance welding - Classification, Spot welding and Seam welding. Soldering - Definition and Classification. Brazing – Definition and Classification.

UNIT - II I C ENGINES, SOURCE OF ENERGY & REFRIGERATION 10

Internal combustion engines, Working principle of Petrol and Diesel Engines, Four stroke and Two stroke cycles, Comparison of four stroke and two stroke engines.
Sources of energy: Introduction, conventional and non-conventional sources of energy, examples, solar energy. Introduction to refrigeration and air-conditioning, COP, properties of refrigerants and types of refrigerants, working principle of vapour compression & vapour absorption refrigeration system, Layout of typical domestic refrigerator, Window and Split type room Air conditioner.

PART-B (ELECTRICAL AND ELECTRONICS)

UNIT – III INTRODUCTION TO BASIC ELECTRICAL ELEMENTS 9

Electrical circuit : passive elements - Resistor, Inductor and Capacitor; active elements-Current, Voltage, Power and Energy – Ohm's Law and limitations - Kirchhoff's Laws – relationship between current, voltage and power – Resistors in series, parallel and series - parallel circuits.

UNIT - IV FUNDAMENTALS OF DC AND AC CIRCUITS 9

DC Circuits: Sources of Electrical Energy - Independent and Dependent Source, Source Conversion - Star –Delta conversion- Mesh and Nodal Analysis.
AC Circuits: Generation of sinusoidal - voltage, average - RMS value, form factor and peak factor-Phasor diagrams of R, L, C, combination of R-L, R-C and R-L-C circuits

UNIT – V SEMICONDUCTOR DEVICES AND SWITCHING THEORY ***9***

Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET -Number systems – binary codes - logic gates

- Boolean algebra, laws & theorems - simplification of Boolean expression - implementation ofBoolean expressions using logic gates

TOTAL : 45 Hrs.

Course Outcomes:

Upon Completion of this course, students will be able to:

CO1: Learn the concept of manufacturing methods encountered in engineering practice such asfoundry and welding processes.

CO2: Know the working of internal combustion engines and the concept of sources of energy,working principle of refrigeration and air conditioning.

CO3: Recognize the different combinations of circuit elements and solving the circuit byapplying basic circuital laws.

CO4: Acquire a good understanding of DC and AC circuits.

CO5: Demonstrate the characteristics of semiconductor devices.

TEXT BOOKS:

1. Ranganath G and Channankaiah, "Basic Engineering Civil & Mechanical",S.S.Publishers, 2014.
2. Shanmugam G., "Basic Mechanical Engineering", Tata McGraw Hill Publishing Co., NewDelhi, 2010.
3. Muthusubramanian R, Salivahanan S, "Basic Electrical and Electronics Engineering",Tata McGraw Hill Education Private Limited, 2010.
4. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

REFERENCE BOOK(S):

1. Shanmugasundaram. S and Mylsamy. K, "Basics of Civil and Mechanical Engineering",Cenage Learning India Pvt.Ltd, NewDelhi, 2012.
2. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 3rd Edition, 2012.
3. Venugopal.K and PrabhuRaja.V, "Basic Mechanical Engineering", Anuradha Publishers,Kumbakonam, 2015.
4. B.L.Theraja, A.K.Theraja, "A Text Book of Electrical Technology, Volume I ", S.Chandand company Ltd., 2006.
5. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9thEdition, Pearson Education / PHI, 2007.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	-	3	2	1	1	-	-	-	-	-	2	-	1
CO 2	3	1	-	3	3	3	1	-	-	-	-	1	1	1	2
CO 3	1	1	-	3	1	1	1	-	-	-	-	1	1	1	1
CO 4	1	1	-	3	2	1	1	-	-	-	-	1	1	2	2
CO 5	1	1	-	3	2	3	1	-	-	-	-	1	1	1	2

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118CYP07 **ENGINEERING CHEMISTRY LABORATORY**
(Common to all Non-Circuit Branches)

L	T	P	C
0	0	2	1

Objectives:

Students will be conversant with the estimation of various compounds using volumetric and instrumental analysis.

LIST OF EXPERIMENTS

1. Estimation of Total hardness by EDTA
2. Determination of percentage of calcium in Lime Stone by EDTA
3. Estimation of chloride in water sample
4. Estimation of alkalinity of Water sample
5. Determination of DO in Water (Winkler's Method)
6. Determination of Rate of Corrosion of the given steel specimen by weight loss method (Without inhibitor)
7. Determination of Rate of Corrosion of the given steel specimen by weight loss method (With inhibitor)
8. Conduct metric titration (Simple acid base)
9. Conduct metric titration (Mixture of weak and strong acids)
10. Conduct metric titration using BaCl2vs Na2 SO4
11. Potentiometric Titration (Fe^{2+} / KMnO4 or K2Cr2O7)
12. PH titration (acid & base)
13. Determination of water of crystallization of a crystalline salt -Copper sulphate
14. Preparation of Bio-Diesel by Trans etherification method.

A minimum of TEN experiments shall be offered.**Course**

Outcomes:

1. Carry out the volumetric experiments and improve the analytical skills.
2. Understand the maintenance and usage of analytical instruments and thereby developtheir skills in the field of engineering.
3. Understand the principle and handling of electrochemical instruments and Spectrophotometer.
4. Apply their knowledge for protection of different metals from corrosion by using different inhibitors

Reference(s):

1. Arthur I. Vogel's, "Quantitative Inorganic Analysis including Elementary Instrumental Analysis", ELBS, Group, 7th Edition, 2000.
2. Dr. K .Sivakumar, "Engineering Chemistry lab manual", S.S publishers, 2016.

118EPP08 ENGINEERING PRACTICE LABORATORY

(Common to all Non-Circuit Branches)

L	T	P	C
0	0	2	1

OBJECTIVES:

1. To get the knowledge on welding techniques and its types.
2. To do the fitting operation on a given material. (Specimen)
3. To carry out sheet metal operation.
4. To know the principle involved in plumbing work.
5. To do the carpentry work on a given work piece.

LIST OF EXPERIMENTSWELDING:

Study of Electric Arc welding and Gas welding tools and equipment's.

Preparation of Arc welding and Gas welding models:

i) Butt joint ii) Lap joint iii) T - joint.

FITTING:

Study of fitting tools and operations.

Preparation of fitting models: ***i) V-fitting ii) Square fitting***

SHEET METAL WORK:

Study of sheet metal tools and operations

Preparation of sheet metal models: ***i) Rectangular Tray ii) Funnel***

PLUMBING WORKS:

Study of pipeline joints and house hold fittings.

Preparation of plumbing models: ***Basic pipe connections with PVC and GI pipe fittings.***

CARPENTRY:

Study of wooden joints and tools used in roofs, doors, windows, furniture.

Preparation of carpentry models:

i) Lap joint ii) Dovetail joint iii) T-Joint

DEMONSTRATION ON:

ELECTRICAL ENGINEERING PRACTICE

Study of Electrical components and equipments

Residential house wiring using switches, fuse, indicator, lamp and energy meter.

ELECTRONICS ENGINEERING PRACTICE

Study of Electronic components –Resistor, color coding, capacitors etc
Soldering practice –components soldering in simple electric circuit & testing continuity
COMPUTER HARDWARE AND SOFTWARE PRACTICE

Study of PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

COURSE OUTCOMES:

The students will be able to

CO1: Prepare simple Lap, Butt and T- joints using arc welding equipments.
CO2: Prepare the rectangular trays and funnels by conducting sheet metal operation.
CO3: Prepare the pipe connections and identify the various components used in plumbing.
CO4: Prepare simple wooden joints using wood working tools.
CO5: Demonstrate basic electrical, electronic and computer components based on their physical parameters and dimensions.

TEXT BOOKS:

1. Ranganath. G & Channankaiah, "Engineering Practices Laboratory Manual", S.S. Publishers, 2014.
2. Jeyapoovan.T & Gowri S "Engineering Practice Lab Manual", Vikas publishing house pvt.ltd, 2016.

REFERENCE BOOKS:

1. Kannaiah.P & Narayana.K.L, "Manual on Workshop Practice", Scitech Publications, 2015.
2. Ramesh BabuV, "Engineering Practices Laboratory Manual", VRB Publishers Private Limited, Chennai, Revised Edition, 2014.
3. Peter Norton, "Introduction to Computers", 7th Edition, Mc Graw Hill, 2010.
4. Bawa. H.S, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2009.
5. David Anfinson and Ken Quamme, "IT Essentials PC Hardware and Software Companion Guide", CISCO Press, Pearson Education, Third Edition, 2008.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	2	1	1	-	-	-	2	1	-	2	3	1	2
CO 2	3	3	2	2	1	-	-	-	2	1	-	2	3	3	2
CO 3	3	2	2	2	1	1	-	1	2	2	3	2	3	2	2
CO 4	3	1	2	1	1	-	-	-	2	1	-	2	3	1	2
CO 5	3	3	2	2	1	-	-	-	2	1	-	2	3	3	2

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218ENT01 COMMUNICATIVE ENGLISH
(Common to all Branches)

L	T	P	C
2	0	2	3

OBJECTIVES:

The Course prepares first semester Engineering and Technology students:

- To help learners develop their listening skills which will enable them listen to lecturesand comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To develop the basic reading and writing skills of first year engineering and technologystudents.
- To help learners develop grammar and vocabulary of a general kind by developing theirreading skills

UNIT I **09**

Listening - conversation - Speaking – introducing oneself - exchanging personal information - Reading – comprehension - Writing - paragraph - Vocabulary Development - synonyms and antonyms - Language Development – consonants & vowels - phonetic transcription.

UNIT II **09**

Listening - telephonic conversation - Speaking – sharing information of a personal kind – greeting - taking leave - Reading – short stories – The Gift of the Magi, A Service of Love and The Last Leaf by O. Henry – Writing – developing hints - Vocabulary Development – everyday vocabulary - Language Development – British and American English - infinitive and gerund.

UNIT III **09**

Listening – class memory quiz - Speaking – impromptu - Reading – magazines – Writing – agenda - proposals - Vocabulary Development - important words used in speaking and writing - Language Development – types of sentences - information and emphasis.

UNIT IV **09**

Listening – interviews of famous persons - Speaking – story narration - Reading – case study – Writing – invitation letter - quotation letter - Vocabulary Development – listening and reading vocabulary - Language Development – cause and effect – purpose and function.

UNIT V **09**

Listening - a scene from a film - Speaking - role play - Reading – jigsaw – Writing – essay writing - Vocabulary Development- business vocabulary - Language Development - degrees of comparison – real English phrases.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course learners will be able to:

CO1: Comprehend conversations and talks delivered in English.
CO2: Participate effectively in formal and informal conversations; introduce themselves andtheir friends and express opinions in English.
CO3: Read short stories, magazines, novels and other printed texts of a general kind.
CO4: Write short paragraphs, essays, letters and develop hints in English.

TEXT BOOKS:

1. Board of Editors. Using English A Coursebook for Undergarduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad: 2015.
2. Richards, C. Jack. Interchange Students' Book-2, New Delhi: CUP, 2015.
3. Uttham Kumar, N. Communicative English (with work book). Sahana Publications, Coimbatore, 2019.

REFERENCES

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Rutledge, 2011.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011.
3. Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books:2013.
4. Means, L. Thomas and Elaine Langlois. English & Communication for Colleges. CengageLearning, USA: 2007.
5. Redston, Chris & Gillies Cunningham. Face2Face (Pre-intermediate Student's Book &Workbook). Cambridge University Press, New Delhi: 2005.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	2	2	1	3	2	2	2	1	3	2	3
CO 2	3	3	2	3	2	2	3	2	2	3	2	1	3	2	2
CO 3	3	2	3	3	2	3	2	2	3	2	2	1	3	2	1
CO 4	3	2	2	3	2	2	3	2	3	3	2	1	3	2	1

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CO 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

218MAT02 ENGINEERING MATHEMATICS-II
(Common to all Branches)

L	T	P	C
3	0	0	3

Course Objectives

- To understand double and triple integration concepts and apply to study vector calculus comprising of surface and volume integrals along with the classical theorems involving them.
- To learn analytic functions and their properties and also conformal mappings with few standard examples those have direct applications.
- To grasp the basics of complex integration and application to contour integration which is important for evaluation of certain integrals encountered in engineering problems.
- To introduce the concept of improper integrals through Beta and Gamma functions.

UNIT-I **INTEGRAL CALCULUS** **9+3**

Definite and indefinite integrals - Substitution rule – Techniques of integration –Integration by parts – Trigonometric integrals - Trigonometric substitutions - Integration of rational functions by partial fractions – Integration irrational functions.

UNIT-II **MULTIPLE INTEGRALS** **9+3**

Double integration – Cartesian and polar co-ordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates –Triple integration in Cartesian co-ordinates

– Area as double integral – Volume as triple integral.

UNIT-III **VECTOR CALCULUS** **9+3**

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal, vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (Statement and applications only) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT-IV **ANALYTIC FUNCTIONS** **9+3**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy–Riemann equation and Sufficient conditions (Statement and applications only) – Harmonic and orthogonal properties of analytic function (Statement and applications only) – Harmonic conjugate – Construction of analytic functions – Conformal mapping: w= z+c, cz, 1/z, and bilinear transformation.

UNIT-V **COMPLEX INTEGRATION** **9+3**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points –Residues – Residue theorem

– Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding poles on boundaries).

TOTAL: 45+15 = 60 PERIODS

Course Outcomes

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

CO1: Determine the area and volume in 2-dimension and 3-dimension respectively usingmultiple integrals and also extending the concept to vector fields.
CO2: Learn the basic concepts of analytic functions and transformations of complex functions.
CO3: Master the integration in complex domain.
CO4: Understand the use of improper integrals' applications in the core subject.TEXT BOOK

1. Grewal. B.S., "Higher Engineering Mathematics", 43th Edition, Khanna Publications,Delhi, 2015.

REFERENCES

1. James Stewart, "Stewart Calculus", 8th edition,2015, ISBN: 9781285741550/1285741552.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", tenth edition, Wiley India, 2011.
3. P.Kandasamy, K.Thilagavathy, K.Gunavathy, "Engineering Mathematics for first year",S.Chand & Company Ltd., 9th Edition, New Delhi, 2014.
4. V.Prameelakaladharan and G.Balaji, "Engineering Mathematics - II",1st Edition, Amrutha marketing, Chennai, 2017.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	-	-	-	-	-	-	-	-	1	3	2	2
CO 2	3	2	2	-	-	-	-	-	-	-	-	1	3	2	2
CO 3	2	2	-	-	-	-	-	-	-	-	-	1	2	2	-
CO 4	3	3	2	-	-	-	-	-	-	-	-	1	3	3	2
CO 5	3	2	2	-	-	-	-	-	-	-	-	1	3	2	2

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218GET03 ENVIRONMENTAL SCIENCE AND ENGINEERING (Common to all Branches)	L	T	P	C
	2	0	0	2

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions toenvironmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world;envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior andsurface.

UNIT I NATURAL RESOURCES 14

Definition, scope and importance of environment – need for public awareness - Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT II ECOSYSTEMSANDBIODIVERSITY 8

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers –energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India –conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes.

UNIT III ENVIRONMENTAL POLLUTION **10**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods,

earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT **6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: Environmental Pollution or problems cannot be solved by mere laws. Public participationis an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
CO2: Public awareness of environmental is at infant stage.
CO3: Ignorance and incomplete knowledge has led to misconceptions
CO4: Development and improvement in std. of living has led to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, Environmental Science and Engineering ', Tata McGraw-Hill, New Delhi,2006.
2. Gilbert M. Masters, Introduction to Environmental Engineering and Science ',

2ndedition, Pearson Education, 2004.

3. Dr. G. Ranganath, Environmental Science and Engineering, Sahana Publishers, 2018edition.

REFERENCES:

1. **Dharmendra S. Sengar, Environmental law ', Prentice hall of India PVT LTD, New Delhi,2007.**

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	-	-	-	2	-	-	-	2	2	1	3	1	-
CO 2	2	3	-	-	-	-	-	-	-	-	1	1	2	3	-
CO 3	2	3	1	-	-	-	-	-	-	-	1	1	2	3	1
CO 4	1	2	3	1	-	-	-	-	-	-	-	1	1	2	3

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218EMT04 ENGINEERING MECHANICS **L T P C**
(Common to all Non-Circuit Branches) **3 0 0 3**

OBJECTIVES:

1. To understand the vectorial and scalar representation of forces and moments.
2. To understand the static equilibrium of particles and rigid bodies both in two dimensions.
3. To understand the concepts of centroids and moment of inertia of composite sections.
4. To understand the principle of work and energy.
5. To enable the students to comprehend the effect of friction on equilibrium.

UNIT I BASICS & STATICS OF PARTICLES **12**

Introduction-Units and Dimensions-Laws of mechanics - Lame's theorem, Parallelogram and Triangular law of forces, Polygon force, Resolution and Composition of forces, Equilibrium of a particle- Forces in space - Equilibrium of a particle in space-Equivalent systems of forces-Principle of transmissibility-Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES **12**

Free body diagram-Types of supports and their reactions-Requirements of stable equilibrium-Moments and Couples, Moment of a force about a point and about an axis-Vectorial representation of couples- Varignon's theorem-Equilibrium of Rigid bodies in two dimensions- Equilibrium of Rigid bodies in three dimensions – Examples.

UNIT III PROPERTIES OF SURFACES AND SOLIDS **12**

Determination of Areas and Volumes-First moment of area and the centroid of sections - rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula, Second and product moments of plane area - Rectangle, triangle, circle from integration-T section, I section, Angle section, Hollow section by using standard formula, Parallel axis theorem and perpendicular axis theorem.

UNIT IV DYNAMICS OF PARTICLES **12**

Displacement, Velocity and Acceleration, their relationship, Relative motion- Rectilinear motion- Curvilinear motion, Newton's law-Work Energy Equation of particles-Impulse and Momentum-Impact of elastic bodies.

UNIT V FRICTION **12**

Frictional force - Laws of Coloumb friction - Simple contact friction - Rolling resistance - Belt friction
- Ladder friction - wedge friction.

TOTAL : 60 Hours

COURSE OUTCOMES:

The students will be able to

CO1: Explain the differential principle applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
CO2: solution for problems related to equilibrium of particles.
CO3: Solve the Moment of inertia for different 2-D plane figures.
CO4: Analyze the forces in any structures.
CO5: Solve rigid body subjected to frictional forces.

TEXT BOOKS:

1. Ramamrutham S, "Engineering Mechanics (S.I Units)", Dhanpat Rai Publications, 10thEdition, Reprint 2015.
2. Dr. Gujral I S, "Engineering Mechanics", Lakmi Publications, Second Edition, 2011.

REFERENCE BOOKS:

1. Bhavikatti S, "Engineering Mechanics", New Age International Publisher, 4th Edition,2014.
2. Khurmi R S, "Engineering Mechanics", S Chand Publisher, 20th Edition, 2012.
3. Dr. Bansal R K and Sanjay Bansal, "Engineering Mechanics", Lakshmi Publication, 7th Edition, 2011.
4. Rajput R K, "Engineering Mechanics", Dhanpat Rai Publications, 3rd Edition, 2005.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	-	-	-	-	1	-	-	-	3	3	2
CO 2	3	3	2	2	-	-	-	-	1	-	-	1	3	3	2
CO 3	3	2	3	2	1	-	-	-	1	-	-	1	3	2	3
CO 4	3	3	3	3	-	-	-	-	1	-	1	-	3	3	3
CO 5	3	3	2	2	-	-	-	-	1	-	-	-	3	3	2

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218PHP07 ENGINEERING PHYSICS LABORATORY **L T P C**
(Common to all Non-Circuit Branches) **0 0 2 1**

Course objectives:

- To understand the practical concepts of Interference and diffraction.
- To understand the concept of velocities of sound in different liquids.
- To get better knowledge of modulus of elasticity.
- To understand the concepts of thermal conductivity.
- To understand the concepts of viscosities of liquid

LIST OF EXPERIMENTS

1. (a) Determination of laser parameters – Wavelength.
   (b) Particle size determination using Diode Laser.
2. Determination of thickness of a thin wire-Air wedge method.
3. Determination of velocity of sound and compressibility of liquid-Ultrasonicinterferometer.
4. Determination of wavelength of mercury spectrum-Spectrometer grating.
5. Determination of thermal conductivity of a bad conductor-Lee's disc method.
6. Determination of Young's modulus of the material –Non uniform bending.
7. Determination of viscosity of liquid – Poiseuille's method.
8. Spectrometer- Dispersive power of prism.
9. Determination of Young's modulus of the material - Uniform bending.
10. Tensional pendulum- Determination of Rigidity modulus.

Course Outcomes: At the end of the course, the student will be able to

CO1: Understanding the moduli of elasticity by determining Young's modulus and Rigiditymodulus of a beam and cylinder respectively.

CO2: Understanding the phenomenon of diffraction, dispersion and interference of light usingoptical component

CO3: Acquiring knowledge of viscosity by determining coefficient of viscosity of a liquid andmeasuring the parameters of ultrasound propagating through a liquid

CO4: Understanding the phenomenon of heat transfer through conductors and bad conductors by determining thermal conductivity.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	2	2	1	3	2	2	2	1	3	2	3
CO 2	3	3	2	3	2	2	3	2	2	3	2	1	3	2	2
CO 3	3	2	3	3	2	3	2	2	3	2	2	1	3	2	1
CO 4	3	2	2	3	2	2	3	2	3	3	2	1	3	2	1
CO 5	3	3	2	3	2	3	3	2	2	3	2	1	3	3	2

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218PPT05 PROBLEM SOLVING AND PYTHON PROGRAMMING
(Common to all Non-Circuit Branches)

L	T	P	C
3	0	0	3

OBJECTIVE(S):

1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs.
3. To develop Python programs with conditionals and loops.
4. To define Python functions and call them.
5. To use Python data structures –- lists, tuples, dictionaries.
6. To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.

UNIT V FILES, MODULES, PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, date and time, errors and exceptions, handling exceptions, debugging, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems

CO2: Read, write, execute by hand simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries.
CO6: Read and write data from/to files in Python Programs.

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised andupdated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. John V Guttag, —Introduction to Computation and Programming Using Python'', Revisedand expanded Edition, MIT Press, 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming inPython: An Inter-Disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	-	-	1	-	3	3	1	1	3	2	1
CO 2	2	2	3	3	2	2	-	-	3	3	3	3	2	2	3
CO 3	2	2	2	2	2	1	-	-	3	3	1	3	2	2	2
CO 4	3	2	2	2	2	3	-	-	3	3	2	3	3	2	2
CO 5	3	3	3	3	2	3	-	-	3	3	3	3	3	3	3

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218PPP08 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

(Common to all Non-Circuit Branches)

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python.

LIST OF PROGRAMS:

1. To Implement python scripts using Variables and operators
2. To Demonstrate Operator precedence to evaluate an expression
3. Display grade of a student using elif statement
4. Implement Floyd triangle using for loop
5. Checks the given number is prime or not using while loop
6. Compute the GCD of Numbers using functions
7. Finding factorial of a given number using recursive function.
8. Takes a list of words and returns the length of longest one using strings
9. To perform linear and binary search using strings
10. To implement list as arrays (multiply 2 matrices)
11. To demonstrate use of list & related functions
12. To demonstrate use of tuple, set& related functions
13. To demonstrate use of Dictionary& related functions
14. Finding most frequent words in a text read from a file
15. Programs that take command line arguments (word count)

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

TOTAL: 45 Hrs.

COURSE OUTCOMES:

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

CO1: Write, test, and debug simple Python programs.

CO2: Implement Python programs with conditionals and loops.

CO3: Develop Python programs step-wise by defining functions and calling them.
CO4: Use Python lists, tuples, dictionaries for representing compound data.
CO5: Read and write data from/to files in Python.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	-	-	-	2	2	-	1	-	1	2	3	1	-	-
CO 2	3	3	3	-	-	-	-	-	-	-	-	2	3	3	3
CO 3	2	2	2	2	2	-	-	-	-	-	-	3	2	2	2
CO 4	1	2	2	2	2	-	-	-	-	-	-	2	1	2	2
CO 5	2	3	3	3	2	2	3	1	3	3	3	3	2	3	3

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		L	T	P	C
318MAT01	ENGINEERING MATHEMATICS-III	3	1	0	4

OBJECTIVES

- To learn various methods to solve the partial differential equations.
- To introduce Fourier series analysis which plays a vital role in many applications in engineering.
- To understand the boundary value problems and to obtain the solution using partial differential equations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To develop z-transform techniques which analyze the discrete time signals.

UNIT 1 PARTIAL DIFFERENTIAL EQUATIONS 12

Solutions of first order partial differential equations-Standard types-Singular solutions-Lagrange's Linear equation- Solution of homogeneous and non-homogenous linear equations of second and higher order with constant coefficients.

UNIT 2 FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Change of scale - Odd and even functions – Half-range Sine and Cosine series – Parseval's identity – Harmonic Analysis.

UNIT 3 BOUNDARY VALUE PROBLEMS 12

Classification of Partial Differential Equations – Method of separation of Variables – Solutions of one dimensional wave equation and One-dimensional heat equations –Applications using Fourier series solutions in Cartesian coordinates - Steady state solution of two-dimensional heat equation.

UNIT 4 FOURIER TRANSFORM 12

Fourier integral theorem – Fourier transform pair - Sine and Cosine transforms – Properties – Fourier Transform of simple functions – Convolution theorem applications – Parseval's identity applications.

UNIT 5 Z- TRANSFORM 12

Z-Transform - Elementary properties and applications – Initial and final value theorems (Statement and applications only) - Inverse Z-Transform – Partial fractions method, Residue theorem method and Convolution theorem (statement and applications only) - Solution of difference equations by applying Z-transforms.

COURSE OUTCOMES:After undergoing the course, the students will have ability to

Co .1: Knowing the methods to solve partial differential equations occurring in various physical and engineering problems.
Co .2: Describing an oscillating function which appear in a variety of physical problems by Fourier series helps them to understand its basic nature deeply.
Co .3: Acquiring the knowledge to construct partial differential equations with initial and boundary conditions for various physical and engineering real time problems and obtaining solution using Fourier series methods.
Co .4: Understanding the effect of Fourier transform techniques and their applications.
Co .5: Gaining the concept of analysis of linear discrete system using Z-transform approach.

TEXTBOOK:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 43rd edition, 2014.

REFERENCES

1. Andrews L.C and Shivamoggi. B.K., "Integral Transforms for Engineers", SPIE Press Book, 1999
2. Wylie C R and Barrett L C, "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Co., New Delhi, 1995.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition Wiley India, 2016.
4. V.Prameelakaladharan and G.Balaji ,"Engineering Mathematics-III", Amrutha marketing, Chennai,2016.
5. T.Veerarajan,"Engineering Mathematics-III", Tata McGraw-Hill Publishing company, New Delhi,2015.
6. P.Kandasamy, K.Thilagavathy, K.Gunavathy, " Engineering Mathematics-III", S.Chand Publishers,2015.

Programme Outcomes (PO's)											
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3	2	1	1	1	1	1	2	1	2	1	2
3	2	1	1	1	1	1	2	1	2	1	2
3	2	3	2	1	1	1	2	1	2	1	2
3	3	3	2	1	1	1	3	1	2	1	3
3	3	2	2	1	1	1	3	1	2	1	3

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		L	T	P	C
318CET02	**MECHANICS OF SOLIDS**	**3**	**0**	**0**	**3**

OBJECTIVES

- To learn the fundamental concepts of Stress, Strain and deformation of solids.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To determine the deflection in beams.
- To understand the effect of torsion on shafts andsprings.
- To analyze plane and spacetrusses

UNIT-1 STRESS STRAIN AND DEFORMATION OF SOLIDS, STATES OF STRESS **12**

Rigid bodies and deformable solids – stability, strength, stiffness – tension, compression and shear stresses – strain, elasticity, Hooke's law, limit of proportionately, modulus of elasticity, stress-strain curve, lateral strain – temperature stresses – deformation of simple and compound bars – shear modulus, bulk modulus, relationship between elastic constants – stress at a point – stress on inclined plane – principal stresses and principal planes – Mohr's circle of stresses.

UNIT-2 TRANSVERSE LOADING ON BEAMS **12**

Beams – types of supports – simple and fixed, types of load – concentrated, uniformly distributed, varying distributed load, combination of above loading – relationship between bending moment and shear force – bending moment, shear force diagram for simply supported, cantilever and over hanging beams – Theory of simple bending – analysis of stresses – load carrying capacity of beams – proportioning of sections - Flitched beams

UNIT-3 DEFLECTION OF BEAMS AND SHEAR STRESSES **12**

Deflection of beams Double Integration method -Macaulay's method – slope and deflection using moment area method, Conjugate Beam method – variation of shear stress – shear stress distribution in rectangular, I sections, solid circular sections, hollow circular sections, angle and channel sections.

UNIT-4 TORSION AND SPRINGS **12**

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel

UNIT-5 ANALYSIS OFTRUSSES **12**

Determinate and indeterminate trusses - Analysis of pin jointed plane determinate trusses by method of joints, method of sections and tension coefficient – Analysis of Space trusses by tension coefficientmethod.

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO .1: Understand the concepts of stress and strain, principal stresses and principal planes.
CO .2: Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
CO .3: Calculate the deflection of beams by different methods and selection of method for determining slope and deflection.
CO .4: Apply basic equation of torsion in design of circular shafts and helical springs.
CO .5: Analyze the pin jointed plane and space trusses

TEXTBOOKS:

1. Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi,2015.
2. Punmia.B.C., Ashok Kumar Jain and Arun Kumar Jain, SMTS –I Strength of materials, Laxmi publications. New Delhi,2015
3. Rattan . S. S, "Strength of Materials", Tata McGraw Hill Education Private Limited, New Delhi,2012
4. Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi,2010

REFERENCES:

1. Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van NosReinbhold, New Delhi 1999.
2. Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi,2016
3. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi,2009.

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3	2	2	1	3	2	2	2	1	3	2	3
CO 2	3	3	2	3	2	2	3	2	2	3	2	1	3	2	2
CO 3	3	2	3	3	2	3	2	2	3	2	2	1	3	2	1
CO 4	3	2	2	3	2	2	3	2	3	3	2	1	3	2	1
CO 5	3	3	2	3	2	3	3	2	2	3	2	1	3	3	2

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		L	T	P	C
318CET03	**MECHANICS OF FLUIDS**	3	0	0	3

COURSE OBJECTIVES

- To understand the basics of fluid mechanics & fluid properties
- To understand the principles of Fluid statics and kinematics
- To gain knowledge on fluid dynamics
- To gain knowledge in Analysis of flow through pipes
- To study about the Dimension and Models

UNIT-1 DEFENITIONS AND FLUID PROPERTIES 12

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Pressure measurements – manometers – Continum Concept of System and Control Volume.

UNIT-2 FLUID STATICS 12

Pascal's Law and Hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Meta centre- Fluid mass under relative equilibrium.

UNIT-3 FLUID KINEMATICS 12

Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – flow nets-Velocity Measurements-Pitot tube.

UNIT-4 FLUID DYNAMICS 12

Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Major and minor losses of flow in pipes – Pipes in series and in parallel

UNIT-5 SIMILITUDE AND MODEL STUDY 12

Dimensional Analysis – Rayleigh's method, Buckingham's Pi-theorem – Similitude and models – Scale effect and distorted models.

COURSE OUTCOMES:After undergoing the course, the students will have ability to

Co 1: Gain knowledge on fluid properties

Co 2: Know about Fluid statics and kinematics

Co 3: Gain knowledge on Fluid dynamics

Co 4: Understand and solve the problems related to flow through pipes

Co 5: Gain knowledge about Dimensional analysis and preparation of models in hydraulic structures

TEXT BOOKS:

1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi, 2009.
2. Jain.A.K.., "Fluid Mechanics" (Including Hydraulic Machines), Khanna Publishers, Twelfth Edition, 2016.
3. Subramanya.K" Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.

4. Bansal.R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2013.

REFERENCES:

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw Hill, 2000.
2. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2013
3. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2017.
4. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2015

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	1	1	1	2	1	2	1	2	3	2	1
CO 2	3	2	1	1	1	1	1	2	1	2	1	2	3	2	1
CO 3	3	2	3	2	1	1	1	2	1	2	1	2	3	3	2
CO 4	3	3	3	2	1	1	1	3	1	2	1	3	3	3	3
CO 5	3	3	2	2	1	1	1	3	1	2	1	3	3	3	3

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318CET04	CONSTRUCTION MATERIALS & LSTRUCTURAL GEOLOGY	L T P C 3 0 0 3

OBJECTIVES

- To impart knowledge on civil engineering materials and their properties.
- To study about timber and other building materials
- To impart knowledge on modern materials.
- To impart knowledge on foundation and form work.
- To impart knowledge on super structure.

UNIT-1 BUILDING MATERIALS 9

Stone as building material-Criteria for selection-Test on stones-Deterioration and preservation of stone works-Bricks-Manufacture of clay bricks-Test on bricks-Compressive strength- Water absorbtion-Efflorescence-Brick for special use- Refractory bricks-Cement and concrete hollow bricks-Lightweight concrete bricks-Lime-Preparation of lime mortar-Cement ingredients-Manufacturing process-Types of cement-Properties of cement and cement mortar + Concrete properties-Compressive strength-Tensile strength-Fly ash bricks-aggregate- Codal provisions.

UNIT-2 TIMBER AND OTHER MATERIALS 9

Timber -Market forms-Industrial timber-Plywood- Veneer- Thermo Cole- Panels of laminates-Steel-Aluminium and other metallic materials-Composition-uses-Market forms-Mechanical treatment- Paints- Varnishes-Distempers-Termite proofing- Codal provisions.

UNIT-3 MODERN MATERIALS 9

Glass-Ceramics-Sealants for joints-Fibre glass reinforced plastic-Clay products-Refractories-Composite materials-Types-Application of laminar composites-Fibre textiles-Geosynthetics for civil engineering application

UNIT-4 FOUNDATION AND STRUCTURAL GEOLOGY 9

Introduction-function of foundation-Requirements of good foundation-Types of foundation-Deep foundation-Shallow foundation-Materials for frame work-Timber work-Plywood formwork-Order and method of removing formwork.

Attitude of beds – Outcrops –Geological maps – study of structures – Folds, faults, joints and Lineaments– Dip, Declination - Their bearing on engineering construction

UNIT-5 SUPERSTRUCTURE CONSTRUCTION 9

Masonry-Bricks-Stone-Types-Uses-Column-Beam-Lintels-Sunshade-Flooring-Plastering-R.C.C slab-One way and two way- Pitched roof and simple trusses-Construction joints-Expansion joints-Scaffoldings-arches-Doors & windows.

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

Co 1: To know the properties of materials
Co 2: To understand the application of Timber and other building materials
Co 3: To know the conventional and modern construction
C0 4: To know the sub structure & frame work
Co 5: To know the super structure

TEXTBOOKS:

1. R.K. Rajput,Engineering materials, S.Chand& company Ltd.,2007.
2. Rangwala.S.C.,Building Construction, Charotar book stall, anand,2009

REFERENCES:

1. Punmia B.C., a Text Book of Building Construction, a Saurabh& co (p)Ltd., New Delhi, 2009.
2. Frederick s.Merritt , a text book of building materials and construction practices McGraw-Hill Professional publication, 2001
3. Civil Engineering Materials, Tichandigarhtata McGraw Hill, edition 2006.

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2							2		2					
CO 2	2			2	2	2							2		
CO 3	2	2	3	3		2									2
CO 4		2		3	2			2	2	2	2	2	2	2	
CO 5		3	3	3		2	1	2	2	2	2	2	2	2	2

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		L	T	P	C
318CET05	**ENGINEERINGSURVEY**	**3**	**0**	**0**	**3**

OBJECTIVES

- To possess the knowledge on Classification of Surveying
- To impart knowledge on the concepts of sueveying
- To impart knowledge on applications of levelling in Engineering field.
- To impart knowledge on uses of theodolite
- To impart knowledge on setting out of curves

UNIT-1 FUNDAMENTALS OF CONVENTIONAL SURVEYINGANDLEVELLING **9**

Classifications and basic principles of surveying - Equipment and accessories for ranging and chaining - Methods of ranging - Compass - Types of Compass - Basic Principles-Bearing – Types-TrueBearing-MagneticBearing- Levelling-PrinciplesandtheoryofLevelling– Datum- Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling- Booking – Reduction - Sources of errors in Levelling - Curvature andrefraction

UNIT-2 THEODOLITE ANDTACHEOMETRICSURVEYING **9**

Horizontal and vertical angle measurements - Temporary and permanent adjustments - Heights and distances - Tacheometer - Stadia Constants - Analytic Lens -Tangential and Stadia Tacheometry surveying - Contour – Contouring – Characteristics of contours – Methods of contouring – Tacheometric contouring - Contour gradient – Uses of contour plan and map

UNIT-3 CONTROL SURVEYINGANDADJUSTMENT **9**

Horizontal and vertical control – Methods – specifications – triangulation- baseline satellite stations – reduction to centre- trigonometrical levelling single and reciprocal observations – traversing–Gale'stable.-ErrorsSources-precautionsandcorrections– classification oferrors– true and most probable values - weighed observations – method of equal shifts – principle of least squares - normal equation – correlates- level nets-adjustment of simple triangulation networks.

UNIT-4 ADVANCED TOPICS INSURVEYING **9**

Hydrographic Surveying – Tides – MSL – Sounding methods – Three point problem – Strength of fix – astronomical Surveying – Field observations and determination of Azimuth by altitude and hour angle methods –.Astronomical terms and definitions - Motion of sun and stars - Celestial coordinate systems - different time systems - Nautical Almanac - Apparent altitude and corrections - Field observations and determination of time, longitude, latitude and azimuth by altitude and hour anglemethod

UNIT-5 MODERN SURVEYING **9**

Total Station : Advantages - Fundamental quantities measured - Parts and accessories - working principle - On board calculations - Field procedure - Errors and Good practices in using Total Station GPS Surveying : Different segments - space, control and user

segments - satellite configuration - signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - Hand Held and Geodetic receivers - data processing - Traversing and triangulation.

COURSE OUTCOMES:After undergoing the course, the students will have ability to

Co 1 The use of various surveying instruments andmapping
Co 2 Measuring Horizontal angle and vertical angle using differentinstruments
Co 3 Methods of Leveling and setting Levels with differentinstruments
Co 4 Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth
Co 5 Concept and principle of modernsurveying

TEXTBOOKS:

1. Kanetkar.T.P and Kulkarni.S.V, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune,2008
2. Punmia.B.C., Ashok K.Jain and Arun K Jain , Surveying Vol. I & II, Lakshmi Publications Pvt Ltd, New Delhi, 2005
3. Bannister and S. Raymond, "Surveying", 7th Edition, Longman2004.
4. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill,2001.

REFERENCES:

1. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India,2004.
2. AroraK.R.,"SurveyingVol I & II", Standard Book house, 10th Edition 2008
3. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition,2004.
4. SatheeshGopi, rasathishkumar, N. madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education,2007

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	1	1	2				3					2	1
CO 2	1	2	1	2	1				3					1	2
CO 3	2	2	1	1	2				3					2	1
CO 4			3			1	1	2	2	1				1	3
CO 5	1	2	1	1	2				1					1	2

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		L	T	P	C
318CET06	VALUE EDUCATION PROGRAM	3	0	0	3

OBJECTIVES

- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT-1 DEFINITION AND CLASSIFICATION OF VALUES **12**

Deflnition-values-types of values – changing concepts of values values through various generous of literature

UNIT-2 INDIVIDUAL AND GROUP BEHAVIOUR **12**

Personal values, self strength (self confidence), self assesments – self reliance, self discipline – self determination – self restrainment – humidity – sympathy- compassion- attitude and forgiveness

UNIT-3 SOCIETIES IN PROGRAM

Defenition – communities – ancient and model agents – sense of survival – security – desire for comfort – sense of belongings – social consequences and responsibility

UNIT-4 SUSTENANCE OF LIFE

The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT-5 ENGINEERING ETHICS

Society of Engineers – care of ethics – Ethical issues – ethical and inethical practice – case studies – situational decision

COURSE OUTCOMES:After undergoing the course, the students will have ability to

Co 1: Able to understand definition and classification of values.
Co 2: Able to understand purusartha
Co 3: Able to understand sarvodaya idea.
Co 4: Able to understand sustenance of life.
Co 5: COAble to understand views of hierarchy of values.

TEXTBOOK:

1. AwadeshPradhan :MahamanakeVichara. (B.H.U., Vanarasi-2007)
2. Little, William, : An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)

REFERENCES

1. William, K Frankena : Ethics (Prentice Hall of India, 1988)

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1			1	1		1	2	3	3	3	3	3			
CO 2						1	2	3	2	2	3	2			
CO 3						1	1	2	2	3	2	3			
CO 4						1	2	1	1	2	3	2			
CO 5						1	2	2	3	3	3	3			

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		L	T	P	C
318CEP07	ENGINEERING SURVEYING LABORATORY	0	0	3	2

OBJECTIVES

- To impart knowledge on Chain & its classification.
- To impart knowledge on Levelling
- To impart knowledge on making contours in plains & hilly area
- To impart knowledge on Theodolite Surveying
- To impart knowledge in astronomical surveying

LIST OF EXPERIMENTS

Chain Survey

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset
2. Setting out works – Foundation marking using tapes single Room and DoubleRoom

Compass Survey

3. Compass Traversing – Measuring Bearings & arriving includedangles

Levelling - Study of levels and levelling staff

4. Fly levelling using Dumpy level &Tiltinglevel
5. Check levelling

Theodolite - Study of Theodolite

6. Measurements of horizontal angles by reiteration and repetition and verticalangles
7. Determination of elevation of an object using single plane method when base is accessible/inaccessible.

Tacheometry – Tangential system – Stadia system

8. Determination of Tacheometric Constants
9. Heights and distances by stadiaTacheometry
10. Heights and distances by TangentialTacheometry

Total Station - Study of Total Station, Measuring Horizontal and vertical angles

11. Traverse using Total station and Area ofTraverse
12. Determination of distance and difference in elevation between two inaccessible points using Totalstation

COURSE OUTCOMES:After undergoing the course, the students will have ability to

co 1: Handle basic survey equipments like Theodolite, Total Station and GPS
Co 2: Carry out survey work covering large area
Co 3: Measure differences in elevation and distance accessible and inaccessible point
Co 4: Carry out alignment surveys and compute area / quantities
Co 5: To carryout Triangulation and Astronomical surveying including general field marking for various engineering projects and Location of siteetc.

REFERENCES:

1.Clark D., *Plane and Geodetic Surveying*, Vols. I and II, C.B.S. Publishers and Distributors, Delhi.

2.James M.Anderson and Edward M.Mikhail, *Introduction to Surveying*, McGraw-Hill Book Company,

3.HeribertKahmen and Wolfgang Faig, *Surveying,* Walter de Gruyter, 2005.

4.AroraK.R.,"SurveyingVol I & II", Standard Book house, 10th Edition 2008

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	1	1	2				3					2	1
CO 2	1	2	1	2	1				3					1	2
CO 3	2	2	1	1	2				3					2	1
CO 4			3			1	1	2	2	1				1	3
CO 5	1	2	1	1	2				1					1	2

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		L	T	P	C
318CEP08	BUILDING MATERIALS & CONSTRUCTIONPRACTICES LABORATORY	0	0	3	2

COURSE OBJECTIVES

- To impart knowledge on the properties of aggregate
- To impart knowledge on the properties of cement
- To impart knowledge on the properties of bricks
- To understand the construction of brick wall

LIST OF EXPERIMENTS

I.TEST ONAGGREGATE

1Aggregate Crushing Test

2 Abrasion Test

3.Shape Test – Flakiness Index, Elongation Index, Angularity Number

4.Specific Gravity And Water Absorption Test For Coarse Aggregate

II.TEST ONCEMENT

1. Specific Gravity Test For Cement
2. Normal Consistency Test For Cement
3. Setting Time Of Cement
4. Compressive Strength Of Cement
5. Fineness Test For Cement

III.TEST ONBRICKS

1. Test for compressive strength of bricks
2. Test for Water absorption of bricks
3. Determination of Efflorescence ofbricks

IV. CONSTRUCTION OF BRICK WALL

1. Arrangement of bricks using English bond for one brick thick wall, one and a half brick thick wall for Tee junction.
2. Arrangement of bricks using Flemish bond for one brick thick wall, one and a half brick thick wall for Tee junction.

COURSE OUTCOMES:

Co 1: After undergoing the course, the students will have ability to conduct
Co 2: Test on properties of aggregates
Co 3: Test on properties of cement
Co 4: Test on bricks
Co 5: Construct brick wall with different bonds

REFERENCES:

1.IS 4031 (Part 1) – 1996 – Indian Standard Method for determination of fineness by drysieving.
2.IS 2386 (Part 1 to Part 6) – 1963 – Indian Standard methods for test for aggregate for concrete
3.IS 383 - 1970 Indian Standard specification for coarse and fine aggregates from natural sources forconcrete.

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	-	-	2	-	1	1	-	-	-	-	-	1		1
CO 2	1	-	-	2	-	1	1	1	-	-	-	1	1	-	1
CO 3	1	-	-	2	-	1	2	1	-	-	-	1	1	-	1
CO 4	1	-	-	1	-	1	1	2	-	-	-	1	1	-	1
CO 5	1	-	-	1	-	1	2	1	-	-	-	1	1	-	1

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		L	T	P	C
318CET09	**BUILDING PLANNING & DRAWING**	**0**	**0**	**3**	**2**

OBJECTIVES

- To draft on manual building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following

BONDS AND BRICK MASONRY

Convertional Signs-Conventional Symbols-Brick Masonry-English Bond-Brick MasonryFlemish bond Stone Masonry-Ashlar, Fine & Rubble.

DOORS AND WINDOWS

Cavity Walls-At Head of Window Opening & Roof Level-Panelled Door-Glazed & Panelled Door-HollowCore or Framed Flushed Door-Panelled Window-Glazed Window

TRUSSES AND STAIR CASE

King Post Truss-Details of King Post Truss-Queen Post Truss-Steel Roof Truss-Lean TO Roof- Stair Case-Quarter Turn-Half Turn –Dog Legged Stairs-Half Turn (Open Well) Stairs.

BUILDING DESIGN

Foundations-Plan-Section-Elevation of Buildings-A Residential House-Two Storied Residential Building-An Office Building-A LIG & MIG House.

COURSE OUTCOMES:

After undergoing the course, the students will have ability to draft on manual building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the drawings

TEXTBOOK:

1. Civil Engg. Drawing & House Planning – B.P. Verma, Khanna publishers, Delhi
2. Building drawing & detailing – Dr. Balagopal & T.S. Prabhu, Spades Publishers, Calicut.
3. Building drawing & detailing .,Dr.N. Kumara Swamy., A. Kameshwara Rao-, Charothar Publishing House-Anand.

REFERENCES

1. Building drawing – Shah, Tata McGraw-Hill
2. Building planning & Drawing – Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing
3. Shah, Kale and Patki, Building Drawing, Tata McGraw-Hill

Course Articulation Matrix (CAM)

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	-	-	2	-	1	1	-	-	-	-	-	1		1
CO 2	1	-	-	2	-	1	1	1	-	-	-	1	1	-	1
CO 3	1	-	-	2	-	1	2	1	-	-	-	1	1	-	1
CO 4	1	-	-	1	-	1	1	2	-	-	-	1	1	-	1
CO 5	1	-	-	1	-	1	2	1	-	-	-	1	1	-	1

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		L	T	P	C
418NMT01	**NUMERICAL METHODS**	**3**	**1**	**0**	**4**

OBJECTIVES

- The students would be acquainted with the basic concepts of numerical methods.
- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them.
- To apply numerical techniques in engineering applications.
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT-1 SOLUTION OF EQUATIONSAND EIGENVALUE PROBLEMS 9

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton-Raphson method- Solution of linear system of equations - Gauss Elimination method - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method.

UNIT-2 INTERPOLATION AND APPROXIMATIO 9

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

UNIT-3 NUMERICAL DIFFERENTATION AND INTEGRATION 9

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT-4 INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT-5 BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TEXTBOOKS:

1. **Grewal, B.S. and Grewal,J.S.,** " *Numerical methods in Engineering and Science*", 6th Edition, Khanna Publishers, New Delhi, 2007.
2. **Sankara Rao, K.** "*Numerical methods for Scientists and Engineers'*, 3rd Edition Prentice Hall of India Private Ltd., New Delhi, 2007.

REFERENCES:

1. Brian B., "A Friendly Introduction to Numerical Analysis", Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. **Gerald, C. F. and Wheatley, P. O.,** *"Applied Numerical Analysis"*, 6th Edition, Pearson Education Asia, New Delhi, 2006.
3. **Chapra, S. C and Canale, R. P.** "*Numerical Methods for Engineers*", 5th Edition, Tata McGraw- Hill, New Delhi, 2007.
4. **Kandasamy.P, Thilagavathy,K., & Gunavathi.K.**, *"Numerical Methods"*., S.Chand& Company Ltd., New Delhi.`
5. **Gerald, C.F.,Wheatley, P.O.**,"Applied Numerical Analysis",Pearson Education Asia,New Delhi,7th Edition, 2011.

COURSE OUTCOMES:After undergoing the course, the students will have ability to

Co 1: solve the eigenvector problems.

Co 2: solve problems by numerical differentiation and integration.

Co 3: solve the numerical differentiation and interpolation and the errors associated with them.

Co 4: solve the engineering problems associated with the ordinary and partial differential equations.

Co 5: apply numerical techniques to real-world problems.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	1	1	1	2	1	2	1	2	3	2	1
CO 2	3	2	1	1	1	1	1	2	1	2	1	2	3	2	1
CO 3	3	2	3	2	1	1	1	2	1	2	1	2	3	3	2
CO 4	3	3	3	2	1	1	1	3	1	2	1	3	3	3	3
CO 5	3	3	2	2	1	1	1	3	1	2	1	3	3	3	3

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		L	T	P	C
418CET02	**STRENGTH OF MATERIALS**	**3**	**0**	**0**	**3**

OBJECTIVES

- To understand the strain energy principles and theorems with their applications
- To understand the shear force and bending moment distribution for indeterminate beams
- To impart the knowledge in calculating the capacity of column
- To provide understanding of various methods in finding deflection of beams.
- To exposure on thick cylinders and various theories of failure.

UNIT-1 ENERGY PRINCIPLES 12

Strain energy and strain energy density – strain energy in traction shear, Flexure and torsion-Principle of virtual work-Castigliano's Theorems –application of energy theorems for computing deflections in beams– Maxwell's reciprocal theorems

UNIT-2 PROPPED CANTILEVER AND FIXED BEAMS 12

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) –Effect of Sinking of Supports in Fixed Beams- theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams for continuous beams (maximum two degrees of indeterminacy).

UNIT-3 CONTINUOUS BEAMS 12

Continuous beams- theorem of three moments- analysis of continuous beams-Supports not at the same level-Continuous beams with a fixed end-S.F. and B.M. diagrams for continuous Beams-Slope and deflections in Continuous Beams (Qualities study only).

UNIT-4 COLUMNS 12

Eccentrically loaded short columns – middle third rule – core section – columns of unsymmetrical sections (angle channel sections) – Euler's theory for long columns – critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns.

UNIT-5 THICK CYLINDERS 12

Introduction-Lamys Theorem-Special Cases-Longitudinal and Shear stress- Design of Thick Cylinders Shells-Compound or Shrunk cylinder-Necessary difference of radii for shrinkage-Introduction to theories of failure – principal stress – principal strain – shear stress – strain energy and distortion energy theories.

TEXTBOOKS:

1.Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2010.

2.Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2012

REFERENCES:

1.Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003

2.William A Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2007.

3.Rattan.S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.

4.Srinath, L.S, "Advanced mechanics and solids", Tata-McGraw Hill publishing company ltd, 2005.

5.http://www.esm.psu.edu/courses/emch213d/tutorials/animations

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

Co 1 apply energy principles in analysing structures

Co 2 analyse the indeterminate beams and their deflections which are required for designing structures

Co 3 analyse columns and to locate kern of column

Co 4 analyse thick cylinders subjected to fluid pressure

Co 5 apply theories of failure to calculate capacity of structure/system

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	3	3	3	2	2	3	1	3	2	1
CO 2	3	3	2	2	2	3	3	3	2	2	3	1	3	2	2
CO 3	3	3	3	2	2	3	3	2	3	2	2	1	3	2	2
CO 4	3	3	3	2	3	3	2	2	2	2	2	1	3	2	3
CO 5	3	3	3	2	2	2	3	3	3	3	2	1	3	2	2

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		L	T	P	C
418CET03	**APPLIED HYDRAULIC ENGINEERING**	**3**	**0**	**0**	**3**

OBJECTIVES

- To learn the characteristics of open channel flow and its measurements
- To study the concepts of uniform and non uniform flow in open channel
- To derive most economical channel sections
- To understand the concepts of momentum principles
- To impart knowledge on working of pumps and turbines

UNIT-1 OPEN CHANNEL FLOW 9

Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Specific energy – Critical flow and its computation. Stream Flow Measurements –Measurement of Stage-Measurement of Velocity – Area - Velocity Method – Numerical on above.

UNIT-2 UNIFORM FLOW 9

Uniform flow - Velocity measurement - Manning's and Chezy's formula - Determination of roughness coefficients - Determination of normal depth and velocity – Most economical sections - Non-erodible channels– Numerical on above

UNIT-3 VARIED FLOW 9

Introduction to GVF,RVF,SVF-Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Hydraulic jump – Types – Energy dissipation –Spillways – Convergent flumes – Numerical on above.

UNIT-4IMPULSE MOMENTUM PRINCIPLES & TURBINE 9

Impulse momentum principles - Impact of Jets on plane and curved plates - Turbines - Classifications of Turbines, Impulse and reaction turbines, Performance characteristics curves for Turbines - Iso efficiency curve - Numerical on above.

UNIT-5 PUMPS 9

Pumps – Classifications of Pumps - Centrifugal Pump –Components of Centrifugal Pumps – Work done on Centrifugal pumps-Characteristic curves for Centrifugal pumps - Positive displacement pumps- Reciprocating pump and its components - slip- Indicator diagram and its variation - Air vessels – Numerical on above - Introduction to Multistage pumps, Jet Pump & Submersible Pump

TEXTBOOKS:

1.**Subramanya K.**, "*Flow in Open channels*", Tata McGraw-Hill Publishing Company, 2005.

2.**Kumar K.L.**,"*Engineering Fluid Mechanics*", Eurasia Publishing House (P) Ltd., New Delhi, 2010.

REFERENCES:

1.**Modi P.N and Seth,** "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2003

2.**RangaRaju, K.G.**, "*Flow through Open Channels*", Tata McGraw-Hill Publishing Company, 2013.

3.**Rajesh Srivastava,** "Flow through open channels", Oxford University Press, New Delhi, 2008.

4.**VenTe Chow,** "Open Channel Hydraulics", McGraw Hill, New York, 2009.

5.**Jain A. K.** "Fluid Mechanics", Khanna Publishers 1995.

COURSE OUTCOMES:After undergoing the course, the students will have ability to

Co 1: analyze the flow characteristic of open channel

Co 2: design the most economical channel section in irrigation channels

Co 3: design spillways

Co 4: develop pilot studies on hydraulic turbines

Co 5: select and design pumps for various flow

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	3	1	1	2	2	1	1	1	1	1	2	2	1
CO 2	2	3	2	1	1	2	2	2	1	1	2	1	3	2	2
CO 3	2	3	2	2	1	2	2	1	2	1	1	1	2	2	2
CO 4	2	2	2	3	2	2	2	2	2	1	1	1	2	2	2
CO 5	2	2	3	2	2	2	2	2	1	2	1	2	2	2	2

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Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
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L T P C

418CET04

GEOTECHNICAL ENGINEERING 3 0 0 3

OBJECTIVES

- To impart knowledge on engineering properties of soil
- To understand and appreciate subsurface flow patterns
- To characterize stress distribution in soil and acquire knowledge on shear strength parameters
- To have knowledge about testing methods of soil
- To understand slope failure mechanisms and protection measures

UNIT-1 INTRODUCTION 12

Nature of Soil - soil phase relationships - Index properties - Sieve analysis - sedimentation analysis – Atterberg limits - classification for engineering purposes - BIS Classification systems – Soil compaction - factors affecting compaction – field compaction methods and monitoring.

UNIT-2 SOIL WATER AND WATER FLOW 12

Soil water – Various forms – Influence of clay minerals – Capillary rise – Suction - Effective stress concept in soil – Total, neutral and effective stress distribution in soil - Permeability – Darcy's Law- Permeability measurement in the laboratory – quick sand condition - Seepage – Laplace Equation - Introduction to flow nets –properties and uses - Application to simple problems.

UNIT-3 STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT 12

Stress distribution in soil media – Boussinesque formula – stress due to line load and Circular and rectangular loaded area - approximate methods - Use of influence charts –Westergaard equation for point load - Components of settlement – Immediate, secondary and consolidation settlement - Terzaghi's one dimensional consolidation theory – governing differential equation - laboratory consolidation test – Field consolidation curve – NC and OC clays - problems on time and rate of consolidation.

UNIT-4 SHEAR STRENGTH 12

Shear strength of cohesive and cohesionless soils - Mohr - Coulomb failure theory – Saturated soil and unsaturated soil (basics only) - Strength parameters - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests –Types of shear tests based on drainage and their applicability - Drained and undrained behaviour of clay and sand.

UNIT-5 SLOPE STABILITY 12

Slope failure mechanisms- Modes - Infinite slopes - Finite slopes – Total and effective stress analysis - Stability analysis for purely cohesive and C-ϕ soils - Method of slices – Modified Bishop's method - Friction circle method - stability number – problems – Slope protection measures & Soil Stabilization

TEXTBOOKS:

1.**PunmiaB.C.**,"*SoilMechanics and Foundation Engineering*", Laxmi Publications Pvt. Ltd., New Delhi,2008

2.**GopalRanjan and Rao A.S.R.,** "*Basic and applied soil mechanics*", New Age International Publishers,2007

REFERENCES:

1.**McCarthy D.F.,** "*Essentials of Soil Mechanics and Foundations Basic Geotechniques*", Sixth Edition, Prentice-Hall, New Jersey, 2002

2.**Das, B.M,** "*Principles of Geotechnical Engineering*", (fifth edition), Thomas Books/ cole, 2002

3.**Khan I.H.**, "*A text book of Geotechnical Engineering*", Prentice Hall of India, New Delhi, 2014

4.**C. Venkataramaiah,** "Geotechnical Engineering", New Age International Publishers, New Delhi, 2014

5.**Murthy, V.N.S.,** "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers, 2007

COURSE OUTCOMES: After undergoing the course, the students will have ability to

Co 1: classify the various types of soil

Co 2: determine the physical and engineering properties of soil

Co 3: determine the stresses in soils with respected to given loading conditions

Co 4: quantify the shear behaviour of soil

Co 5: derive the stability of slopes

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	2	3	2	3	2	2	3	1	3	1	3	3	2	1
CO 2	2	3	1	3	1	2	2	3	2	1	3	2	2	3	2
CO 3	3	2	2	3	1	1	2	2	3	2	3	2	1	1	3
CO 4	3	2	2	3	2	2	1	3	1	2	3	2	2	3	1
CO 5	1	2	3	3	1	3	3	1	3	1	2	2	2	3	1

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		L	T	P	C
418CET05	**Water Supply Engineering**	**3**	**0**	**0**	**3**

OBJECTIVES

- The main objectives of this course are
- To study the determination of water requirement for public supply,
- To understand the selection of sources of water,
- To study the quality standards for public supply
- To understand the concepts of treatment to make it potable for public supply & distribution.

UNIT-1 WATER USES AND DEMAND OF WATER 9

INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply– WaterDemand and Types of water demands - domestic demand, institutional and commercial demand, industrial demand, public uses and fire demand etc., Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire underwriters' formula.Peak factors, design periods & factors governing the design periods.

UNIT-2 SOURCES - COLLECTION AND CONVEYANCE OF WATER 9

Surface and subsurface sources – suitability with regard to quality and quantity-Intake structures – different types of intakes; factor for selection and location of intakes. Pumps- Necessity, types of pumps; factors to be considered for the selection of a pumps. Pipes – Design of the economical diameter for the rising main; Nomo grams – use; Pipe appurtenances.

UNIT-3 QUALITY OF WATER 9

Objectives of water quality. Wholesomeness& palatability of water, water borne diseases. Water quality parameters – Physical, chemical and Biological.Sampling of water for examination. Water quality analysis using a[nalytical and instrumental techniques. Drinking water standards as per BIS & WHO guidelines.Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic and toxic / trace organics.

UNIT-4 WATER TREATMENT 9

Water treatment flow-charts. Aeration- Principles of aeration, types of Aerators - Sedimentation-Theory, Types of settling tanks, design. Sedimentation aided with Coagulation, chemical feeding, flash mixing, and clari-flocculator-Filtration-Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design.– Back washing of filters. Operational problems in filters. Disinfection-Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV radiation treatment – treatment of swimming pool water - Softening – definition, methods of removal of hardness by lime soda process, zeolite process, RO & Membrane technique. Miscellaneous Treatment - Removal of color, odor & taste, use of copper sulfate, adsorption technique ,fluoridation and defluoridation- Removal of Iron & Manganese.

UNIT-5 DISTRIBUTION SYSTEMS 9

System of supply- service reservoirs and their capacity determination- methods of layout of distribution systems-Maintenance of Distribution Systems-Miscellaneous-Pipe appurtenances, various valves, type of fire hydrants, pipefitting,Leak Detection&layout of water supply pipes in buildings.

COURSE OUTCOMES:After undergoing the course, the students will have ability to:

Co 1: Know about water demand, its source & collection

Co 2: Understand the Standards applied for drinking water.

Co 3: Design the appropriate water treatment plant for municipal water supply.

Co 4: Understand & design the distribution system.

TEXTBOOK:

1.Water supply Engineering –S.K.Garg, Khanna Publishers, 24th revised edition, 2014

2.Environmental Engineering I –B.C. Punima and Ashok Jain, 2016 Edition,

3.Environmental Engineering –I Dr. P.N. Modi, 2010 Publication

REFERENCES:

1.Manual on Water supply and treatment - CPHEEO, Ministry of Urban Development, New Delhi.

2.Standard Methods for the examination of Water and Waste Water-APHA- 17th Edition,

3.Hand Book on Water Supply and Drainage, SP35. BIS., New Delhi,

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	2				1						1	2	3
CO 2	1	2	2	2	1								2	3	1
CO 3	1	3	2		2			1					2	1	
CO 4	1	2	3		1		1	1					3	2	1
CO 5	2	3	3	2	1								1	3	2

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Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

		L	T	P	C
418CET06	**3D PRINTING AND DESIGN**	**3**	**0**	**0**	**2**

OBJECTIVES

- To impart knowledge and skills related to 3D printing technologies
- To know about CAD for additive manufacturing
- To know about the technique in developing a product in industry and environment
- To know about the materials in developing a product
- To know about the equipment, post processing and quality control of products
-

UNIT-1 3D PRINTING **9**

Introduction, Process, Classification, Advantages, Additive V/s Conventional Manufacturing process, Applications.

UNIT-2 CAD FOR ADDITIVE MANUFACTURING **9**

CAD Data formats, Data translation, Data loss, STL format.

UNIT-3 ADDITIVE MANUFACTURING TECHNIQIUES9

Stereo- Lithography, LOM, FDM, SLS,SLM, Binder Jet technology, Process- Process parameter- Process selection for various applications, Additive Manufacturing- Application Domains.

UNIT-4 MATERIALS **9**

Polymers- Metals, Non-metals- Ceramics, Various forms of raw material- Liquid – Solid, wire powder- Powder preparation and their desired properties, Support materials.

UNIT-5 ADDITIVE MANUFACTURING EQUIPMENT, POST PROCESSING AND PRODUCT QUALITYTOTAL HOURS **9**

Process Equipment – Design and process parameters- Governing body mechanism- Common faults and troubleshooting- Process design
Post Processing-Requirement and Techniques
Product Quality – Inspection and testing – Defects and their causes

COURSE OUTCOMES:After undergoing the course, the students will have ability to

Co 1: Develop CAD models for 3D printing
Co 2: Import and Export CAD data and generate .stl file
Co 3: Select a specific material for the given application
Co 4: Select a 3D printing process for an application
Co 5: Produce a product using or Additive Manufacturing (AM)

TEXTBOOKS:

1. **Lan Gibson, David W.Rosen and Brent STUCKER,** "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2. **CK Chua, Kah Fai Leong,** "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017

REFERENCES:

1. **Andreas Gebhardt,** "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooloing, Rapid Manufacturing", Hanser Publisher, 2011.
2. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi
3. J.D.Majumdar and I.Manna, "Laser-Assisted Fabrication of Materials", Springer Series
4. in Material Science, 2013.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	2				1						1	2	3
CO 2	1	2	2	2	1								2	3	1
CO 3	1	3	2		2			1					2	1	
CO 4	1	2	3		1		1	1					3	2	1
CO 5	2	3	3	2	1								1	3	2

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	L	T	P	C
418CEP06 STRENGTHOFMATERIALS LABORATORY	**0**	**0**	**3**	**2**

OBJECTIVES

- To understand the fundamental modes of application of loading on the structures toevaluate the strength.
- To impart the knowledge on measurements of loads, displacements and strains.
- To obtain the strength of the material and stiffness properties of structural elements.
- To measure hardness of material.
- To estimate impact value of material.

LIST OF EXPERIMENTS

1. Determination of Compression Test on given concrete cube specimen
2. Determination of Compression Test on given Brick specimen
3. Determination of Compression Test on given wooden specimen
4. Determination of Split Tensile Test on given concrete specimen
5. Determination of tension test on mild steel specimen
6. Determination of Modulus of Rigidity of given specimen by conducting torsion test
7. Determination of Modulus of rigidity of Helical spring
8. Determination of Flexural Rigidity of given steel beam
9. Determination of Flexural Rigidity of given wooden beam
10. Determination of Double shear strength of given specimen
11. Determination of Hardness of specimen by Brinell's Hardness Test
12. Determination of Hardness of specimen by Rock well hardness Test
13. Determination of Hardness of specimen by Vicker's hardness Test
14. Determination of Impact strength of mild steel specimen by
    i. Izod impact test
    ii. Charpy Impact test.
15. Determination of tension test on thin steel wire specimen

COURSE OUTCOMES: After undergoing the course, the students will have ability to

Co 1: access the compressive strength of concrete cubes and bricks
Co 2: analyze the flexural behavior of beams
Co 3: evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens
Co 4: find stiffness of springs
Co 5: decide over the suitability of materials for the intended purpose

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2	3	3	3	2	2	3	1	3	2	1
CO 2	3	3	2	2	2	3	3	3	2	2	3	1	3	2	2
CO 3	3	3	3	2	2	3	3	2	3	2	2	1	3	2	2
CO 4	3	3	3	2	3	3	2	2	2	2	2	1	3	2	3
CO 5	3	3	3	2	2	2	3	3	3	3	2	1	3	2	2

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Adhiyamaan College of Engineering (Autonomous)
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		L	T	P	C
418CEP07	**HYDRAULIC ENGINEERING LABORATORY**	**0**	**0**	**3**	**2**

OBJECTIVES

- To impart knowledge on measuring flow through pipes and open channels
- To familiarize the determination of major and minor losses in pipes
- To get exposed to flow tests
- To acquire knowledge on finding the efficiency of various types of pumpsTo provide knowledge on various types of turbines and their applications

LIST OF EXPERIMENTS

1. Determination of hydraulic co-efficient for orifice piece
2. Determination of hydraulic co-efficient for mouth piece
3. Determination of co-efficient of discharge for notches
4. Determination of co-efficient of discharge for venturimeter
5. Hydraulic co-efficient of V notch orifice
6. Hydraulic co-efficient of Rectangular orifice
7. Hydraulic co-efficient of Triangular orifice
8. Study of impact of jet on flat normal plate
9. Study of impact of jet on flat inclined plate
10. Study of major and minor losses in pipes
11. Study on performance characteristics of Pelton turbine.
12. Study on performance characteristics of Francis turbine
13. Study on performance characteristics of Kaplan turbine
14. Study on performance characteristics of Centrifugal pumps (Constant speed / variable speed)
15. Study on performance characteristics of reciprocating pump.

Course Outcomes	Programme Outcomes (PO's)												(PSO's)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	1	3	1		1	2	2	3	1	3	2	1
CO 2	3	3	2		2		2	2	2	2	3	1	3	2	2
CO 3	3	3	3			1			3	2	2	1	3	2	2
CO 4	3	3	3	2			1	3	2	2	2	1	3	2	3
CO 5	3	3	3		1	2	2		3	3	2	1	3	2	2

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Adhiyamaan College of Engineering (Autonomous)
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Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering - Autonomous					Regulation			R-2015
Department	Civil Engineering		Programme Code and Name		C.E:B.E. Civil Engineering			
Semester - V								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
515CET01	CONCRETE TECHNOLOGY	3	0	0	3	50	50	100
OBJECTIVES	i) To impart knowledge to the students on the properties of materials for ordinary concrete ii) To impart knowledge to the students on mix design procedure. iii) To impart knowledge to the students on different tests on properties of concrete. iv) To impart knowledge to the students on the properties of special concrete							
UNIT-1	CONSTITUENT MATERIALS				TOTAL HOURS			9 HOURS
Cement-Different types-Chemical composition and Properties -Tests on cement-IS Specifications-Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements- Water- Quality of water for use in concrete.								
UNIT-2	CHEMICAL AND MINERAL ADMIXTURES				TOTAL HOURS			9 HOURS
Accelerators-Retarders- Plasticisers- Super plasticizers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline -Their effects on concrete properties								
UNIT-3	PROPORTIONING OF CONCRETE MIX				TOTAL HOURS			9 HOURS
Principles of Mix Proportioning-Properties of concrete related to Mix Design-Physical properties of materials required for Mix Design - Design Mix and Nominal Mix-BIS Method of Mix Design - Mix Design Examples								
UNIT-4	FRESH AND HARDENED PROPERTIES OF CONCRETE				TOTAL HOURS			9 HOURS
Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete-Determination of Compressive and Flexural strength-Stress-strain curve for concrete-Determination of Young's Modulus.								

UNIT-5	**SPECIAL CONCRETES**	TOTAL HOURS	9 HOURS
Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete - SIFCON-Shotcrete – Polymer concrete - High performance concrete- Geopolymer Concrete			
TOTAL HOURS TO BE TAUGHT			**45 HOURS**

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	To know the properties of materials required for concrete
CO.2	To know the design procedures for making concrete
CO.3	To know the tests on concrete - Fresh and hardened concrete
CO.4	To know the properties of different materials used for making special concrete

TEXT BOOKS:

1.	Shetty, M.S., " Concrete Technology" , S. Chand and Company Ltd., 2002.
2.	Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010

REFERENCES:

1.	Santhakumar,A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007
2.	Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 2005
3.	Gambir, M.L; "Concrete Technology", 3 rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
4.	IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 2008

515CET01 Concrete Technology																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	To know the properties of materials required for concrete	3	2	2	3		1	1		1			2	2	1	3
CO2	To get the knowledge on mineral and chemical admixtures	3	2	2	3		1	1		1			2	2	1	3
CO3	To know the design procedures for making concrete	3	2	2	3		1	1		1			2	2	1	3
CO4	To know the tests on concrete - Fresh and hardened concrete	3	2	2	3		1	1		1			2	2	1	3
CO5	To know the properties of different materials used for making special concrete	3	2	2	3		1	1		1			2	2	1	3

515CET02 Structural Analysis - I																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Able to find the deflections of determinate structures.	3	3										2	3	3	
CO2	To understand the concept of influence line and able to draw for determinate structures.	3	3										2	3	3	

CO3	To get the knowledge on two and three hinged arches and able to find the reactions.	3	3										2	3	3	
CO4	To draw the bending moment diagram by using slope deflection method.	3	3										2	3	3	
CO5	To draw the bending moment diagram by using moment distribution method.	3	3										2	3	3	

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Semester - V

Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
515CET03	**DESIGN OF RCC STRUCTURES**	**3**	**1**	**0**	**4**	**50**	**50**	**100**

OBJECTIVES	1. To study the different types of philosophies related to Design of Reinforced Concrete Structures with emphasis on Limit State Method. 2. To understand the behavior the structural elements. 3. To design of Basic elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice for Reinforced Concrete Structures. 4. To posses knowledge on detailing of reinforcement in RC structures.

UNIT-1	**METHODS OF DESIGN OF CONCRETE STRUCTURES**	TOTAL HOURS	12 HOURS

Concept of Elastic method, working stress, ultimate load method and limit state method – Advantages of Limit State Method over other methods – Design codes and specification – Limit State philosophy as detailed in IS code

UNIT-2	**LIMIT STATE DESIGN FOR FLEXURE**	TOTAL HOURS	12 HOURS

Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects – Analysis and design of singly and doubly reinforced rectangular and flanged beams

UNIT-3	**LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR &TORSION**	TOTAL HOURS	12 HOURS
Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.			
UNIT-4	**LIMIT STATE DESIGN OF COLUMNS**	TOTAL HOURS	12 HOURS
Types of columns – Braced and unbraced columns – Design of short column for axial, uniaxial and biaxial bending – Design of long columns – Standard method of detailing RC beams, slabs and columns.			
UNIT-5	**LIMIT STATE DESIGN OF FOOTING AND DETAILING**	TOTAL HOURS	12 HOURS
Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Design of combined rectangular footing for two columns only – Special requirements of detailing with reference to erection process.			
TOTAL HOURS TO BE TAUGHT			**60 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Use the IS codes for analysis and design of RC structures.		
CO.2	Analyze the structure to quantify the capacity of the constructed structures.		
CO.3	Design a RC building structure.		
CO.4	Detail the reinforcement in each elements of RC structure as per IS codal provisions.		
TEXT BOOKS:			
1.	Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt.Ltd.,New Delhi		
2.	Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi		
REFERENCES:			
1.	Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Rourkee		

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Adhiyamaan College of Engineering (Autonom
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2.	Sinha, S.N., "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3.	UnnikrishnaPillai, S., DevadasMenon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Co. Ltd., New Delhi
4.	Use of code books- IS – 456, IS- 875 & SP 16.

515CET03 Design of RCC Structures															
CO's		PO's												PSO's	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Use the IS codes for analysis and design of RC structures.	3	3	3	1	-	1	1	-	-	-	1	-	3	2	1
CO2	Analyze the structure to quantify the capacity of the constructed structures.	3	3	3	1	-	1	2	-	-	1	-	-	3	2	1
CO3	Design a RC building structure.	3	3	3	1	-	1	2	-	-	1	-	-	3	2	1
CO4	Detail the reinforcement in each elements of RC structure as per IS codal provisions.	3	3	3	1	-	1	2	-	-	1	-	-	3	2	1
CO5	Detail the connections between structural elements.	3	3	3	1	-	1	2	-	-	1	-	-	3	2	1

Adhiyamaan College of Engineering - Autonomous						Regulation		R-2015
Department	Civil Engineering	**Programme Code and Name**				C.E:B.E. Civil Engineering		
Semester-V								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
515CET04	**Water Supply Engineering**	3	0	0	3	50	50	100
OBJECTIVES	The main objectives of this course are 1. To study the determination of water requirement for public supply, 2. To understand the selection of sources of water, 3. To study the quality standards for public supply 4. To understand the concepts of treatment to make it potable for public supply & distribution.							
UNIT-1	WATER USES AND DEMAND OF WATER					TOTAL HOURS		9 HOURS
INTRODUCTION: Human activities and environmental pollution. Water for various beneficial uses and quality requirement. Need for protected water supply – Water Demand and Types of water demands - domestic demand, institutional and commercial demand, industrial demand, public uses and fire demand etc., Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits &demerits- variations in demand of water. Fire demand – estimation by Kuichling's formula, Freeman formula & national board of fire under writers' formula. Peak factors, design periods & factors governing the design periods.								
UNIT-2	SOURCES - COLLECTION AND CONVEYANCE OF WATER					TOTAL HOURS		9 HOURS
Surface and subsurface sources – suitability with regard to quality and quantity-Intake structures – different types of intakes; factor for selection and location of intakes. Pumps- Necessity, types of pumps; factors to be considered for the selection of a pumps. Pipes – Design of the economical diameter for the rising main; Nomo grams – use; Pipe appurtenances.								
UNIT-3	QUALITY OF WATER					TOTAL HOURS		9 HOURS
Objectives of water quality. Wholesomeness & palatability of water, water borne diseases. Water quality parameters – Physical, chemical and Biological. Sampling of water for examination. Water quality analysis using analytical and instrumental techniques. Drinking water standards as per BIS & WHO guidelines. Health significance of Fluoride, Nitrates and heavy metals like Mercury, Cadmium, Arsenic and toxic / trace organics.								
UNIT-4	WATER TREATMENT					TOTAL HOURS		9 HOURS

Water treatment flow-charts. Aeration- Principles of aeration, types of Aerators - Sedimentation-Theory, Types of settling tanks, design. Sedimentation aided with Coagulation, chemical feeding, flash mixing, and clari-flocculator -Filtration-Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design.– Back washing of filters. Operational problems in filters. Disinfection-Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV radiation treatment – treatment of swimming pool water - Softening – definition, methods of removal of hardness by lime soda process, zeolite process, RO & Membrane technique. Miscellaneous Treatment - Removal of color, odor & taste, use of copper sulfate, adsorption technique ,fluoridation and defluoridation- Removal of Iron & Manganese.			
UNIT-5	DISTRIBUTION SYSTEMS	TOTAL HOURS	9 HOURS
System of supply- service reservoirs and their capacity determination- methods of layout of distribution systems-Maintenance of Distribution Systems-Miscellaneous-Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Leak Detection & layout of water supply pipes in buildings.			
TOTAL HOURS TO BE TAUGHT		45 HOURS	
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to:			
CO.1	Know about water demand, its source & collection		
CO.2	Understand the Standards applied for drinking water.		
CO.3	Design the appropriate water treatment plant for municipal water supply.		
CO.4	Understand & design the distribution system.		
TEXTBOOK			
1.	Water supply Engineering –S.K.Garg, Khanna Publishers, 24th revised edition, 2014		
2.	Environmental Engineering I –B.C. Punima and Ashok Jain, 2016 Edition,		
3.	Environmental Engineering –I Dr. P.N. Modi, 2010 Publication		
REFERENCES:			
1.	Manual on Water supply and treatment - CPHEEO, Ministry of Urban Development, New Delhi.		
2.	Standard Methods for the examination of Water and Waste Water-APHA- 17th Edition,		
3.	Hand Book on Water Supply and Drainage, SP35. BIS., New Delhi,		

515CET04 Water Supply Engineering																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Know about water demand, its source, collection and distribution	2	3	2				1						1	2	3
CO2	Identify the quantity and quality of water from various sources and processes involved in the water conveyance systems	1	2	2	2	1								2	3	1
CO3	Compute the quality and characteristics of wastewater.	1	3	2		2			1					2	1	
CO4	Infer the design principles of unit operations and processes for water treatment.	1	2	3		1		1	1					3	2	1
CO5	Justify method of distribution system.	2	3	3	2	1								1	3	2

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Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering - Autonomous					Regulation		R - 2015
Department	Civil Engineering	Programme Code and Name			CE : B.E. Civil Engineering		
Semester - V							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA	TOTAL
515CET05	**FOUNDATION ENGINEERING**	**3**	**0**	**0**	**3**	**50**	**50**	**100**

OBJECTIVES	• To study the methods to investigate the soil condition, sampling techniques and to design suitable foundation. • To acquire knowledge of different types of shallow foundation and to proportion foundation. • To know the different types of pile foundation and their function. • To have complete knowledge of plastic equilibrium in soils and stability of retaining walls.

UNIT-1	**SITE INVESTIGATION AND SELECTION OF FOUNDATION**	TOTAL HOURS	12 HOURS

Scope and objectives – Methods of soil exploration-augering and boring – Water boring and rotatory drilling – Depth of boring – Spacing of bore hole - Sampling – disturbed and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – Bore log report – Penetration tests (SPT and SCPT) – Geo physical exploration methods (Seismic refraction and Electrical Resistivity)Data interpretation (Strength parameters and Liquefaction potential) – Selection of foundation based on soil condition.

UNIT-2	**SHALLOW FOUNDATIONS.**	TOTAL HOURS	12 HOURS

Introduction – Location and depth of foundation – Codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems - Bearing Capacity from insitu tests (SPT, SCPT and plate load) – Allowable bearing pressure, Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements – Codal provision – Methods of minimising settlement, differential settlement

UNIT-3	**FOOTINGS AND RAFTS *Machine foundation***	TOTAL HOURS	12 HOURS

Types of foundation – Contact pressure distribution below footings & raft - Isolated and combined footings – types – proportioning - mat foundation – types – use - proportioning – floating foundation..*(design for all types of shallow foundation)*

UNIT-4	**PILES**	TOTAL HOURS	12 HOURS

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering news and Hiley's) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – uplift capacity – Group capacity by different methods (Feld's rule, Converse Labara formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test – Forces on pile caps – under reamed piles – Capacity under compression and uplift.

UNIT-5	**RETAINING WALLS**	TOTAL HOURS	12 HOURS
Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil - Coloumb's wedge theory – condition for critical failure plane - Earth pressure on retaining walls of simple configurations – Graphical methods (Rebhann and Culmann) - pressure on the wall due to line load – Stability of retaining walls.Machine foundation			
TOTAL HOURS TO BE TAUGHT			**60 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Learn about the foundation types and methodology.		
CO.2	Design Shallow foundation..		
CO.3	Design raft foundation.		
CO.4	Design piles and retaining walls theories.		
TEXT BOOKS:			
1.	Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, New Delhi, 1999		
2.	GopalRanjan and Rao, A.S.R. "Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi (India), 2003.		
3.	Punmia B.C., "Soil Mechanics and Foundation Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 1995.		
REFERENCES:			
1.	Das, B.M. "Principles of Foundation Engineering (Fifth edition), Thomson Books / COLE, 2003		
2.	Swamisaran, "Analysis and Design of Structures – Limit state Design", Oxford IBH Publishing Co-Pvt. Ltd., New Delhi, 1998		
3.	Kaniraj, S.R, "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2002		
4.	Bowles J.E, "Foundation Analysis and Design", McGraw-Hill, 2004		
5.	Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2005		
6.	N.N. Som and S.C. Das, "Theory and Practice of Foundation Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2003		

515CET05 Foundation Engineering																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Learn about the foundation types and methodology.	2	1	3	1	3	2	2	3	3	2	1	2	2	3	2
CO2	Design Shallow foundation.	3	1	2	3	3	2	3	3	1	2	2	1	3	2	2
CO3	Design raft foundation.	1	2	2	1	3	1	3	2	2	2	1	3	3	3	2
CO4	Design piles and retaining walls theories.	2	3	2	3	3	1	1	2	1	2	3	3	1	2	2
CO5	To study the methods to investigate the soil condition, sampling techniques and to design suitable foundation.	2	2	2	1	3	2	3	2	3	3	2	1	1	2	3

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Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomou
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Krishnagiri (Dt.), Tamil Nadu.

CO3	Gain knowledge about groundwater exploration and designing of wells.	1	2	3	2	2	2	2	-	1	1	1	2	2	2	1
CO4	Evaluateartificial recharge methods and structuresfor groundwater managemen	1	2	1	2	1	1	1	-	1	2	-	1	1	1	1
CO5	design a ground water model for a basin	2	1	2	1	1	2	1	2	1	-	2	1	2	1	2

Adhiyamaan College of Engineering - Autonomous				Regulation		**R - 2015**	
Department	**Civil Engineering**		Programme Code and Name		**C.E:B.E. Civil Engineering**		
Semester - V							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA
515CEP07	**GEOTECHNICAL ENGINEERING LABORATORY**	0	0	3	2	50	50
OBJECTIVES	At the end of this course, the student acquires the capacity to test the soil to assess its Engineering and Index properties.						
LIST OF EXPERIMENTS :							
1.	Determination of water content by oven drying method						
2.	Determination of Grain size distribution a) Sieve analysis b) Hydrometer analysis						
3.	Determination of Field density a) Core Cutter Method b) Sand Replacement Method						
4.	Determination of Specific gravity of soil grains						
5.	Determination of Relative density of sands						
6.	Determination of Atterberg limits test –Liquid limit ,Plastic limit & Shrinkage limit						

7.	Determination of Optimum Moisture Content & Maximum Dry Density - Standard Proctor test.
8.	Determination of Permeability -Constant head and Falling head methods
9.	Determination of shear strength parameters. a) Direct shear test on cohesion less soil b) Unconfined compression test on cohesive soil c) Triaxial compression test d) Vane shear test
10.	Determination of co-efficient of consolidation -One dimensional consolidation test
11.	Geophysical exploration
COURSE OUTCOMES:	
After undergoing the course, the students will have ability to	
CO.1	To Gain knowledge about Grain size distribution of soil
CO.2	To know fundamentals of Atterberg limits .
CO.3	To Determine the Field density and permeability of soil.
CO.4	To Evaluate the shear strength of soil.
REFERENCES	1. "Soil Engineering Laboratory Instruction Manual", Published by the Engineering College Co-operative Society, Chennai, 2002. 2. Head, K.H, "Manual of Soil Laboratory Testing (Vol-1 to 3)", John Wiley & Sons, Chichester, 1998. 3. "I.S.Code of Practice (2720) Relevant Parts", as amended from time to time. 4. Saibaba Reddy, E. and Rama Sastri, K., "Measurement of Engineering Properties of Soils", New Age International Publishers, New Delhi, 2002.

Faculty of Civil Engineering (UG)
Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering – Autonomous			Regulation	R-2015
Department	Civil Engineering	Programme Code and Name	C.E:B.E. Civil Engineering	

Semester – VI

Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
615CET01	Structural Analysis – II	3	2	0	4	50	50	100

OBJECTIVES	To learn the matrix methods of analysis of beams and frames. To understand the various methods of analysis of indeterminate structures. To understand the principles of plastic analysis and behaviour of indeterminate structures. To study the analysis of space structures To understand Principles of and suspension cables

UNIT-1	**FLEXIBILITY METHOD**	TOTAL HOURS	12 HOURS

Equilibrium and compatibility – Determinate and Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy up to two).

UNIT-2	**STIFFNESS METHOD**	TOTAL HOURS	12 HOURS

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames.

UNIT-3	**FINITE ELEMENT METHOD**	TOTAL HOURS	12 HOURS

Introduction – Discretisation of a structure –Displacement functions-Truss element-Beam element-Plane stress and plane strain- Triangular elements.

UNIT-4	**PLASTIC ANALYSIS OF STRUCTURES**	TOTAL HOURS	12 HOURS

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems .

UNIT-5	**SPACE AND CABLE STRUCTURES**	TOTAL HOURS	12 HOURS

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables - cables with two and three hinged stiffening girders	
TOTAL HOURS TO BE TAUGHT	**60 HOURS**
COURSE OUTCOMES:	
After undergoing the course, the students will have ability to	
CO.1	Analyse determinant and Indeterminate structure using Flexible method
CO.2	Analyse structures using matrix methods.
CO.3	Understand the basics of Finite Element Methods.
CO.4	Know about plastic analysis of intermediate beams and frames.
CO.5	Analyse space truss and suspension cables.

TEXT BOOKS:

1.	C.S.Reddy., "Basic Structural Analysis'',Tata McGraw-Hill Education, 2011
2.	Vaidyanathan, R. and Perumail, P., "Comprehensive structural Analysis – Vol. I & II", Laxmi Publications, New Delhi, 2017
3.	Coates R.C, Coutie M.G. and Kong F.K., "Structural Analysis", ELBS and Nelson, 1990
4.	L.S. Negi& R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2004

REFERENCES:

1.	Ghali.A, Nebille,A.M. and Brown,T.G. "Structural Analysis" A unified classical and Matrix approach" –5th edition. Spon Press, London and New York, 2009.
2.	Vazirani V.N, &Ratwani, M.M, "Analysis of Structures", Khanna Publishers, Delhi, 2004
3.	G.S. Pandit & S.P. Gupta, "Structural Analysis – A Matrix Approach", Mcgraw Hill Education, 2009
4.	Matrix Analysis of Framed Structures – Jr. William Weaver & James M. Gere, CBS Publishers and Distributors, Delhi, 2004

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Krishnagiri (Dt.), Tamil Nadu.

Department	**Civil Engineering**	Programme Code and Name	CE : B.E. Civil Engineering

Semester – VI

Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
615CET02	**Design of Steel Structures**	3	2	0	**4**	50	50	100

OBJECTIVES

- To introduce the students to the limit state design concepts for steel design
- To study the design concepts of tension members.
- To study the design concepts of compression members.
- To study the design concepts of beams,
- To study the design concepts roof trusses and industrial structures.

UNIT-1	**INTRODUCTION**	TOTAL HOURS	12 HOURS

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using welding & bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts.

UNIT-2	**TENSION MEMBERS**	TOTAL HOURS	12 HOURS

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connectio in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT-3	**COMPRESSION MEMBERS**	TOTAL HOURS	12 HOURS

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base

UNIT-4	**BEAMS**	TOTAL HOURS	12 HOURS

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns

UNIT-5	**ROOF TRUSSES**	TOTAL HOURS	12 HOURS

Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss; end bearing – Design of gantry girder

TOTAL HOURS TO BE TAUGHT	**60 HOURS**

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	Design steel structure elements using limit state design concept.
CO.2	Design bolted and welded joints.
CO.3	Use IS codes and Design tension, compression members and beams.
CO.4	Design roof trusses.
CO.5	Design Gantry girders and other industrial structures.

TEXTBOOKS:

1. Dayaratnam, P., "Design of Steel Structures", Second edition, S. Chand & Company, 2003
2. Duggal. S.K. "Limit state design of steel structures", Tata McGraw Hill Publishing company, 2005.

REFERENCES:	
1.	Bhavikatti. S.S "Design of Steel Structures" By Limit State Method as per IS800-2007,IK international publishing house Ltd,2009.
2.	"Teaching Resources for Structural Steel Design – Vol. I & II", INSDAG, Kolkatta.
3.	Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., "Design of Steel Structures", 3rd edition, McGraw-Hill Publications, 1992.

615CET02 Design of Steel Structures															
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Design steel structure elements using limit state design concept.	3	1	1	1	1			1	1			2	3	3	1
CO2	Design bolted and welded joints.	3	3	3	2	1			1	1			2	3	3	1
CO3	Use IS codes and Design tension, compression members and beams.	3	3	3	2	1			1	1			2	3	3	1
CO4	Design roof trusses.	3	3	3	2	1			1	1			2	3	3	1
CO5	Design Gantry girders and other industrial structures.	3	3	3	2	1			1	1			2	3	3	1

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Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering - Autonomous			Regulation	R-2015
Department	Civil Engineering	**Programme Code and Name**	C.E:B.E. Civil Engineering	

Semester – VI

Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
615CET03	**Sanitary Engineering**	3	0	0	**2**	50	50	100

OBJECTIVES

- To introduce the students Basics of sanitary engineering
- To study the design concepts of sewers and sewer appurtenances
- To study of waste water characteristics
- To understand principles of disposal of effluents
- To study of the various waste water treatment process

UNIT-1	**INTRODUCTION**	TOTAL HOURS	9 HOURS

Sources of waste water-Necessity for sanitation, methods of domestic waste water disposal, types of sewerage systems and their suitability. Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design flow, estimation of storm flow, rational method and empirical formulae of design of storm water drain. Time of concentration.

UNIT-2	**DESIGN OF SEWERS, MATERIALS OF SEWERS AND SEWER APPURTENANCES**	TOTAL HOURS	9 HOURS

Hydraulic formulae for velocity, effects of flow variations on velocity, self-cleansing and non-scouring velocities, Design of hydraulic elements for circular sewers flowing full and flowing partially full (No derivations).Sewer materials, shapes of sewers, laying of sewers, joints and testing of sewers, ventilation and cleaning of sewers. Catch basins, manholes, flushing tanks, oil and grease traps, Drainage traps. Basic principles of house drainage. Typical layout plan showing house drainage connections, maintenance of house drainage.

UNIT-3	**WASTE WATER CHARACTERIZATION**	TOTAL HOURS	9 HOURS

Sampling, significance, techniques and frequency. Physical, Chemical and Biological characteristics, Aerobic and Anaerobic activity, CNS cycles. BOD and COD. Their significance & problems

UNIT-4	**DISPOSAL OF EFFLUENTS**	TOTAL HOURS	9 HOURS

Disposal of Effluents by dilution, self-purification phenomenon. Oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Effluent Disposal standards for land, surface water & ocean. Numerical Problems on Disposal of Effluents. Streeter Phelps equation.

UNIT-5	**TREATMENT OF WASTE WATER AND SECONDARY TREATMENT**	TOTAL HOURS	9 HOURS

Flow diagram of municipal waste water treatment plant. Preliminary & Primary treatment: Screening, grit chambers, skimming tanks, and primary sedimentation tanks – Design criteria & Design examples.

Suspended growth, Trickling filter – theory and operation, types and designs. Activated sludge process-Principle and flow diagram, Design of ASP. Anaerobic Sludge digestion, Sludge digestion tanks, Design of Sludge drying beds. Low cost waste treatment method. Septic tank, Oxidation Pond and Oxidation ditches – Design. Reuse and recycle of waste water-A Case Study of Treatment and Reuse of Waste Water.	
TOTAL HOURS TO BE TAUGHT	**45 HOURS**
COURSE OUTCOMES:	
After undergoing the course, the students will have ability to	
CO.1	Learn about waste water sources and collection.
CO.2	The different types of Sewer systems.
CO.3	Know and identify waste water characterization
CO.4	Disposal the effluents in most efficient manner
CO.5	Design the unit processes for conventional and advanced waste water treatment
TEXT BOOKS:	
1.	S.K. Garg., "Environmental Engineering I & II", Khanna Publishers, 2017, New Delhi-2.
2.	B.C.Punmia "Environmental Engineering II", Laxmi Publication, 2016, New Delhi-2.
3.	Modi, P.N., "Environmental Engineering I & II", Standard Book House,2008 Delhi - 6
REFERENCES:	
1.	Manual on Waste Water Treatment: CPHEEO, Ministry of Urban Development, 2016 New Delhi.
2.	Waste Water Treatment, Disposal and Reuse: Metcalf and Eddy inc : Tata McGraw Hill Publications 2002.

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Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu

		615CET03 SANITARY ENGINEERING														
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Able to Learn about waste water sources ,disposal and design of storm flow	2	2	3	1									1	1	
CO2	Able to Know Design of sewer, sewer material and appurtenances.	1		2	3									2	1	
CO3	Compute the quantity and characteristics of wastewater.	1	3	2		2			11					2	1	
CO4	Point out the disposal methods of effluents	1	2	3	2			3	1					2	1	3
CO5	Express the design principles of various unit operations and processes for sewage treatment system.	2	1	3	3	2								3	2	1

Adhiyamaan College of Engineering - Autonomous					Regulation		R-2015
Department	Civil Engineering				**Programme Code and Name**		**Department**
Semester – VI							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA	TOTAL
615CET04	**Transportation Engineering – II**	3	0	0	**2**	50	50	100
OBJECTIVES	• To provide the knowledge of planning, design, construction and maintenance of railway tracks. • To introduce the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering. • To study about the airport planning and design • To gain knowledge about Airport layouts and visual aids • To study about the planning of harbours & coastal structures.						
UNIT-1	**RAILWAY PLANNING AND DESIGN**				TOTAL HOURS		12 HOURS
Role of Indian Railways in National Development - Engineering Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipment) Permanent Way, its Components and Functions of each Component: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density Ballasts – Functions, Materials, Ballast less Tracks Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves							
UNIT-2	**RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION**				TOTAL HOURS		12 HOURS
Points and Crossings - Design of Turnouts, Working Principle Signalling-Interlocking and Track Circuiting Construction & Maintenance – Conventional, Modern methods and Materials-Track Drainage Track Modernisation– Automated maintenance and upgrading, Technologies, Re-laying of Track-Lay outs of Railway Stations and Yards-Rolling Stock-Tractive Power-Track Resistance-Level Crossings.							
UNIT-3	**AIRPORT PLANNING AND DESIGN**				TOTAL HOURS		12 HOURS

Advantages and Limitations of Air Transport, Components of Airports-Airport Planning – Air traffic potential, Site Selection, Design of Components, Cost Estimates, Evaluation and Institutional arrangements Runway Design- Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems)-Drainage Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed-Airport Drainage Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways.			
UNIT-4	**AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL**	TOTAL HOURS	12 HOURS
Airport Layouts – Apron, Terminal Building, Hangars, Motor Vehicle Parking Area and - Circulation Pattern, Case studies of Airport Layouts-Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings-Air Traffic Control – Basic Actions, Air Traffic Control Network Helipads, Hangars.			
UNIT-5	**HARBOUR ENGINEERING**	TOTAL HOURS	12 HOURS
Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports Requirements and Classification of Harbours Site Selection & Selection Investigation –Dredging, Range of Tides, Waves and Tidal Currents, Littoral Transport with Erosion and Deposition, Winds & Storms, , Construction Materials, Coast Lines Dry and Wet Docks,, Planning and Layouts Entrance, Position of Light Houses, Navigating Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids-Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders.			
TOTAL HOURS TO BE TAUGHT			**60 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Plan and do the geometric design of the railway track and its elements.		
CO.2	Design turn outs and modern method of maintenance of railway track		
CO.3	Plan and design of the Runway and Taxiway		
CO.4	Design the elements of an airport and its layout, aids and traffic control.		
CO.5	Understand different terminologies in harbour Engineering		
TEXT BOOKS:			
1.	Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, DhanpatRai and Sons, Delhi, 2003.		

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2.	Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 2009.
3.	S P Bindra, A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, 1993.
REFERENCES:	
1.	Rangwala, Railway Engineering, Charotar Publishing House, 2008.
2.	Rangwala, Airport Engineering, Charotar Publishing House, 2014.
3.	Hasmukh P. Oza and Gautam H. Oza, "Dock & Harbour Engineering" Charotar Publishing House Pvt. Ltd., 2012.

615CET04 Transportation Engineering-II

CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	Plan and do the geometric design of the railway track and its elements.	1	-	3	-	-	-	-	1	-	-	1	1	3	3	-
CO 2	Design turn outs and modern method of maintenance of railway track	1	2	-	-	3	-	-	-	-	-	-	2	-	3	1
CO 3	Plan and design of the Runway and Taxiway	1	-	2	3	3	2	-	1	-	-	-	3	3	3	-
CO 4	Design the elements of an airport and its layout, aids and traffic control.	-	-	-	1	3	-	-	-	-	-	-	3	1	1	-
CO 5	Understand different terminologies in harbour Engineering	1	-	2	-	-	-	2	-	-	-	2	3	3	-	-

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Adhiyamaan College of Engineering - Autonomous						Regulation		R-2015
Department	Civil Engineering	**Programme Code and Name**				C.E:B.E. Civil Engineering		
Semester- **VI**								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
615CET05	**Irrigation Engineering**	3	0	0	**2**	50	50	100
OBJECTIVES	To study the need and mode of irrigation. To learn about various irrigation methods To study the design concepts of various irrigation structures. To understand the design concepts of canal irrigation system To study the irrigation management practices.							
UNIT-1	**INTRODUCTION**					TOTAL HOURS		12 HOURS
Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – Consumptive use of water – Duty & Delta – Factors affecting duty – Irrigation efficiencies.								
UNIT-2	**IRRIGATION METHODS**					TOTAL HOURS		12 HOURS
Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation.								
UNIT-3	**DIVERSION HEAD WORKS AND IMPOUNDING STRUCTURES**					TOTAL HOURS		12 HOURS
Weirs – Elementary profile of a Weir – Weirs on pervious foundations – Dams - Factors affecting location and types of dam – Forces on a dam – Types of dam - Gravity dams – Earth dams – Arch dams –Design of a Gravity dam – Types of impounding structures - Tanks and Sluices.								
UNIT-4	**CANAL IRRIGATION**					TOTAL HOURS		12 HOURS
Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.								
UNIT-5	**IRRIGATION WATER MANAGEMENT**					TOTAL HOURS		12 HOURS
Need for optimisation of water use – Minimising irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation- **Planning and Development of irrigation projects.**								
TOTAL HOURS TO BE TAUGHT						60 HOURS		
COURSE OUTCOMES:								
After undergoing the course, the students will have ability to:								
CO.1	Know types and methods of irrigation system.							

CO.2	Have more knowledge focussed on irrigation and water resources engineering.
CO.3	Apply multidisciplinary approaches to plan, design and execute relevant irrigation and water resources structures
CO4	Design various irrigation structures like canal regulators, cross drainage works, canal headwork's etc.,
CO5	Ability to evaluate Irrigation management system and development of irrigation projects
TEXTBOOK	
1.	Asawa, G.L., "Irrigation Engineering", New Age International Publishers. 2005
2.	Sharma R.K., and Sharma T.K., "Irrigation Engineering", S. Chand and company, New Delhi. 2002
3.	Gupta, B.L, & Amir Gupta, "Irrigation Engineering", SatyaPraheshan, New Delhi. 2013
REFERENCES:	
1.	Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P), Ltd., 2014
2.	Basak, N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co.2017
3.	Garg, S.K., "Irrigation Engineering& hydraulic structures –vol -2kanna publishers-2017"
4.	Dr. H.M. Ragunath -Irrigation Engineering- Wiley eastern ltd, New Delhi, 2014

615CET05 Irrigation Engineering

CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	*Know types and methods of irrigation system.*	1	-	-	1	-	1	1	-	-	-	-	-	1	-	1
CO2	Have more knowledge focussed on irrigation and water resources engineering.	2	2	1	1	-	1	1	-	-	-	-	-	1	-	1
CO3	Apply multidisciplinary approaches to plan, design and execute	2	3	3	-	-	1	1	-	-	-	-	-	1	-	1

3.	Shah, Kale and Patki, Building Drawing, Tata McGraw-Hill.

Adhiyamaan College of Engineering - Autonomous					Regulation		**R-2015**	
Department	**Civil Engineering**	Programme Code and Name			**C.E:B.E. Civil Engineering**			
Semester – VI								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
615XXXXX	**ADVANCED CONCRETE TECHNOLOGY**	3	0	0	**3**	50	50	100

OBJECTIVES	• To study the properties of concrete making materials, • To study the Fresh and Harden properties of concrete, • To develop the require mix design • To gain knowledge of special concrete • To learn about various concreting methods

UNIT-1	**CONCRETE MAKING MATERIALS**	TOTAL HOURS	9 HOURS
Aggregates classification, IS Specifications, Properties, Grading, Methods of combining aggregates, specified grading, testing of aggregates. Cement, Grade of cement, Chemical composition, testing of concrete, Hydration of cement, Structure of hydrated cement, special cements. Water Chemical admixtures, Mineral admixture.			
UNIT-2	**TESTS ON CONCRETE**	TOTAL HOURS	9 HOURS
Properties of fresh concrete, Hardened concrete, Strength, Elastic properties, Creep and shrinkage – Durability of concrete			
UNIT-3	**MIX DESIGN**	TOTAL HOURS	9 HOURS
Principles of concrete mix design, Methods of concrete mix design, IS Method, ACI Method, DOE Method – Statistical quality control – Sampling and acceptance criteria.			
UNIT-4	**SPECIAL CONCRETE**	TOTAL HOURS	9 HOURS

615CEE01 Advanced Concrete Technology																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	know various tests on fresh properties of concrete.	3	-	1	2	-	-	-	-	-	-	-	2	-	-	-
CO2	know various tests on hardened concrete,	3	2	1	2	2	-	-	-	-	-	-	2	-	-	-
CO3	Know concreting mix designs as per codes	3	2	2	1	-	-	-	2	-	2	3	2	3	2	-
CO4	know about some special types of concrete	3	-	-	2	-	2	3	2	-	-	-	-	-	2	2
CO5	know about types of concreting methods and Dewatering Techniques	3	-	1	-	3	2	2	-	2	1	2	2	2	1	3

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Light weight concrete, Fly ash concrete, Fibre reinforced concrete, Sulphur impregnated concrete, Polymer Concrete – High performance concrete. High performance fiber reinforced concrete, Self-Compacting-Concrete, Geo Polymer Concrete, Waste material based concrete – Ready mixed concrete.			
UNIT-5	**CONCRETING METHODS**	TOTAL HOURS	9 HOURS
Process of manufacturing of concrete, methods of transportation, placing and curing. Extreme weather concreting, special concreting methods. Vacuum dewatering – Underwater Concrete.			
TOTAL HOURS TO BE TAUGHT			**45 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	know various tests on fresh properties of concrete.		
CO.2	know various tests on hardened concrete,		
CO.3	Students are capable to do the Mix design as per IS.		
CO.4	know about some special types of concrete and Dewatering Techniques		
CO.5	know about types of concreting methods and Dewatering Techniques		
TEXT BOOKS:			
1.	Gambhir.M.L., Concrete Technology, McGraw Hill Education, 2006.		
2.	Gupta.B.L., Amit Gupta, "Concrete Technology, Jain Book Agency, 2010.18		
3.	Shetty M.S., Concrete Technology, S.Chand and Company Ltd. Delhi, 2003.		
REFERENCES:			
1.	Neville, A.M., Properties of Concrete, Prentice Hall, 1995, London.		
2.	S.S.Bhavikatti.,"Concrete Technology",I K International Publishing House,2015.		

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Adhiyamaan College of Engineering – Autonomous			R-2015
Department	Civil Engineering	Programme Code and Name	B.E.CIVIL ENGINEERING

Semester-III

Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
	PREFABRICATED STRUCTURES	3	0	0	3	50	50	100

OBJECTIVES	• To Study design principles involved in the prefabricated structures. • To make the students to understand the concepts of prefabricating the framed buildings • To possess the knowledge on connection of various structural elements • To gain knowledge about wall panels its behaviour and design • To enrich the students on construction of industrial buildings using prefabricated elements.

UNIT-1	**Design Principles**	TOTAL HOURS	9 HOURS

General Civil Engineering requirements, specific requirements for planning and layout of prefabricates plant. IS Code specifications Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, and erection, stages of loading and codal provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

UNIT-2	**Prefabricated Reinforced Concrete Structural Elements**	TOTAL HOURS	9 HOURS

Prefabricated structures - Long wall and cross-wall large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls, -Connections – Beam to column and column to column.

UNIT-3	**Floors, Stairs and Roofs**	TOTAL HOURS	9 HOURS

Types of floor slabs, analysis and design example of cored and panel types and two way systems, staircase slab design, types of roof slabs and insulation requirements, Description of joints, their behaviour and reinforcement requirements, Deflection control for short term and long term loads, Ultimate strength calculations in shear and flexure.

UNIT-4	**Walls**	TOTAL HOURS	9 HOURS

Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, load transfer from floor to wall panels, vertical loads, Eccentricity and stability of wall panels, Design Curves, types of wall joints, their behaviour and design, Leak prevention, joint sealants, sandwich wall panels, approximate design of shear walls.

UNIT-5	**Industrial Buildings and Shell Roofs**	TOTAL HOURS	9 HOURS

Components of single-storey industrial sheds with crane gantry systems, R.C. Roof Trusses, Roof Panels, corbels and columns, wind bracing design. Cylindrical, Folded plate and hyper-prefabricated shells, Erection and jointing, joint design, hand book based design.

TOTAL HOURS TO BE TAUGHT	45 HOURS

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	Understand the basic concepts of prefabrication and their needs in construction industry.
CO.2	Knowing the behaviour of prefabricated structures.

CO.3	Design the cross section and joints of prefabricated units
CO.4	Design the wall panels partition and load bearing walls of prefabricated units
CO.5	To construct the pre-fabricated structures with various structure elements

REFERENCES:

1.	**Structural Design Manual**, *Precast Concrete Connection Details*, Society for the Studies in the use of Precase Concrete, Netherland BetorVerlag, 1978.
2.	**Hass, A.M.** *Precast Concrete Design and Applications*, Applied Science Publishers, 2003.
3.	**Promislow, V***Design and Erection of Reinforced Concrete Structures*, MIR Publishers, Moscow.
4.	**Gerostiza. C.Z., Hendrikson, C. and Rehat D.R.,** *Knowledge Based Process Planning for Construction and Manufacturing*, Academic Press, Inc., 2009.

615CEE02 Prefabricated Structures

CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the basic concepts of prefabrication and their needs in construction industry.	3	-	-	1	-	1	1	2	-	-	-	1	-	2	1
CO2	Knowing the behaviour of prefabricated structures.	3	-	-	1	-	1	1	2	-	-	-	1	-	2	1
CO3	Design the cross section and joints of prefabricated units	3	3	3	3	2	2	2	1	2	1	2	1	3	2	3
CO4	Design the wall panels partition and load bearing walls of prefabricated units	3	3	3	3	2	2	2	1	2	1	2	1	3	3	3
CO5	To construct the pre-fabricated structures with various structure elements	3	2	2	3	2	2	2	2	1	2	2	1	3	1	3

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Adhiyamaan College of Engineering - Autonomous					Regulation		R-2015
Department	Civil Engineering	Programme Code and Name			C.E:B.E. Civil Engineering		
Semester – VI							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA	TOTAL
615XXXXX	EARTHQUAKE RESISTANT DESIGN	3	0	0	3	50	50	100

OBJECTIVES

- To study the effect of earthquakes,
- To understand degrees of freedom, evaluation and effects of earth quake
- To analysis and design of earthquake resistant Structures
- To study about ductile detailing of structures
- To understand the concepts of vibration control techniques

UNIT-1	SEISMOLOGY	TOTAL HOURS	9 HOURS

Engineering Seismology (Definitions, Introduction to Seismic hazard, Earthquake Phenomenon), Seismic Zoning of India, Causes of Earthquake – Plate Tectonic theory – Elastic rebound Theory Estimation of earthquake parameters - Magnitude and intensity of earthquakes - Seismic Instrumentation - Microzonation. - Lessons Learnt From Past Earthquakes

UNIT-2	DEGREES OF FREEDOM	TOTAL HOURS	9 HOURS

Dynamics of Structures - degree of freedom system – modes of vibrations & mode shapes – formulation of equations of motion of SDOF, TDOF & MDOF - Eigen values and Eigen vectors – Response Spectra - Evaluation of Earthquake Forces as per codal provisions - Effect of Earthquake on Different Types of Structures.

UNIT-3	SEISMIC AND ASEISMIC DESIGN OF STRUCTURES	TOTAL HOURS	9 HOURS

Response spectrum IS1893:2002 – Concepts of PGA – Codal provisions for seismic analysis of RC building as per IS1893:2002 – Design problems – Aseismic Design of a Multistory RC Building as per IS13920:1990

UNIT-4	DUCTILE DETAILING OF RC STRUCTURES	TOTAL HOURS	9 HOURS

Codal provisions for ductile detailing of RC structures subjected to seismic force – Flexural members (Longitudinal, Web Reinforcement0 – Column & Frame (Longitudinal, Transverse, & Special confining Reinforcement)

UNIT-5	VIBRATION CONTROL TECHNIQUES	TOTAL HOURS	9 HOURS

Vibration Control - Tuned Mass Dampers – Principles and application, Basic Concept of Seismic Base Isolation – various types of damper- Case Studies, Important structures.	
TOTAL HOURS TO BE TAUGHT	**45 HOURS**
COURSE OUTCOMES:	
After undergoing the course, the students will have ability to	
CO.1	understand the causes and effect of earthquake..
CO.2	draw the mode shape for a SDOF, TDOF, MDOF Structures
CO.3	design masonry and RC structures to the earthquake forces as per the recommendations of IS codes of practice.
CO.4	Ductile detailing of RC Structures
CO.5	They will be able to understand the concepts of damping and vibration control techniques

TEXT BOOKS:

1.	Mohiuddin Ali Khan "Earthquake-Resistant Structures: Design, Build and Retrofit", Elsevier Science & Technology, 2012
2.	Pankaj Agarwal and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India, 2009.
3.	Paulay,T and Priestley, M.J.N., "Seismic Design of Reinforced Concrete and Masonry buildings", John Wiley and Sons, 1992.

REFERENCES:

1.	Brebbia C. A.,"Earthquake Resistant Engineering Structures VIII",WIT Press, 2011
2.	Bruce A Bolt, "Earthquakes" W H Freeman and Company, New York, 2004.
3.	Duggal S K , "Earthquake Resistant Design of Structures", Oxford University Press, 2007.

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Krishnagiri (Dt.), Tamil Nadu.

615CEE03 Earthquake Resistant Structures																
CO's		POs												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Get the knowledge on seismology	3	2	3	2		1		1		2		2	3	2	1
CO2	To find the EOM, natural frequency and mode shape for SDOD and TDOD	3	2	3	2		1		1		2		2	3	2	1
CO3	Able to design the RCC structures by using seismic codes	3	2	3	2		1		1		2		2	3	2	1
CO4	Get the knowledge on ductile detailing as per IS	3	2	3	2		1		1		2		2	3	2	1
CO5	To know the concepts of base isolation techniques	3	2	3	2		1		1		2		2	3	2	1

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Adhiyamaan College of Engineering - Autonomous					Regulation		R-2015
Department	Civil Engineering	Programme Code and Name			C.E:B.E. Civil Engineering		
Semester – VI							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA	TOTAL
615XXXXX	DESIGN OF PSC STRUCTURES	3	0	0	3	50	50	100

OBJECTIVES	• To introduce the need for pressurising as well as the methods, • To study the types and advantages of prestressing. • To the design of pressurised concrete structures subjected to flexure and shear. • To study about defection zones and design of anchorage zone • To understand the concepts of composite beams, continuos beams and miscellaneous structures

UNIT-1	INTRODUCTION – THEORY AND BEHAVIOUR	TOTAL HOURS	9 HOURS

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width.

UNIT-2	DESIGN FOR FLEXURE AND SHEAR	TOTAL HOURS	9 HOURS

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code

UNIT-3	DEFLECTION AND DESIGN OF ANCHORAGE ZONE	TOTAL HOURS	9 HOURS

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT-4	COMPOSITE BEAMS AND CONTINUOUS BEAMS	TOTAL HOURS	9 HOURS

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems .			
UNIT-5	**MISCELLANEOUS STRUCTURES**	TOTAL HOURS	9 HOURS
Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables - cables with two and three hinged stiffening girders			
TOTAL HOURS TO BE TAUGHT			**45 HOURS**

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	Analyse Prestressed concrete sections.
CO.2	design prestressed concrete sections for flexure and shear
CO.3	Analyse and design composite and continuous beams
CO.4	Design Anchorage zone
CO.5	Design prestressed concrete pipes and tanks.

TEXT BOOKS:

1.	Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2.	Pandit.G.S. and Gupta.S.P., " Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012

REFERENCES:

1.	Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2.	Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
3.	Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
4.	IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012

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Adhiyamaan College of Engineering–Autonomous					Regulation		R-2015
Department	Civil Engineering	Programme Code and Name			M.E STRUCTURAL ENGINEERING		
Semester-III							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA	TOTAL
615XXXXX	**SMART STRUCTURES**	3	0	0	3	50	50	100

OBJECTIVES	To describe the basic principles and mechanisms of smart materials To gain knowledge about various devise in smart systems. To study the principles underlying the behaviour of smart materials. To gain knowledge about control systems To study about sensors in smart structures.

UNIT-1	**Introduction to passive and active systems**	TOTAL HOURS	9 HOURS
Introduction to passive and active systems – need for active systems – smart systems –definitions and implications - active control and adaptive control systems – examples.			
UNIT-2	**Components of smart systems**	TOTAL HOURS	9 HOURS
Components of smart systems– system features and interpretation of sensor data – proactive and reactive systems – demo example in component level – system level complexity			
UNIT-3	**Materials used in smart systems**	TOTAL HOURS	9 HOURS
Smart Materials (Physical Properties) piezoelectric materials, materials, magneto strictive electrostrictive materials, magneto electric materials. magneto rheological fluids, electrorheological fluids, shape memory materials, fiber-optic sensors.			
UNIT-4	**Control Systems**	TOTAL HOURS	9 HOURS
Control Systems – features – active systems – adaptive systems – electronic, thermal and hydraulic type actuators – characteristics of control systems – application examples.			
UNIT-5	**Sensors in smart structures**	TOTAL HOURS	9 HOURS
Smart Sensor, Actuator and Transducer Technologies smart sensors: accelerometers; force sensors; load cells; torque sensors; pressure sensors; microphones; impact hammers; mems sensors; sensor arrays smart actuators: displacement actuators; force actuators; power actuators; vibration dampers; shakers; fluidic pumps; motors smart transducers: ultrasonic transducers; sonictransducers; air transducers.			
TOTAL HOURS TO BE TAUGHT			45 HOURS

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	understand principles and mechanisms of smart materials
CO2	Work with various types of material used in smart structures
CO3	Make use of the principles of control system in smart structures

CO4	Work with various types of Sensors used in smart structures
CO5	Utilize the smart materials in effective manner

REFERENCES:

1. Srinivasan, A.V. and Michael McFarland, D., Smart Structures: Analysis and Design, Cambridge University Press, 2000.
2. Yoseph Bar Cohen, Smart Structures and Materials 2003, The International Society for Optical Engineering 2003.
3. Brian Culshaw, Smart Structures and Materials, Artech House, Boston, 2006.
4. M.V.Gandhi and B.S.thompson, Smart Materials and Structures, Chapman and Hall 2002.

615CEE05 Smart Structures

CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Know about smart materials	1	1		2	2		1	1				1	2	2	
CO2	Know about various measuring techniques.	1	1		2	2		1	1				1	2	2	
CO3	Know about sensors	1	1		2	2		1	1				1	2	2	
CO4	Know about actuators	1	1		2	2		1	1				1	2	2	
CO5	Know about signal processing and control system.	1	1	1	2	2		1					1	2	2	

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	relevant irrigation and water resources structures															
CO4	Design various irrigation structures like canal regulators, cross drainage works, canal headwork's etc.,	1	2	3	-	-	1	1	-	-	-	-	-	1	2	1
CO5	Ability to evaluate Irrigation management system and development of irrigation projects	1	-	-	-	-	1	1	-	-	1	-	-	1	1	1

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Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering – Autonomous		
Department	**Civil Engineering**	Programme Code and Name
Semester – VI		
Course Code	Course Name	
611CEP08	**CONCRETE AND HIGHWAY MATERIALS LABORATORY**	
OBJECTIVES	To study various testing procedure to know the properties of cement To study various testing procedure to know the properties of aggregates To study various testing procedure to know the properties of Bitumen To learn about the various tests conducted to know the properties of concrete To gain knowledge about the mix-design concepts for various grades of concretes.	
LIST OF EXPERIMENTS		
TESTS ON CEMENT		

1. Specific Gravity Test For Cement
2. Normal Consistency Test For Cement
3. Setting Time Of Cement
4. Compressive Strength Of Cement
5. Fineness Test For Cement
TESTS ON AGGREGATE
1Aggregate Crushing Test
2 Abrasion Test
3.Shape Test – Flakiness Index, Elongation Index, Angularity Number
4.Specific Gravity And Water Absorption Test For Coarse Aggregate
TESTS ON CONCRETE
1. Slump Test
2. Compaction Factor Test
3. Vee-Bee Consistometer Test
4. Compressive Strength Of Concrete
5. Split Tensile Strength Of Concrete
MIX DESIGN FOR VARIOUS GRADES OF CONCRETE
TESTS ON BITUMEN
1. Specific Gravity Test For Bitumen
2. Penetration Test
3. Viscosity Test
4. Ductility Test
5. Flash & Fire Point Test
6. Softening Test
COURSE OUTCOMES:

After undergoing the course, the students will have ability to	
CO.1	Find out the properties of cement.
CO.2	Find out the properties of aggregate.
CO.3	Find out the properties of Bitumen
CO.4	Find out the properties of concrete.
CO.5	Design concrete mix design

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Faculty of Civil Engineering (UG & PG)
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Hosur - 635 130
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TEXT BOOKS:	
1.	Shetty, M.S., "Concrete Technology" , S. Chand and Company Ltd., 2002.
2.	Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010
REFERENCES:	
1.	Job Thomas "Concrete Technology" , Oxford University Press, Cengage Learning India, 2015
2.	Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 2012
3.	Gambir, M.L; "Concrete Technology", 3 rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
4.	P.Kumar Mehta.,"Concrete Microstructure, Properties and Materials", McGraw Hill Education, 2017
5.	IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 2008

Adhiyamaan College of Engineering – Autonomous				Regulation	R - 2015
Department	**Civil Engineering**	Programme Code and Name	**C.E:B.E. Civil Engineering**		

Semester – VI

Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA
615CEP09	**Computer Aided Design – I**	0	0	3	**2**	50	50

OBJECTIVES	• to draft on computer building drawings (Plan, elevation and sectional views) of a load bearing walls • to draft on computer building drawings (Plan, elevation and sectional views) of a details of doors and windows • to draft on computer of one and two storey RCC Framed structures • to draft on computer of a different types of trusses • To learn the principle to draw perspectives views of one and two storey buildings

LIST OF EXPERIMENTS :

1. Drawing of buildings with load bearing walls (Drawing of Flat and pitched roof) – Including details of doors and windows
2. RCC framed structures – One and Two storey building(Plan, Section and Elevation)
3. Industrial buildings – North light roof structures – Trusses
4. Perspective view of one and two storey buildings

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	Draw the load bearing walls
CO.2	Draw the details of doors and windows
CO.3	Draw the different types of roofs trusses
CO.4	Draw the plan sectional elevation of a structure
CO.5	Draw the different views of a structure

REFERENCE:

1.	Building drawing – Shah, Tata McGraw-Hill
2.	Building planning & Drawing – Dr. N. Kumaraswamy, A. KameswaraRao, Charotar Publishing

Choice 11

<table>
<tr><td colspan="3">Adhiyamaan College of Engineering - Autonomous</td><td colspan="2">Regulation</td><td colspan="3">R – 2015</td></tr>
<tr><td>Department</td><td>Civil Engineering</td><td colspan="2">Programme Code and Name</td><td colspan="3">C.E:B.E. Civil Engineering</td></tr>
<tr><td colspan="7">Semester – VI</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td colspan="2">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CA</td><td>EA</td></tr>
<tr><td>615XXXXX</td><td>Irrigation Drawing</td><td>0</td><td>0</td><td>3</td><td>2</td><td>50</td><td>50</td></tr>
<tr><td rowspan="4">OBJECTIVES</td><td colspan="6">To learn the fundamentals of the design of tank components</td></tr>
<tr><td colspan="6">To learn the general principles of impounding structures draw the plan elevation and the cross sectional details of it</td></tr>
<tr><td colspan="6">To learn the general principles of canal regulation systems and draw the plan elevation and the cross sectional details of it</td></tr>
<tr><td colspan="6">To know the general design principles of cross drainage works and design & draft its plan, elevation and cross sectional details</td></tr>
<tr><td></td><td colspan="6">To know the general design principles of cross regulation structures and design & draft its plan, elevation and cross sectional details</td></tr>
<tr><td colspan="7">UNIT 1-TANK COMPONENTS

Fundamentals of design-Tank surplus weir-Tank sluice with tower head-Drawing showing foundation details, plan and Elevation.</td></tr>
<tr><td colspan="7">UNIT-2-IMPOUNDING STRUCTURES

Design principles-earth dam-Profile of Gravity dam</td></tr>
<tr><td colspan="7">UNIT-3 –CROSS DRAINAGE WORKS

General design principles- Aqueducts- Syphon aqueduct(Type 3)- Canal drop (Notch type)- Drawing showing plan, elevation and cross sectional details</td></tr>
<tr><td colspan="7">UNIT-4 CANAL REGULATION STRUCTURESGeneral Principles-Direct sluice, Canal regulation-Drawing showing detailed plan, elevation and cross sectional details</td></tr>
</table>

COURSE OUTCOMES:	
After undergoing the course, the students will have ability to	
CO.1	Design and draft the various components of the Tank.
CO.2	Design and draft the various irrigation impounding structures.
CO.3	Know about the various aspects in canal drainage works.
CO.4	Design and draft cross drainage structures
CO.5	**Design and draft canal regulation structures**
TEXT BOOKS	
1	Satyanarayana Murthy Challa, " Water resources engineering and practice", New age International publishers, New Delhi, 2002
2	Garg S.K," Irrigation engineering and desigm of structures", New age international publishers, New Delhi, 1997.
REFERENCES:	
1.	Raghunath H.M, "Irrigation Engineering", Wiley India Pvt ltd, New Delhi, 2011
2.	Sharma R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 2002

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Adhiyamaan College of Engineering (Autonomous)
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Adhiyamaan College of Engineering							
Department	Civil Engineering	Programme Code & Name	CE : B.E. Civil Engineering				
Semester VI							
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
ENVIRONMENTAL ENGINEERING DRAWING		0	0	3	2	50	50	100

Objective(s)	To study the process, design of major treatment units associated with water and sewage. To design and draft mixing basin, flocculation tank To understand the principles in designing and drafting slow sand filter/rapid sand filter To draw a major treatment units associated with water and sewage with scale To learn at the end of the course, about the designing of various treatment units and respective drawings.

CYCLE – I

Detailed Design and Drawing of

1. Layout of water supply scheme
2. Mixing basin, flocculation and sedimentation tanks
3. Slow sand filter
4. Rapid sand filter
5. Infiltration gallery

CYCLE - II

Detailed Design and Drawing of	
1	Layout of sewage treatment plant
2	Design of primary and secondary settling tanks
3	Trickling filter
4	Man holes, Pumping stations for water and sewage treatment works
5	Septic tanks with dispersion trench
6	Effluent Treatment Plant Design
7	Design of Water supply and Sewage treatment for a city
Course Outcomes	
1	Outline the layout of water and sewage treatment plant for a city.
2	Explain the design principles of various water and sewage treatment units.
3	Design the water supply and sewage treatment system for a city.
4	Prepare the design parameters for water treatment systems and sketch the detailed drawings with scale
Total hours to be taught	45

Text book (s) :	
1	Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2016
2.	Karia.G.L and Christian R.A.," Waste Water treatment Concepts and Design Approach", Prentice Hall of
Reference(s) :	
1	Manual of Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 2016
2	Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 2001

Adhiyamaan College of Engineering–Autonomous								R-2015
Department	Civil Engineering			Programme Code and Name				B.E.CIVIL ENGINEERING
Semester-VI								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
	STEEL STRUCTURAL DRAWING	3	0	0	2	50	50	100
OBJECTIVES	To Study the Design of Bolted and Welded Joints To understand the design principles of columns and draft the different section with lacings To Design Structural Steel member subjected to Compressive, Tensile and Bending loads as per codal provision. To understand the design principles of columns bases and draft the different section with slab base and gusseted base To Design Structural system such as Roof trusses, Gantry Girders							
UNIT-1	**Connections (Drawings to be prepared for given structural details)**				TOTAL HOURS	9 HOURS		
Bolted and welded,beam-beam,Beam-column,seated,stiffened and un-stiffened.								
UNIT-2	**Columns (drawings to be prepared for given structural details)**				TOTAL HOURS	9 HOURS		
Splices,column-column of same and different sections, lacing and battens.								
UNIT-3	**Column Bases(drawings to be prepared for given structural details)**				TOTAL HOURS	9 HOURS		

Slab base and gusseted base, grillage foundation			
UNIT-4	**Design and drawing of**	TOTAL HOURS	9 HOURS
Design and drawing of i) bolted and welded plate girder ii) Roof Truss (Forces in the members to be given) iii) Gantry Girder			
TOTAL HOURS TO BE TAUGHT			45 HOURS
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Design Bolted and Welded joints		
CO.2	Design Column steel Lacing and Battens		
CO.3	Design Column steel Lacing and Battens		
CO.4	Design slab base and gusseted base.		
CO.5	Design of Roof Truss and Gantry Girder.		
TEXT BOOKS:			
1. Design of Steel Structures by K.S.Sai Ram, Pearson Publishers.			
2.Limit state Design of Steel Structures by S.K.Duggal, Tata Mcgraw Hill, New Delhi.			
3. Design of Steel Structures by Bhavikatti. IK INT Publication House, New Delhi 2010.			
REFERENCES:			
1.	Structural Design and Drawing by N.Krishna Raju, University Press, Hyderabad.		
2.	Structural Design in steel by Sarwar Alam Raz, New Age International Publishers, New Delhi		
3.	Steel structures by Subramanyam.N, Oxford University Press, New Delhi		
4.	Design of Steel Structures by Edwin Gaylord, Charles Gaylord, James Stallmeyer, Tata Mcgrew Hill, New Delhi.		

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Codes and Tables:
1) IS-800-2007
2)IS- 875 -part III
3)Steel Tables.

Adhiyamaan College of Engineering – Autonomous				Regulation		R - 2015	
Department	Civil Engineering	Programme Code and Name		C.E:B.E. Civil Engineering			
Semester – VI							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA
615XXXXX	**Bridge Engineering Drawing**	0	0	3	**2**	50	50
OBJECTIVES	• At the end of this course the student should be able to design and draft on computer bridge drawings (Plan, elevation and sectional views) of different types of bridges • At the end of this course the student should be able to design and draft on computer bridge drawings (Plan, elevation and sectional views) of different types of bearings						

LIST OF EXPERIMENTS :

1. Design and drawing of an RCC slab culvert and T- beam bridge
2. Design and drawing of RCC slab bridge and prestressed concrete bridge.l
3. Design and drawing of pipe and box culverts.
4. Design and drawing of truss girder bridge.
5. Design and drawing of various types of bearings.

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	Design and draw slab culverts and T-Beam bridge.
CO.2	Design and draw RCC slab and prestressed concrete bridges
CO.3	Design and draw box and pipe culverts.
CO.4	Design and draw a truss girder bridge.
CO.5	Design and draw various types of bracings

REFERENCE:

1. **Ponnuswamy, S.,** "*Bridge Engineering*", Tata McGraw Hill, 2008.
2. **Johnson Victor, D.** "*Essentials of Bridge Engineering*", Oxford and IBH Publishing Co. New Delhi, 2007.

3.	**Jagadeesh. T. R. and Jayaram. M. A.,** "*Design of Bridge Structures*", Prentice Hall of India Pvt. Ltd. 2004.
4.	**Raina. V.K.** "*Concrete Bridge Practice*" Tata McGraw Hill Publishing, 1994
5.	**Bakht, B. and Jaegar, L.G.,** "*Bridge Analysis Simplified*", McGraw Hill, 1985.

Adhiyamaan College of Engineering - Autonomous				Regulation	**R-2015**		
Department	**Civil Engineering**	Programme Code and Name		**C.E:B.E. Civil Engineering**			
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA
	RCC Structural Drawing	**0**	**0**	**3**	**2**	**50**	**50**

OBJECTIVES

- To enable the students to know the properties and appropriate uses of construction materials.
- To impart the knowledge on drawing the reinforcing details in slabs as per IS codes
- To Understand the practical issues in detailing the reinforcement in beam column junctions
- To practice the detailing of bars in plan and sectional views.
- To know the bar bending details in various structural elements.

LIST OF EXPERIMENTS

1. Concept of Reinforced Cement Concrete. Specifications, properties and types of materials used in RCC.
2. Design and detailing of reinforcement in plan and section for a simply supported RCC one way and two slab with intermediate support from the given data. Bar bending schedule should be prepared.
3. Design and detailing of reinforcement in a simply supported RCC beam (singly reinforced and doubly reinforced) with the given design data.
4. Design and detailing of reinforcement for a cantilever beam with given data regarding the size of the beam and the reinforcement
5. Design and detailing of T Beams.
6. Design and detailing of reinforcement for a RCC square and circular column with isolated square footing.
7. Design and detailing of reinforcement in a two storeyed RCC internal and corner column. In this, the details of reinforcement at the junction with beams must be shown from the given design data
8. Design and detailing of reinforcement in square, circular and trapezoidal footings

COURSE OUTCOMES:

After undergoing the course, the students will have the ability to

- Understand the given plan, sectional view of a buildings and implement the same in construction site.
- Prepare the bar bending schedules for the given building
- Develop the structural drawing for various RCC elements.
- Develop the structural drawing for square, trapezoidal and circular footings
- Prepare the detailed drawing of reinforcement's details for any kind of buildings.

1. SP-34-1987 Handbook on Reinforcement and Detailing.
2. Mallick, SK; and Gupta, AP; "Reinforced Concrete", New Delhi, Oxford and IBH Publishing Co, 2007.
3. Dayarathnam P "Design of reinforced concrete structures" Publisher: New Delhi : Oxford & IBH Publishing, 2000
4. P C Varghese "Limit State Design of Reinforced Concrete " Prentice Hall of India, 1999.

Adhiyamaan College of Engineering - Autonomous					Regulation			R - 2015
Department	Civil Engineering			Programme Code and Name				C.E.: B.E. Civil Engineering
Semester – VII								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
715CET01	**ESTIMATION AND QUANTITY SURVEYING**	**3**	**1**	**0**	**4**	**50**	**50**	**100**
OBJECTIVES	1. To study the basic concepts of estimation and methods for estimation 2. To study the various aspects of estimating of quantities of items of works involved in buildings. 3. To gain knowledge about estimating other civil Engineering structures 4. To gain knowledge about the rate analysis for estimation of various items 5. To study about PWD Accounts and Procedures							
UNIT-1	**INTRODUCTION**				TOTAL HOURS			12 HOURS
Estimate, Data for estimate, Types of estimates -Preliminary, Plinth area, Cube rate, Approximate quantity, Detailed, Revised, Supplementary and Annual repair. Abstract of estimate; Floor area; Circulation area; Carpet area.								
UNIT-2	**ESTIMATE OF BUILDINGS**				TOTAL HOURS			12 HOURS
Load bearing and framed structures – Calculation of quantities of Earthwork, PCC, R.R. Stone work, DPC, Brick work, RCC, Plastering, white washing, colour washing and painting / varnishing for residential, Commercial and Industrial buildings with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches.								
UNIT-3	**ESTIMATE OF OTHER STRUCTURES**				TOTAL HOURS			12 HOURS
Estimating of septic tank, soak pit – sanitary and water supply installations –estimate of earth work of road by three methods from L - Section- estimate of bituminous and cement concrete roads – estimate of retaining walls–estimate of earth work irrigation channels of different cases-Preparation of Bar bending schedule								
UNIT-4	**ANALYSIS OF RATES & SPECIFICATIONS.**				TOTAL HOURS			12 HOURS

Data – Schedule of rates –Preparing Analysis of rates for different items of works–Transport of material –Estimate of transport work- Specifications – Writing specification for different items of works - Detailed and general specifications.			
UNIT-5	**P.W.D. ACCOUNTS AND PROCEDURE FOR WORKS**	TOTAL HOURS	12 HOURS
Works; Classification of works-Original, Major, Minor, Petty, Repair works; Annul repair,. Quadrennial repair, Special repair works, Contract, Tender; Tender Notice; Earnest money; Security money; Arranging contract; Power of accepting tender, E Tender, Tender notice, Methods of carrying out works – Daily labour; Muster Roll, Preparation of M.R-Administrative sanction,Expenditure sanction Technical sanction			
TOTAL HOURS TO BE TAUGHT			**60 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Estimate the quantities of different items in buildings		
CO2	Estimate the quantities of water supply and sanitary works, Roads and irrigation works		
CO.3	Design the bar bending schedule		
CO4	Analyse the rates of the quantities and estimate the material quantity		
CO.5	Prepare a bill of quantities, make specifications and prepare tender documents.		
TEXTBOOKS:			
1.	Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers Distributors Pvt.Ltd., 2003		
2.	Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand& Company Ltd., 2004		
REFERENCES:			
1.	M.Chakraborthy,"Estimating and Costing in Civil Engineering", UBS Publishers Distributors Pvt. Ltd., 2003		
2.	National Building Code.		
3	Latest Schedule of Rates and Data book of PWD		

715CET01 – Estimation & Quantity Surveying																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Get knowledge on different types of estimate	3					3		2		3		3	3	2	2
CO2	To find the quantities of various types of works in RCC building	3					3		2		3		3	3	2	2
CO3	To estimate the quantities o septic tank and road pavements	3					3		2		3		3	3	2	2
CO4	To arrive the rates & Costs for various types of works	3					3		2		3		3	3	2	2
CO5	To prepare the tender document and muster roll	3					3		2		3		3	3	2	2

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Adhiyamaan College of Engineering (Autonome
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Adhiyamaan College of Engineering - Autonomous				Regulation			R - 2015
Department	Civil Engineering		Programme Code and Name		C.E.: B.E. Civil Engineering		
Semester – VII							
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
715CET02	**GROUND IMPROVEMENT TECHNIQUES**	**3**	**0**	**0**	**3**	**50**	**50**	**100**
OBJECTIVES	• to identify basic deficiencies of various soil deposits • to decide various ways and means of improving the soil and implementing various techniques of ground improvement • to understand the different techniques to improve the characteristics of different soils • to gain knowledge on various ground improvement methods • to impart knowledge on different grouting methods							
UNIT-1	**INTRODUCTION**				TOTAL HOURS	9 HOURS		
Role &methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil conditions.								
UNIT-2	**DRAINAGE AND DEWATERING**				TOTAL HOURS	9 HOURS		
Drainage techniques - Well points - Vaccum and electro-osmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating soils in homogenous deposits (Simple cases only).								
UNIT-3	**INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS**				TOTAL HOURS	9 HOURS		
Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques - relative merits of various methods and their limitations.								
UNIT-4	**EARTH REINFORCEMENT**				TOTAL HOURS	9 HOURS		

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.			
UNIT-5	**GROUTING TECHNIQUES**	TOTAL HOURS	9 HOURS
Types of grouts - Grouting equipment and groutability ratio- Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils			
TOTAL HOURS TO BE TAUGHT			**45 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO1	identify various problems associated with soil deposits, formulate and methods to evaluate them.		
CO2	demonstrate an ability to design a dewatering system, component or process as per needs and specifications.		
CO3	understand the concept involved for insitu treatment of cohesive and cohesionless soils and ability required to design an appropriate techniques to implement ground improvement methods.		
CO4	understand of soil reinforcement and its uses in various engineering structure. Also, graduate will demonstrate an ability to design reinforced earth retaining structure.		
CO5	demonstrate an ability to design retaining walls, its component or process as per the needs and specifications.		
TEXTBOOKS:			
1.	Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994.		
2.	Purushothama Raj, P. "Ground Improvement Techniques", Tata McGraw-Hill Publishing Company, New Delhi, 1995		
REFERENCES:			
1.	Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.		
2.	Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.		
3	Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002		

4	Jewell, R.A., "Soil Reinforcement with Geotextiles", CIRIA special publication, London, 1996
5	Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003

715CET02 Ground Improvement Techniques

CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Able to gain knowledge on different ground improvement techniques and contemporary issues.				3			2					2		3	2
CO2	Able to analyse the various dewatering techniques	3	3	3	3	1		2	2	2	2		2	3	1	2
CO3	Able to know different ground improvement techniques for cohesive and cohesionless soil	2		3	3	1				3	2		2		2	2
CO4	Able to understand the concept and application of earth reinforcement	2	2	3	2	1					2		2		2	2
CO5	Able to understand grouting techniques and stability analysis.	2	3	2	1						2		2	3	2	2

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Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering - Autonomous							R- 2015
Department	Civil Engineering	**Programme Code and Name**			C.E:B.E. Civil Engineering		
Semester- VII							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	ES	TOTAL
715CEE15	**Architecture and Town Planning**	3	0	0	3	50	50	100
OBJECTIVES	• To know about the principles of architecture design • To impart knowledge on functional planning of buildings • To know about the various building services required foe a building • To know about town planning theory • To study the various planning process in a building						
UNIT-1	**Principles of architectural Design**				TOTAL HOURS	9 HOURS	
Definition of architecture: factors influencing architectural development- characteristic features of a style-historical examples. Creative principles: function/strength, aesthetics – deciding the space and form – detailed analysis of factors influencing the space – activity space, circulation space and tolerance space – Factors influencing form- form perception – form expressive of function-form related with material and Structural system. Design principles – elements of composition – point, line, plane, texture, colour etc. – mass and scale, proportion, rhythm, balance and unity – iconic, canonic and analogic design - consideration of comfort factors such as acoustics, lighting, ventilation and thermal aspects.							
UNIT-2	**Functional planning of buildings**				TOTAL HOURS	9 HOURS	
Occupancy classification of buildings'-general requirements of site and building – building codes and rules – licencing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings – the process of identifying activity areas and linkages – drawing built diagrams – checking for circulation, ventilation, structural requirements and other constraints preparing sketch plan and working drawings – site plans.Municipal acts – planning regulations of corporations and developmental authorities – building bye laws.							
UNIT-3	**Building services**				TOTAL HOURS	9 HOURS	
Vertical Transportation: stairs – layout and details of different types of timber – masonry, steel and concrete stairs – pre-cast concrete stairs, elevators – types – traction, hydraulic operation – passenger, service goods elevators – design considerations of passenger elevators – handling capacity – arrangement of lifts – positioning, escalators, features- operation arrangement – ramps. Ventilation and air conditioning – ventilation requirements -natural and mechanical ventilation – air movement – cross ventilation – effect of orientation – radiation – evaporation, calculation of air conditioning load – summer and winter air conditioning. Plumbing services: typical details of water supply and sewage disposal arrangements for							

residence, hospitals and hostel buildings – standard requirements.			
UNIT-4	**Town planning theory**	TOTAL HOURS	9 HOURS
Evolution of towns: problems of urban growth – beginning of planning acts – ideal town – garden city movement – concept of new towns and conservative theory – comprehensive planning of towns- Survey and analysis of town: fare maps – land use classification – transportation network – housing demographic arid social surveys – economic studies – environmental aspects. Theories of land use planning, transportation planning and housing development.Urban area lineation: urban influence zone – urban region concept of regional planning.			
UNIT-5	**Planning Process**	TOTAL HOURS	9 HOURS
Concept of master plan: structural plan, detailed town planning scheme and act. Estimating future needs: planning standards for different land use allocation for commerce, industries, public amenities, open areas etc. planning standard for density distributions-density zone, planning standards for traffic networks – standards of roads and paths – provision for urban growth-growth models. Plan implementation: town planning legislation and municipal acts – planning control development schemes – urban financing – land aquisitions – slum clearance schemes – pollution control aspects.			
TOTAL HOURS TO BE TAUGHT			45 HOURS
COURSE OUTCOMES			
After undergoing the course, the student will have the ability to			
CO.1	Understand the importance of architecture		
CO.2	Understand the general requirements of site and buildings according to building codes and rules		
CO.3	Know the various design considerations involved in building services		
CO.4	Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and cities		
CO.5	Compose spaces of buildings using design concepts and planning principles.		
TEXTBOOK			
1.	Banister Fletcher, History of World Architecture, Taraporevalas.		
2.	Broadbent, Theory of Architecture Design, John Wiley Sons		
3.	Gallien, Urban Pattern, D.VanNostrand CD. Inc.		
REFERENCES:			
1.	Rangwala, Town Planning, Charotar Publishing House.		
2.	Rangwala, Town Planning, Charotar Publishing House.		
3.	Nelson P. Low's, Planning to Modern City		

315 CEE06 Architectural & Town Planning																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	To know the various principles of Architectural Design	1		3			3	2	2				1	3		1
CO2	Able to plan and draw the layout of industrial building as per bye laws	1		3			3	2	2				1	3		1
CO3	To get the knowledge on building services like Ventilator, Fire hydrant, elevator etc	1		3			3	2	2				1	3		1
CO4	To get the knowledge on town planning with all basic requirements	1		3			3	2	2				1	3		1
CO5	Able to plan the township with population density and traffic network etc	1		3			3	2	2				1	3		1

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Adhiyamaan College of Engineering - Autonomous					Regulation			R – 2015
Department	Civil Engineering		Programme Code and Name		C.E.: B.E. Civil Engineering			
Semester – VII								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
715CEE03	**ROCK MECHANICS**	**3**	**0**	**0**	**3**	**50**	**50**	**100**
OBJECTIVES	1.To know geological factor on rock to solve field problems 2 .At the end of this course the student should able to solve the field problems associated with rocks and have a knowledge of classification of rock mass, 3. At the end of this course the student have clear knowledge about Elasticity in rock mechanics 4.To acquire the knowledge about Rock dynamics							
UNIT-1	**GEOLOGICAL SETTING**				TOTAL HOURS			9
Introduction to rock mechanics, Rocks and its classification-rock as an engineering material, natural rock environment-influence of geological factor on rock and rock masses- Intact rock, Discontinuities and rock structure- In situ pre-existing rock stress, Pore fluids—water flow-influence of time								
UNIT-2	**PROPERTIES OF ROCKS**				TOTAL HOURS			9
Physical properties of rocks – Density, unit weight and specific gravity Moisture content, degree of saturation, Porosity, Void ratio, -Mechanical properties of rock - uniaxial compressive strength, Tensile Strength Deformability, hydraulic properties of rocks - Permeability, storatvity and Thermal properties of rocks – Strength properties of rocks and rock masses .								
UNIT-3	**ELASTICITY IN ROCK MECHANICS**				TOTAL HOURS			9
Stresses- Cauchy Stress Principle, State of Stress at a Point, State of Stress on an Inclined Plane, strains Deformation and Finite Strain Tensors, Small Deformation Theory, Applications of theory of elasticity in rock mechanics - Visco-elasticity and rocks - Rock discontinuities -Hemispherical projection methods - In situ stresses - Rock slope engineering - Underground excavation in rock.								
UNIT-4	**ROCK MASS CLASSIFICATION AND TESTING**				TOTAL HOURS			9
Rock mass rating (RMR) system- Q-system-application of rock mass classification system- Links between the classification systems and rock properties- Use of RES (Rock Engineering Systems)- Testing techniques – tailoring test- test on intact rock-discontinuities-standardized test.								
UNIT-5	**ROCK DYNAMICS AND TIME DEPENDENT ASPECTS**				TOTAL HOURS			9

Introduction –stress waves-– Glossary of Terms -Elastic, plastic, Viscous, Elastoplasticity, Viscoelasticity Viscoelasticity, Elastoviscoplasticity Creep ,relaxation and fatigue- time dependency in rock engineering- interaction matrices in rock mechanics	
TOTAL HOURS TO BE TAUGHT	**45 HOURS**
COURSE OUTCOMES:	
After undergoing the course, the students will have ability to	
CO.1	know geological factor on rock to solve field problems
CO.2	Classify the rocks, and have the knowledge index properties of rock systems.
CO.3	have clear knowledge about Elasticity in rock mechanics
CO4	acquire the knowledge about Rock dynamics
TEXTBOOKS:	
1.	Engineering rock mechanics –John –A- Hudson ,published by pergamon
2.	Rock Mechanics-For underground mining Authors: Brady, Barry H.G., Brown, E.T-springer
REFERENCES:	
1.	Trends In Rock Mechanics -American Society of Civil Engineers
2.	Design Analysis in Rock Mechanics, Third Edition by William G. Pariseau, CRC Press

Adhiyamaan College of Engineering - Autonomous							Regulation	R-2015
Department	Civil Engineering		Programme Code and Name				CE : B.E. Civil Engineering	
Semester – VII								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
715CEE08	TOTAL QUALITY MANAGEMENT	3	0	0	3	50	50	100

OBJECTIVES

- To understand the Total Quality Management concept and principles
- To impart knowledge on various tools available to achieveTotal Quality Management.
- To get aware of managements tools for statistical process control
- To understand the statistical approach for quality control
- To create an awarenessabout the ISO and QS certification process and its need for the industries.

UNIT-1	INTRODUCTION	TOTAL HOURS	9 HOURS

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT-2	TQM PRINCIPLES	TOTAL HOURS	9 HOURS

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT-3	STATISTICAL PROCESS CONTROL (SPC)	TOTAL HOURS	9 HOURS

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT-4	TQM TOOLS	TOTAL HOURS	9 HOURS

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT-5	**QUALITY SYSTEMS**	TOTAL HOURS	9 HOURS
Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.			
TOTAL HOURS TO BE TAUGHT			**45 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Identify the barriers in TQM implementation and resolve the problems.		
CO.2	Provide the quality in products and make the customers satisfied by applying various TQM principles		
CO.3	Implement the management tools in statistical process control		
CO.4	Develop benchmark and able to attain it through appropriate tools		
CO.5	Implement the quality systems		
TEXTBOOK:			
1.	Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.		
REFERENCES			
1.	James R.Evans& William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).		
2.	Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.		
3.	Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.		
4.	Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.		
5.	Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.		

Adhiyamaan College of Engineering - Autonomous					Regulation		R – 2015	
Department	Civil Engineering		Programme Code and Name		CE : B.E. Civil Engineering			
Semester – VII								
Course Code	Course Name	Hours / week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
715CEE13	CONSTRUCTION PLANNING & PROJECT MANAGEMENT	3	0	0	3	50	50	100
OBJECTIVES	• To understand the concepts of construction planning • To understand the concepts of scheduling procedures and techniques • To impart knowledge on cost control, monitoring and accounting • To understand about various quality control projects • To organise and use various project information necessary for construction project							
UNIT-1	CONSTRUCTION PLANNING				TOTAL HOURS		9 HOURS	
Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships among Activities - Estimating Activity Durations - Estimating Resource Requirements for Work Activities - Coding Systems.								
UNIT-2	SCHEDULING PROCEDURES AND TECHNIQUES				TOTAL HOURS		9 HOURS	
Construction Schedules - Critical Path Method - Scheduling Calculations - Float - Presenting Project Schedules - Scheduling for Activity-on-Node and with Leads, Lags, and Windows - Scheduling with Resource Constraints and Precedences- Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations - Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Improving the Scheduling Process.								
UNIT-3	COST CONTROL, MONITORING AND ACCOUNTING				TOTAL HOURS		9 HOURS	
The Cost Control Problem - The Project Budget - Forecasting for Activity Cost Control - Financial Accounting Systems and Cost Accounts - Control of Project Cash Flows -Schedule Control -Schedule and Budget Updates - Relating Cost and Schedule Information.								
UNIT-4	QUALITY CONTROL AND SAFETY DURING CONSTRUCTION				TOTAL HOURS		9 HOURS	
Quality and Safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - Total Quality Control - Quality Control by Statistical Methods - Statistical Quality Control with Sampling by Attributes - Statistical Quality Control with Sampling by Variables Safety.								
UNIT-5	ORGANIZATION AND USE OF PROJECT INFORMATION				TOTAL HOURS		9 HOURS	

Types of Project Information - Accuracy and Use of Information - Computerized Organization and Use of Information - Organizing Information in Databases - Relational Model of Databases -Other Conceptual Models of Databases - Centralized Database Management Systems -Databases and Applications Programs - Information Transfer and Flow.	
TOTAL HOURS TO BE TAUGHT	**45 HOURS**
COURSE OUTCOMES:	
After undergoing the course, the students will have ability to	
CO.1	Understand basic concepts of construction planing.
CO.2	Schedule the construction activities.
CO.3	Forecast and control the cost in a construction.
CO.4	Understand the quality control and safety during construction.
CO.5	Organize information in Centralized database Management systems.
TEXT BOOKS:	
1.	Construction Planning and Equipment by B.C.Punmia
2.	Project Planning and Equipment by L. S. Srinath
REFERENCES:	
1.	Calin M. Popescu, ChotchaiCharoenngam, Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.
2.	Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, McGraw-Hill Publishing Co
3.	Willis, E. M., Scheduling Construction Projects, John Wiley & Sons, 1986.

715CEE12 Construction Planning & Project Management																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Able to know about Planning methods and work task					2	1	1	2	3	2	3	2		2	2
CO2	Able to know about scheduling & controlling of projects				1	1	2	2	2	3	2	2	2		1	2
CO3	Able to understand the cost control techniques			1	3	2	1	1	1	2					2	2
CO4	Able to understand the safety aspects to be followed and the quality concerns					3	1	2	2	1	2	1			1	2
CO5	Able the know the Projects information and its usage in software tools for project management	1	1		2	1				2	3	3	1		2	3

Chairman, Board of Studies
Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonom
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering – Autonomous			Regulation	R-2015
Department	Civil Engineering	Programme Code and Name	C.E: B.E. Civil Engineering	

Semester-VII

Course Code	Course Name	Hours/week			Credit
		L	T	P	C
715CEP07	**COMPUTER AIDED DESIGN LABORATORY – II**	0	0	3	2

OBJECTIVES

- to design and draft structural drawings of retaining walls
- to design and draft structural drawings of RCC bridges
- to design and draft structural drawings of steel bridges
- to draft structural drawings of connections in bridges
- to design and draft structural drawings of water tanks

1. Design and drawing of RCC cantilever retaining walls with reinforcement details
2. Design and drawing of RCC counterfort type retaining walls with reinforcement details
3. Design of solid slab bridge for IRC loading and reinforcement details
4. Design of RCC Tee beam bridges for IRC loading and reinforcement details
5. Design and detailed drawings including connections of plate girder bridge
6. Design and detailed drawings including connections of Twin Girder deck type railway bridge
7. Design and detailed drawings including connections of Truss Girder bridges
8. Design of pressed, rectangular and hemispherical bottomed steel tank – Staging – Detailed drawings
9. Design and drafting of Intz type water tank
10. Design and detailing of circular and rectangular water tanks

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	design and draft retaining walls with reinforcement details
CO.2	design the solid slab and RCC tee beam bridges.
CO.3	design and draft steel bridges
CO.4	design and draft connections
CO.5	design and draft different types of water tanks

REFERENCES:

1.	Krishna Raju, "Structural Design & Drawing (Concrete & Steel)", CBS Publishers, 2015
2.	Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Design of steel structures", Lakshmi publications Pvt. Ltd, 2014
3.	Krishnamurthy, D., "Structural Design & Drawing – Vol. II", CBS Publishers & Distributors, Delhi, 2015
4.	Krishnamurthy, D., "Structural Design & Drawing – Vol. III Steel Structures", CBS Publishers & Distributors, New Delhi, 2015
5.	Krishna Raju, "Design of Bridges", CBS Publishers, 2015

Adhiyamaan College of Engineering – Autonomous						Regulation	R-2015	
Department	Civil Engineering	Programme Code and Name			CE : B.E. Civil Engineering			
Semester – VII								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
715CEP08	EMPLOYABILITY SKILL LABORATORY	0	0	3	2	50	50	100
OBJECTIVES	• To enable the students to conduct the experimental tests in the field • To make the students to understand the Field oriented knowledge in various Civil Engineering subjects.							

List of Experiments:

1. Measurement of Sound Level and Spot speed
2. Standard Penetration Test
3. Cyclic Loading Test on RC beam
4. NDT Tests
5. Study of Iso-efficiency curve of Impulse Turbine
6. Study of Iso-efficiency curve of Reaction Turbine
7. Preparation of Map by using Total Station and GPS
8. Radar Test

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO.1	Determine the cohesion, bearing capacity of soil.
CO.2	Identify the behaviour and performance of the beams under cyclic loading
CO.3	Prepare the contour maps for the given site or area

REFERENCES

1.	Lambe.T.W., "Soil Testing For Engineers", John Wiley and Sons, NewYork, 1990.
2.	Punmia.B.C. "Soil Mechanics and Foundation Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 1995
3.	GPS – User Manual – Garmen
4.	Total Station-User Manual.
5.	Dr. P.N. Modi & S.M. Sethi, " Fluid Mechanics and Machinery", Standard Book House, New Delhi.
6.	Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
7.	S.Y. Dyke Wuscle's University- 2009, "Structural Health Monitoring".

Adhiyamaan College of Engineering – Autonomous							R-2018
Department	Civil Engineering		Programme Code and Name		C.E: B.E. Civil Engineering		
Semester-VII							
Course Code	Course Name	Hours / week			Credit	Maximum Marks	
		L	T	P	C	CA	EA
715CEP09	**MINI PROJECT**	0	0	3	2	50	50
OBJECTIVES	The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.						
COURSE OUTCOMES:							
After undergoing the course, the students will have ability to							
CO.1	On completion of the design project, students will have a better experience & Knowledge in various design problems related to Civil Engineering.						

Adhiyamaan College of Engineering–Autonomous					Regulation		R-2015
Department	Civil Engineering	Programme Code and Name			B.E Civil Engineering		
Semester-VIII							
Course Code	Course Name	Hours/week			Credit	Maximum Marks	
		L	T	P	C	CA	EA	TOTAL
815CET01	**Disaster Mitigation & Management**	4	0	0	4	50	50	100
OBJECTIVES	To provide basic conceptual understanding of disasters and its relationships with global development To understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction To get knowledge about information technologies in disaster risk management To enhance awareness of Disaster Risk Management institutional processes in India To build skills to respond to disaster							
UNIT-1	**Introduction to Disaster**				TOTAL HOURS	12 HOURS		
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social,economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms ofcaste, class, gender, age, location, disability - Global trends in disasters: urban disasters,pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters								
UNIT-2	**Approaches to disaster risk reduction (DRR)**				TOTAL HOURS	12 HOURS		
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders-Institutional Processess and Framework at State and Central Level- State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.								
UNIT-3	**Inter-relationship between disasters and development**				TOTAL HOURS	12 HOURS		
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.								
UNIT-4	**Disaster risk management in India**				TOTAL HOURS	12 HOURS		
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and								

Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment			
UNIT-5	**Disaster management: Applications and case studies and fieldworks**	TOTAL HOURS	12 HOURS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.			
TOTAL HOURS TO BE TAUGHT			60 HOURS

COURSE OUTCOMES:

After undergoing the course, the students will have ability to

CO1	Understand the concepts, definitions of hazards and disasters.
CO2	Outline the disaster risk reduction strategies.
CO3	Understand concepts of Inter-relationship between disasters and development.
CO4	Describe the preparedness in disaster management.
CO5	Know the case studies in disaster management.

REFERENCES:

1. Singal J P., "Disaster management", laxmi Publishing 2010.
2. Tushar Bhattacharys., "Disaster science and management", McGraw Hill, India Education, Pvt Ltd 2012.
3. Gupta, Anil K. and Nair, Sreeja S. Environmental. Knowledge for Disaster Risk Management, NIDM New Delhi 2011.

815CET01 DISASTER MITIGATION & MANAGEMENT

CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the concepts, definitions	1			2			1		3			1		1	

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Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

	of hazards and disasters.															
CO2	Outline the disaster risk reduction strategies.	2	1	2			3	1				1	2			1
CO3	Understand concepts of Inter-relationship between disasters and development.		2		1			1			2		1		1	
CO4	Describe the preparedness in disaster management.	2	1	1	1			2	3			1		1	1	1
CO5	Know the case studies in disaster management.	3	1	1	1			1				1		1	2	1

Chairman, Board of Studies
Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous)
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering - Autonomous						Regulation		R-2015
Department	Civil Engineering		Programme Code and Name			C.E:B.E. Civil Engineering		
Semester-VIII								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
815CEE01	REPAIRS AND REHABILITATION OF STRUCTURES	3	0	0	3	50	50	100
OBJECTIVES	To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.							
UNIT-1	MAINTENANCE AND REPAIR STRATEGIES				TOTAL HOURS		9 HOURS	
Maintenance- repair and rehabilitation-Facets of Maintenance- importance of Maintenance various aspects of Inspection- Assessment procedure for evaluating a damaged structure- causes of deterioration.								
UNIT-2	SERVICEABILITY AND DURABILITY OF CONCRETE				TOTAL HOURS		9 HOURS	
Quality assurance for concrete construction concrete properties – strength- permeability- thermal properties and cracking – Effects due to climate- temperature- chemicals- corrosion – design and construction errors – Effects of cover thickness and cracking.								
UNIT-3	MATERIALS AND TECHNIQUES FOR REPAIR				TOTAL HOURS		9 HOURS	
Special concretes and mortar- concrete chemicals- special elements for accelerated strength gain-Expansive cement-polymer concrete- sulphur infiltrated concrete- ferro cement- Fibre reinforced concrete- Rust eliminators and polymers coating for rebars during repair- foamed concrete- mortar and dry pack-vacuum concrete- Gunite and Shotcrete- Epoxy injection- Mortar repair for cracks-shoring and underpinning-Methods of corrosion protection-corrosion inhibitors-corrosion resistant steels-coating and cathodic protection.								
UNIT-4	REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES				TOTAL HOURS		9 HOURS	
Repairs to overcome low member strength-Deflection-Cracking- Chemical disruption- weathering corrosion- wear-fire-leakage and marine exposure.								

UNIT-5	**DEMOLITION TECHNIQUES**	TOTAL HOURS	9 HOURS
Engineered demolition techniques for Dilapildated structures – case studies.			
TOTAL HOURS TO BE TAUGHT			45 HOURS
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Know about the assessment procedure for evaluating a damaged structure.		
CO.2	Know about the different materials used for repair techniques.		
CO.3	Know about the different repair methods to overcome low member strength.		
TEXT BOOKS:			
1.	Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991.		
2.	R.T.Allen and S.C.Edwards, Repair of Concrete structures, Blakie and Sons, UK, 1987		
REFERENCES:			
1.	M.S.Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.		
2.	Santhakumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, "RHDC – NBO" Anna University, July 1992		
3.	Raikar, R.., Learning from failures – Deficiencies in Design, Construction and Service – R & D centre (SDCPL), Raikar Bhavan, Bombay, 1987.		
4.	N.Palaniappan, Estate Management, Anna Institute of Management, Chennai, 1992.		
5.	Lakshmipathy, M. etal. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 -30th October 1999.		

315 CEE06 Repair & Rehabilitation of Structures																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Know about the assessment procedure for evaluating a damaged structure.	1	2	-	2	2	1	-	-	1	-	1	2	1	-	1
CO2	Able to identify the serviceability & durability on concrete structures	1	2	-	-	1	1	1	-	-	-	1	2	2	2	-
CO3	Know about the different materials used for repair techniques.	-	2	-	1	1	1	-	-	1	-	1	1	-	-	2
CO4	Know about the different repair methods to overcome low member strength.	1	-	2	-	1	1	-	-	1	-	1	1	-	1	1
CO5	Know about the different demolition techniques	2	1	-	-	3	1	1	1	3	-	1	1	-	1	3

Chairman, Board of Studies
Faculty of Civil Engineering (UG & PG)
Adhiyamaan College of Engineering (Autonomous
Hosur - 635 130
Krishnagiri (Dt.), Tamil Nadu.

Adhiyamaan College of Engineering - Autonomous				Regulation		R-2015		
Department	Civil Engineering		Programme Code and Name		C.E:B.E. Civil Engineering			
Semester-VIII								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
815CEE05	VALUATION OF REAL PROPERTIES	3	0	0	2	50	50	100
OBJECTIVES	At the end of this course the student shall be able to Analyse the valuation of residential, commercial and industrial buildings. The students will gain a comprehensive knowledge related to the investment of finance in real properties.							
UNIT-1	VALUE				TOTAL HOURS	9 HOURS		
General - Concept of the Terms Value & cost, Purposes of Valuation, Different Forms of Value- Capitalised value, Scrap value, Salvage value, Book value, Market value and Guideline value. Factors affecting the value of property - Mortgage - Role of the Valuer.								
UNIT-2	METHODS OF VALUATION				TOTAL HOURS	9 HOURS		
General - Methods of Valuation – Rental method, Direct comparison with the capital value, Valuation based on profits, Valuation based on cost, Developmental method of valuation and Depreciation method of valuation. Standard rent.								
UNIT-3	DEPRECIATION				TOTAL HOURS	9 HOURS		
Meaning of the Term depreciation, Physical Conditions, Functional Obsolescence, Economic Obsolescence, Methods of calculating depreciation - Straight line method, Constant percentage method, Sinking fund method and Quantity survey method. – Comparative analysis. Reproduction Cost and Replacement Cost. Cost Appreciation.								
UNIT-4	PROJECT PROFITABILTY & METHODS OF PRICING				TOTAL HOURS	9 HOURS		
Time value of money- Methods of appraising project profitability- Payback period, Net present value, ARR, IRR and Benefit cost ratio method -Aspects of appraisal – Pricing –concepts – Methods of Price determination – Full cost pricing, Pricing for a rate of return, Marginal cost, Acceptance cost, Going rate pricing and Customary pricing- Break even analysis.								

UNIT-5	**FINANCE FOR INVESTMENT IN REAL PROPERTIES**	TOTAL HOURS	9 HOURS
Money and Banking – Sources of finance -Terms of Borrowing – Loan for residential, Commercial and industrial properties – Rate of interest - Co-operative Housing Societies – Gearing and equity - Low-Geared High Geared – Acquisition of land – Transfer of property – Urban land Ceiling Act .			
TOTAL HOURS TO BE TAUGHT			**45 HOURS**
COURSE OUTCOMES:			
After undergoing the course, the students will have ability to			
CO.1	Know the basic concepts of finite element techniques		
CO.2	Analyse one dimensional and two dimensional problems..		
CO.3	Know about isoperimetric elements and its applications to field problems.		
TEXT BOOKS:			
1.	Valuation of real properties – S .C. Rangwala - Charotar Publishing House, 1995		
2.	Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers Distributors Pvt. Ltd., 2003		
3.	Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chanc Company Ltd., 2004		
REFERENCES:			
1.	National Building Code-2009.		
2.	Bhindra&Bhindra, "Estimating and Costing", Lakshmi Publication, New Delhi.		

315 CEE06 Valuation of Real Properties																
CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the concepts of cost, price & value	3	2	3	3	3	3	3	2	2	3	2	1	3	2	2
CO2	To arrive the present market value of a property by using different methods of valuations.	3	3	2	2	2	3	3	3	2	2	2	1	3	2	2
CO3	Understand the meaning, purpose & calculation of deprecation in the valuation of the existing properties	3	3	2	2	3	2	2	3	3	2	2	1	3	3	2
CO4	To Understand the project profitability.	3	3	3	2	2	3	3	2	2	3	2	1	3	2	2
CO5	Understand about banking, rate of interest & procedure to avail the funds for construction activities	3	2	3	3	3	2	2	2	3	2	2	1	3	3	2

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Adhiyamaan College of Engineering–Autonomous						Regulation		R-2015
Department	Civil Engineering	Programme Code and Name				B.E Civil Engineering		
Semester-VIII								
Course Code	Course Name	Hours/week			Credit	Maximum Marks		
		L	T	P	C	CA	EA	TOTAL
815CEE08	**Fundamentals of Bridge structures**	3	0	0	3	50	50	100
OBJECTIVES	To learn IRC loading conditions for design of bridges. To design different RCC bridges. To achieve knowledge about design of steel To study about prestressed concrete bridges. To know about bearing, joints and appurtenances in bridges							
UNIT-1	**INTRODUCTION**				TOTAL HOURS		9 HOURS	
Definition-Components of a bridge-Classification-Importance of bridges-Standard specifications-Need for investigation-Selection of bridge site-Preliminary data to be collected-Preliminary drawing-Determination of design discharge –Linear waterway-Economical span-Location of piers and abutments-Vertical clearance above HFL-Subsoil exploration-Scour depth-Traffic projection-Investigation report-Choice of bridge type- Importance of proper investigation-Standard Specifications for Road Bridges.								
UNIT-2	**REINFORCED CONCRETE SLAB BRIDGES**				TOTAL HOURS		9 HOURS	
Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading								
UNIT-3	**STEEL BRIDGES**				TOTAL HOURS		9 HOURS	
Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.								
UNIT-4	**PRESTRESSED CONCRETE BRIDGES**				TOTAL HOURS		9 HOURS	
Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters - Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder –Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections.								
UNIT-5	**BEARINGS, JOINTS AND APPURTENANCES**				TOTAL HOURS		9 HOURS	
Importance of bearings-Bearing for slab bridges-Bearings for girder bridges-Expansion bearing-Fixed bearings-Elastomeric bearing-Elastomeric pot bearing-Bearing for skew bridges-Joints-Expansion joints-Handrails-Foot paths on bridges-Drainage arrangements-Wearing coat-River training works								

TOTAL HOURS TO BE TAUGHT		45 HOURS
COURSE OUTCOMES:		
After undergoing the course, the students will have ability to		
	CO1	Outline the basic design concept of bridges
	CO2	Design of Reinforced concrete girder bridges
	CO3	Design of steel bridges, girder and plates
	CO4	Design of Prestressed concrete bridges
	CO5	Know about bearings, joints and appurtenances in bridges
REFERENCES:		
1.	Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi.	
2.	Rajagopalan, N.Bridge Superstructure, Alpha Science International.	
3.	Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi.	
4.	Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi.	

815CEE06 Bridge Engineering

CO's		PO's												PSO's		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Get an overall idea about investigation required for the selection of site, types of bridges and construction of bridges,	1	2	2	3	2	2	2	-	-	-	1	-	3	2	2
CO2	Design Steel bridges & RCC bridges	3	3	3	2	1	2	3	-	-	-	2	-	3	3	2
CO3	Understand the importance, types and Design of bearings	2	2	3	2	2	2	2	-	-	-	2	-	3	3	2
CO4	Understand the appurtenances in bridges.	1	1	2	2	2	2	2	-	-	-	1	-	3	2	2
CO5	Design Prestressed Concrete Bridges	3	3	3	2	1	2	3	-	-	-	2	-	3	3	2

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2.	Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 1991.
REFERENCES:	
1.	COULL, A. and SMITH, STAFFORD, B. " Tall Buildings ", Pergamon Press, London, 1997.
2.	LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.
3.	Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.
4.	Taranath.B.S., Structural Analysis and Design of Tall Buildings, McGraw Hill 1998.

Adhiyamaan College of Engineering – Autonomous						R-2015	
Department	Civil Engineering	Programme Code and Name		C.E: B.E. Civil Engineering			
Semester-VIII							
Course Code	Course Name	Hours / week			Credit	Maximum Marks	
		L	T	P	C	CA	EA
815CEP05	**PROJECT WORK**	0	0	20	10	50	50
OBJECTIVES	To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.						
	STRATEGY: The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.						
COURSE OUTCOMES:							
After undergoing the course, the students will have ability to							
On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.							