VINAYAKA MISSION'S RESEARCH FOUNDATION, SALEM
(Deemed to be University)

FACULTY OF ENGINEERING AND TECHNOLOGY

REGULATIONS-2016

CURRICULUM AND SYLLABUS
FROM
I TO VII SEMESTERS
FOR

B.E.CIVIL ENGINEERING
[PART TIME]

INDEX

ABOUT THE COURSE

Civil engineering is perhaps the broadest of the engineering fields, for it deals with the creation, improvement, and protection of the communal environment, providing facilities for living, industry and transportation, including large buildings, roads, bridges, canals, railroad lines, airports, water-supply systems, dams, irrigation, harbours, docks, aqueducts, tunnels, and other engineered constructions. The civil engineer must have a thorough knowledge of all types of surveying, of the properties and mechanics of construction materials, the mechanics of structures and soils, and of hydraulics and fluid mechanics. Among the important subdivisions of the field are construction engineering, irrigation engineering, transportation engineering, soils and foundation engineering, geodetic engineering, hydraulic engineering, and coastal and ocean engineering.

Man first started his life as a civil engineer. It was the invention of wheel that favoured the development of human race into culture one. Our aim is to achieve a target of producing creative innovative and dignified Civil Engineers. Every Civil Engineer needs the skill for preliminary investigation, analysis, design and execution and maintenance.

Preliminary investigation provides adequate information that are required for the successful completion of the project. This may include collection of environmental data, local material availability, soil and geological conditions, availability of labour force, traffic characteristics etc.

Detailed survey and other field tests are to be conducted before proceeding with the analysis. During the analysis period, different options of the project have to be considered thoroughly and the final one has to be detected. After the analysis, a decision on the materials to be used has to be made. Then the design is made with one or more approaches and the optimal one is chosen such that the project will be economical without sacrificing the safety and durability aspects. Next stage is the execution which is done with proper construction planning for completion of the project in a short duration of time such that the facility shall be available to the society early.

A well constructed project should not get spoiled without proper maintenance. It needs streamlined maintenance plan and proper execution. Civil engineering is perhaps the broadest of the engineering fields, for it deals with the creation, improvement, and protection of the communal environment, providing facilities for living, industry and transportation, including large buildings, roads, bridges, canals, railroad lines, airports, water-supply systems, dams, irrigation, harbours, docks, aqueducts, tunnels, and other engineered constructions. The civil engineer must have a thorough knowledge of all types of surveying, of the properties and mechanics of construction materials, the mechanics of structures and soils, and of hydraulics and fluid mechanics. Among the important subdivisions of the field are construction engineering, irrigation engineering, transportation engineering, soils and foundation engineering, geodetic engineering, hydraulic engineering, and coastal and ocean engineering.

The course aims at packing up Engineers with above mentioned concepts of motivating and leading the construction industry a full-fledged one for a bright India.

CURRICULUM

OBJECTIVES

i) KNOWLEDGE

"Knowledge is Power" the saying pays an active attention by bringing out the essence of life. "You become what you think!" said, Vivekananda. Still then it could be well felt that most of us worship the great men who told the sayings but don't follow them. Is not that true? Human beings are in a wild struggle for the want of money, bread and happiness. But do we achieve the things that we long for in our life? Life is not meant to search but to enjoy. Enjoyment should be the fullest up to the brim. Engineering is always a joy when learned with enthusiasm, the eager to learn, the love to conquer humanity, will drive the life a more meaningful one. Knowledge makes you sharp, brings elation to the brain. Civil engineering is perhaps the broadest of the engineering fields, for it deals with the creation, improvement, and protection of the communal environment. Intelligent hard work never fails. A thirst for knowledge, a drive to win, a passion to achieve can always be accompanied of having sound knowledge in what ever field you choose. Just remember Darwin's theory of survival of the fittest. If you want to survive enter this competitive world with your brain and get ready for a high tech environment of Civil Engineers.

ii) SKILLS

Are you really skilled? What do you mean by skill then? Perhaps it nothing but proficiency and excellence in whatever you start with .You need virtue of scientific education and training in the field of Engineering to develop the Engineering skills. Every Engineer has the role to play. For instance a simple train journey to work or school illustrates the number of different kinds of engineers who have involved in some way in making the journey possible. Mechanical and electrical engineers have involved with the design of locomotives and coaches. Civil Engineers with the design and construction of railway tracks, bridges and station buildings; Electronics engineers with the design and installation of communication facilities; Computer Engineers with automatic control and regulation of movement of trains; Chemical engineers with the production of paints and Diesel. Rapid movement of new technologies and new construction techniques and materials has implications upon all branches of engineering. No one is born skilled; It's the Education that nourish him.

iii) INTERPRETATION

It was the interpretation that had led man to this extent to rule this world and to some extent he had conquered time also. The Engineering science has no end at all. Fire was the first interpretation of man. Today he makes the computers interpret humans. Civil Engineering has been redefined with the advent of Finite element analysis softwares like NASTRAN, ANSYS other packages like STAAD pro, SAP, STRUDS etc., It's an interesting thing to note down that Artificial intelligence has come down with flying colours for Civil Engineering that for constructing a bridge or fly over, it has been made possible that about 200 designs can be done at a moment and the appropriate can be chosen at interest.

It's not what field you choose upon but how do you interpret. The engineering interpretation of Tsunami has ended up with an innovative design of folded plate design that could keep the people at comfort. Folded plates offer the combined advantages of both plates

and shells. Sometimes folded plates are called as prismatic shells. All structural theories distinguish sharply between the structures having small deflections and those having large deflections. For the former the law of superposition is applicable while for the latter the so – called "Structural theories of second order "must be used. One of the most important bridge structures, "HowrahBridge" is made fully of rivets and no where it has bolts and nuts. How enthusiastic the designer was? How creative? One of our Civil Engineering staff often uses to say "Design starts from the top while Construction from the bottom!" Our aim is create innovative, creative and dignified Civil Engineers. We wish you to achieve the aim by joining hand with us.

DURATION OF THE COURSE – 3 ½ Years
B.E. CIVIL ENGINEERING (PART-TIME – 7 SEMESTERS)
(2016 on Wards)

SEMESTER – I

Sl.No.	CODE NO.	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
THEORY							
1		Engineering Mathematics	MATHS	3	1	0	4
2		Surveying	CIVIL	3	0	0	3
3		Environmental Science and Engineering	CIVIL	3	0	0	3
4		Engineering Mechanics	MECHANICAL	3	1	0	4
PRACTICAL							
1		Survey Practical – I Lab	CIVIL	0	0	4	2
			TOTAL	**12**	**2**	**4**	**16**

SEMESTER – II

S.NO	CODE NO.	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
THEORY							
1		Advanced Engineering Mathematics	MATHS	3	0	0	3
2		Mechanics of Solids	CIVIL	3	1	0	4
3		Mechanics of Fluids	CIVIL	3	1	0	4
4		Construction Techniques, Equipment and Practices	CIVIL	3	0	0	3
PRACTICAL							
1		Hydraulics Engineering Lab	CIVIL	0	0	4	2
TOTAL				**12**	**2**	**4**	**16**

SEMESTER – III

Sl.No.	CODE NO.	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
THEORY							
1		Numerical Methods	MATHS	3	0	0	3
2		Construction Materials	CIVIL	3	0	0	3
3		Advanced Mechanics of Solids	CIVIL	3	1	0	4
4		Applied Hydraulic Engineering	CIVIL	3	1	0	4
PRACTICAL							
1		Survey Practical – II Lab	CIVIL	0	0	4	2
2		Strength of Materials Lab	CIVIL	0	0	4	2
TOTAL				**12**	**2**	**8**	**18**

SEMESTER – IV

Sl.No.	CODE NO.	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
THEORY							
1		Irrigation Engineering	CIVIL	3	0	0	3
2		Structural Analysis	CIVIL	3	1	0	4
3		Environmental Engineering-I	CIVIL	3	0	0	3
4		Mechanics of Soils	CIVIL	3	1	0	4
PRACTICAL							
1		Computer Aided Building Drawing Lab	CIVIL	0	0	4	2
2		Soil Mechanics Lab	CIVIL	0	0	4	2
TOTAL				**12**	**2**	**8**	**18**

SEMESTER – V

Sl.No	CODE NO.	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
THEORY							
1		Modern Methods of Structural Analysis	CIVIL	3	1	0	4
2		Foundation Engineering	CIVIL	3	1	0	4
3		Design of Reinforced Concrete Elements	CIVIL	3	1	0	4
4		Environmental Engineering-II	CIVIL	3	0	0	3
PRACTICAL							
1		Environmental Engineering Lab	CIVIL	0	0	4	2
2		Concrete and Construction Technology Lab	CIVIL	0	0	4	2
TOTAL				**12**	**3**	**8**	**19**

SEMESTER – VI

Sl.No	CODE NO.	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
THEORY							
1		Design of Reinforced Concrete and Masonry Structures	CIVIL	3	1	0	4
2		Highway Engineering	CIVIL	3	0	0	3
3		Disaster Mitigation and Management	CIVIL	3	0	0	3
4		Design of Steel Structures	CIVIL	3	1	0	4
PRACTICAL							
1		Computer Aided Design and Drawing Lab	CIVIL	0	0	4	2
2		Design Project	CIVIL	0	0	8	4
			TOTAL	**12**	**2**	**12**	**20**

SEMESTER – VII

Sl.No.	CODE NO.	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
THEORY							
1		Estimation and Quantity Surveying	CIVIL	3	1	0	4
2		Railway, Airport and Harbour Engineering	CIVIL	3	0	0	3
3		Elective I	CIVIL	3	0	0	3
4		Elective II	CIVIL	3	0	0	3
PRACTICAL							
1		Project Work& viva voce	CIVIL	0	0	12	6
			TOTAL	**12**	**1**	**12**	**19**

TOTAL CREDITS: 126

B.E. - CIVIL ENGINEERING (PART TIME)
LIST OF ELECTIVES

Sl.No.	COURSE CODE	COURSE TITLE	DEPT. OFFERING THE COURSE	L	T	P	C
1		Hydrology	CIVIL	3	0	0	3
2		Remote Sensing Techniques and Applications	CIVIL	3	0	0	3
3		Housing Planning and Management	CIVIL	3	0	0	3
4		Traffic Engineering and Management	CIVIL	3	0	0	3
5		Management of Irrigation Systems	CIVIL	3	0	0	3
6		Prefabricated structures	CIVIL	3	0	0	3
7		Ground Improvement Techniques	CIVIL	3	0	0	3
8		Introduction to Soil Dynamics and Machine Foundations	CIVIL	3	0	0	3
9		Geographical Information System	CIVIL	3	0	0	3
10		Electronic Surveying	CIVIL	3	0	0	3
11		Air Pollution Management	CIVIL	3	0	0	3
12		Bridge Structures	CIVIL	3	0	0	3
13		Storage Structures	CIVIL	3	0	0	3
14		Tall Buildings	CIVIL	3	0	0	3
15		Structural Dynamics	CIVIL	3	0	0	3
16		Wind Engineering	CIVIL	3	0	0	3
17		Total Quality Management	MBA	3	0	0	3
18		Computer Aided Design of Structure	CIVIL	3	0	0	3
19		Industrial Waste Management	CIVIL	3	0	0	3
20		Industrial Structures	CIVIL	3	0	0	3

21		Smart Structures and Smart Materials	CIVIL	3	0	0	3
22		Finite Element Technique	CIVIL	3	0	0	3
23		Design of Plate and Shell Structures	CIVIL	3	0	0	3

SEMESTER	CODE	COURSE TITLE	L	T	P	C
I		ENGINEERING MATHEMATICS	3	0	0	3

(COMMON TO THE BRANCHES MECH,ECE,CSE, CSSE,EEE, EIE,CIVIL,IT,MECHTRONICS,AERONAUCTICAL ,ETC,AUTOMOBILE)

OBJECTIVES:

The syllabus for the Engineering Mathematics I have been framed catering to the needs of the Engineering students. It is purely applications oriented. To mention a few i) To utilize the powerful features of MATLAB one has to be an expert in Matrix theory (ii) The matrix theory plays an vital role in simplifying large arrays of equation and in determining their solution.(iii) Partial differential equation frequently occured in the theory of elasticity and Hydraulics.(iv) In circuit branches the current flow can be calculated by using Laplace transform when EMF,resistance and inductions are known.

UNIT I

MATRICES9

Characteristic equation – Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form.

UNIT II

ORDINARY DIFFERENTIAL EQUATIONS 9

Solutions of First and Second order linear ordinary differential equation with constant coefficients– Method of variation of parameters–Simultaneous first order linear equations with constant coefficients.

UNIT III

MULTIPLE INTEGRALS AND VECTOR CALCULUS 9

Double integration - Cartesian and polar coordinates –Area as a double integral – Triple integration – volume as a triple integral-Directional derivatives – Gradient, Divergence and Curl – Irrotational and solenoidal- vector fields – vector integration.

UNIT IV

LAPLACE TRANSFORMS **9** Laplace transform – transform of elementary functions – basic properties – derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions.

UNIT V

APPLICATIONS OF LAPLACE TRANSFORMS **9** Inverse Laplace transform – Convolution theorem – Initial and Final value theorem-Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transforms.

Total hours: 60

Lecture Hours: 45
Tutorial Hours: 15

OUTCOME: At the end of this course the students will be in a position to apply the knowledge of Mathematics in the respective Engineering branches.

TEXT BOOKS

1. **"**Engineering Mathematics**"** by Department of Mathematics, VMU

2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.

3. Prof.Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers, Delhi 2001.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics", Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
I		SURVEYING	3	0	0	3

OBJECTIVES

At the end of the course the student will posses knowledge about

- Chain surveying,
- Compass surveying,
- Plane table surveying, Levelling,
- Theodolite surveying
- Engineering surveys.

UNIT – I INTRODUCTION AND CHAIN SURVEYING 9

Definition - Principles - Classification - Fields and office work - Scales - Conventional signs - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Setting perpendiculars - well-conditioned trainagles - Traversing - Plotting - Enlarging and Reducing figures.

UNIT – II COMPASS SURVEYING AND PLANE TABLE SURVEYING 9

Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction – Magnetic declination - Dip - Traversing - Plotting - adjustment of error - Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing.

UNIT – III LEVELLING AND APPLICATIONS 9

Level line - Horizontal line - Levels and Staves - Sprit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and Check leveling - Booking - reduction - Curvature and Refraction - reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring - Methods -Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reserviors.

UNIT – IV THEODOLITE SURVEYING 9

Theodolite - Vernier and micro optic - Description and uses - temporary and permanent adjustments of vernier transit - Horizontal angles - Vertical angles - Heights and Distances - Traversing - Closing error and distribution - Gales's tables - Omitted measurements.

UNIT – V ENGINEERING SURVEYS 9

Reconnaissance, Preliminary and location surveys for engineering projects - Layout - Setting out works – Route Surveys for highways, railways and waterways - Curve ranging - Horizontal and vertical curves - Simple Curves - setting with chain and tapes, tangential

angles by theodolite, double theodolite - Compound and reverse curves - Transistion curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances - Mine Surveying - Instruments - Tunnels - Correlation of underground and surface surveys - Shafts - Adits.

Total Hours = 45

OUTCOME:

- Students are expected to use all surveying equipments, prepare LS & CS, contour maps and carryout surveying works related to land and civil engineering projects.

TEXT BOOKS:

1. Bannister A. and Raymond S., "Surveying ", ELBS, Sixth Edition, 1992.
2. Heribert Kahmen and Wolfgang Faig, "Surveying ", Walter de Gruyter, 1995.
3. Kanetkar T.P., "Surveying and Levelling ", Vols. I and II, United Book Corporation, Pune, 1994.
4. Punmia B.C., "Surveying ", Vols. I, II and III, Laxmi Publications, 1999.

REFERENCES:

1. Clark D., "Plane and Geodetic Surveying ", Vols. I and II, C.B.S. Publishers and Distributors, New Delhi, Sixth Edition, 1991.
2. James M. Anderson and Edward M. Mikhail, "Introduction to Surveying", McGraw Hill Book Company, 1995.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
I		ENVIRONMENTAL SCIENCE AND ENGINEERING	3	0	0	3

(Common to all branches)

OBJECTIVES:

To study the nature and facts about environment.

- To find and implement scientific, technological, economic and political solutions to environmental 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.
- To study the integrated themes and biodiversity, natural resources, pollution control andwaste management.

UNIT – I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – need for public awareness- forest resources: use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems-mineral resources: use effects on forests and tribal people-water resources: use and over-utilization of surface and exploitation, environmental effects if extracting and using mineral resources, case studies-food resources: world food problems, changes caused by agriculture and overgrazing, effects of modem 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 ECOSYSTEMS AND BIODIVERSITY 14

Concept of and 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, etc.

UNIT – III ENVIRONMENTAL POLLUTION 8

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: caused, effects and control measures of urban and industrial 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 / agriculture

UNIT – IV SOCIAL ISSUES AND THEIR 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 – 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 protection act-air (prevention and control of pollution) act-water (prevention and control of pollution) act- wildlife protection act-forest conservation act-issues involved in enforcement of environmental legislation-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 Hours : 45

OUTCOME:

- The student will come out with ethical responsibility in his/her profession.

TEXT BOOK:

1. Raman Sivakumar, Environmental Science and Engineering, Vijay Nicole imprints Pvt.Ltd.

REFERENCE BOOKS:

1. Bharucha Erach, The Biodiversity of India, publishing Pvt. Ahmedabad, India,
2. Trivedi R.K. Hand book of Environmental laws, Rules, Guidelines, Compliances and Standards, Vol. and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, jaicao., House, Mumbai, 2001.
4. Weger K.D., Environmental Management, W.B. Saunders, Co., Philadelphia, USA., 1998.
5. Gilbert M.Masters, Introduction to Environmental Engineering and science, pearson Education Pvt., Ltd., Second Edition, 2004
6. Miller `T.G. Jr., Environmental Science, Wadsworth Publishing Co.
7. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science

8. Trivedi R.K And P.K. Goel, Introduction to air pollution, Techno-Science publication

SEMESTER	CODE	COURSE TITLE	L	T	P	C
I		ENGINEERING MECHANICS	3	0	0	3

OBJECTIVES:

To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT – I BASICS& STATICS OF PARTICLES 9

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem. Parallelogram and triangular law of forces - Vectors - Vectorial representation of forces and moments - Vector operations: addition, subtraction, dot product, cross product - Coplanar Forces - 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 9

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 and axis - Vectorial representaion of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimension - Equilibrium of Rigid bodies in three dimensions - Examples.

UNIT – III PROPERTIES OF SURFACES AND SOLIDS 9

Determination of Areas and Volumes - First moment of area 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 - Polar moment of inertia - Principle moments of inertia of plane areas - Principle axes of inertia - Mass moment of inertia - Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle - Relation to area moments of inertia.

UNIT – IV DYNAMICS OF PARTICLES 9

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

UNIT – V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 9

Frictional force - Laws of Coloumb friction - simple contact friction - Rolling resistance - Belt friction Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion.

Total Hours: 45

OUTCOMES:

- ability to explain the differential principles applies to solve engineering problems dealing
  with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

1. Beer & Johnson, "Vector Mechanics for Engineers". Vol. I Statics and Vol. II Dynamics McGraw Hill International Edition, 1995.
2. Meriam, "Engineering Mechanics", Vol. I Statics & Vol.II Dynamics 2/e,Wiley Intl., 1998.
3. K. L.Kumar, "Engineering Mechanics", III Edition, Tata McGraw Hill Publishing Co. Ltd., 1998

REFERENCES:

1. Rajasekaran.S, and Sankara Subramanian G, "Engineering Mechanics - Statics and Dynamics".
2. Irving H. Sharma, "Engineering Mechanics - Statics & Dynamics", III Edition, Prentice Hall of India Pvt. Ltd., 1993.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
I		PRACTICALS SURVEY PRACTICAL – I LAB	0	0	4	2

1) CHAIN SURVEYING

Ranging – changing and traverse.

2) COMPASS SURVEYING.

Traverse.

3) PLANE TABLE SURVEYING.

Triangulation to find the distance between inaccessible points with and with out known scale. – Three-point problem, two point problem.

4) LEVELLING

Study of levels and leveling staff – Fly leveling using dumpy level. – fly leveling using tilting level. – Check leveling.

5) THEODOLITE SURVEYING

Study of theodolite measurement of angles by reiteration and repetition - measurement of vertical angles.

OUTCOME:

- Students completing this course would have acquired practical knowledge on handling basic survey instruments including leveling and development of contour map of given area.

LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Chain	6

2.	Ranging Rod	12
3.	Arrow	30
4.	Tape	6
5.	Cross staff	6
6.	Peg	30
7.	Prismatic compass	6
8.	Tripod stand	6
9	Plane Table	6
10	Plumb Bob	6
11	Trough compass	6
12	Alidade	6
13	Spirit level	6
14	Dumpy level	6
15	Levelling Staff	6

SEMESTER	CODE	COURSE TITLE	L	T	P	C
II		ADVANCED ENGINEERING MATHEMATICS	3	0	0	3

(Common to CIVIL, MECH, AUTO, AERO, MECHAT, ECE, EEE, ETC, E&I, CSE, IT, CSSE)

OBJECTIVES:

The syllabus for the Advanced Engineering Mathematics has been framed catering to the needs of the Engineering students. It is purely application oriented. To mention a few (i) Partial differential equations arises in most of the Engineering discipline when the number of independent variables in the given problem under discussion is two or more. (ii) Fourier series has the wide application in the field of heat propagation and diffusion, wave propagation and in signal and systems analysis. (iii) Transform techniques are very useful in the field of signal and system analysis. Z - transform plays an important role in analysis of Discrete signals. This is a prelude to learn higher semester courses.

1. PARTIAL DIFFERENTIAL EQUATIONS 9

Formation - Solutions of standard types of first order equations - Lagrange's Linear equation - Linear partial differential equations of second and higher order with constant coefficients.

2. FOURIER SERIES 9

Dirichlet's conditions - General Fourier series - Half-range Sine and Cosine series - Parseval's identity – Harmonic Analysis.

3. BOUNDARY VALUE PROBLEMS 9

Classification of second order linear partial differential equations - Solutions of one - dimensional wave equation, one-dimensional heat equation

4. FOURIER TRANSFORMS 9

Statement of Fourier integral theorem - Fourier transform pairs - Fourier Sine and Cosine transforms – Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

5. Z - TRANSFORM 9

Z-Transform – Elementary Properties – Inverse Z-Transform – Convolution Theorem – Formation of Difference Equations – Solution of Difference Equations using Z-Transform.

Total hours: 45

TEXT BOOKS:

1. Kreyszig, E., " Advanced Engineering Mathematics " (8th Edition), John Wiley and Sons, (Asia) Pte Ltd.,Singapore, 2000.
2. Grewal, B.S., " Higher Engineering Mathematics " (35th Edition), Khanna Publishers, Delhi 2000.
3. Prof.Dr.A .Singaravelu, Transform and Partial Differential Equations by Meenakshi Publications.

REFERENCES:

1. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " Engineering Mathematics ", Volumes II & III (4th Revised Edition), S. Chand & Co., New Delhi, 2001.
2. Narayanan, S., Manicavachagom Pillay, T.K., Ramanaiah, G., " Advanced Mathematics for Engineering Students ", Volumes II & III (2ndEdition), S.Viswanathan (Printers & Publishers, Pvt, Ltd.) 1992.
3. Venkataraman, M.K. " Engineering Mathematics " Volumes III - A & B, 13th EditionNational Publishing Company, Chennai, 1998.
4. Shanmugam, T.N. : http://www.annauniv.edu/shan/trans.html

SEMESTER	CODE	COURSE TITLE	L	T	P	C
II		MECHANICS OF SOLIDS	3	1	0	4

OBJECTIVES:

- To learn fundamental concepts of Stress, Strain and deformation of solids with applications to bars, beams and thin cylinders.
- To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- To understand the effect of torsion on shafts and springs.
- To analyse a complex two dimensional state of stress and plane trusses.

UNIT – I STRESS, STRAIN AND DEFORMATION OF SOLIDS, STATES OF STRESS 9

Rigid bodies and deformable solids - Stability, strength and stiffness - tension, compression and shear stresses – strain , elasticity Hooke's law ,limit of proportionality, modulus of elasticity, stress strain curve, lateral strain - Deformation of simple and compound bars - Thermal Stresses - Elastic Constants.- shear modulus, bulk modulus. Biaxial state of stress - Thin cylinders and shells - Deformation of thin Cylinders and shells - Stresses at a point - Stress as tensor - Stresses on inclined planes - Principal stresses and principal planes - Mohr's circle of stress.

UNIT – II ANALYSIS OF PLANE TRUSSES, THIN CYLIDERS/SHELLS 9

Stability and equilibrium of plane frames - perfect frames - types of trusses - analysis of forces in truss members - Method of joints - Method of tension coefficients - Method of sections, thin cylinders and shells – under internal pressure – deformation of thin cylinders and shells.

UNIT – III TRANSVERSE LOADING ON BEAMS 9

Beams - Types of supports – simple and fixed, types of load – concentrated, uniformly distributed , combination of above loading – relationship between BM and SF – BMD, SFD diagrams for simply supported, cantilever and overhanging beams – theory of simple bending – analysis of stresses- load carrying capacity of beams – proportioning of sections.

UNIT – IV DEFLECTION OF BEAMS AND SHEAR STRESSES 9

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 section, solid circular section, hollow circular section, angle and channel sections – shear flow – shear centre.

UNIT – V TORSION AND SPRINGS **9**

Stresses and deformation in circular (solid and hollow shafts) - Stepped shafts - shafts fixed at the both ends - Stresses in helical springs – leaf springs - Deflection of springs -

Total Hours: 45

OUTCOMES:

The students will have

- Thorough understanding of the fundamental concepts of stress and strain in mechanics ofsolids and structures.
- the ability to analyse determinate beams and trusses to determine shear forces, bendingmoments and axial forces.
- a sufficient knowledge in designing shafts to transmit required power and also springs forits maximum energy storage capacities.

TEXT BOOKS:

1. Er.R.K.Rajput,"Strength of Materials"S.Chand Publications,New Delhi,2006
2. Dr.R.K.Bansal,"A Textbook of Strength of Materials"Laxmi Publications,2010
3. Srinath L.N., " Advanced Mechanics of Solids ", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.

REFERENCES:

1. Junarkar S.B., " Mechanics of Structures ", Vol. 1, 21st Edition, Charotar Publishing House, Anand, India, 2007
2. Kazimi S.M.A., " Solid Mechanics ", Tata McGrawHill Publishing Company, New Delhi, 1991.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
II		MECHANICS OF FLUIDS	3	1	0	4

OBJECTIVES:

To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyse and appreciate the complexities involved in solving the fluid flow problems.

UNIT -1 FLUID PROPERTIES AND STATISTICS 9

Definitions - Fluid and Fluid Mechanics - Dimensions and units - Fluid properties - Continuum - Concept of system and control volume - Pascal's law and Hydrostatic equation - Forces on plane and curved surfaces - Buoyancy - Pressure measurement.

UNIT -2 FLUID KINEMATICS 9

Classification of flows -stream, streak and path lines - Continuity equation - Stream and potential functions - Flow nets - Velocity measurement.

UNIT -3 FLUID DYNAMICS 9

Euler and Bernoulli's equations - Application of Bernoulli's equation - Discharge measurement- Momentum Principle - Laminar flows through pipes and between plates - Hagen Poiseuille equation - Darcy Weisbach formula - Moody diagram -Turbulent flow.

UNIT – 4 BOUNDARY LAYER AND FLOW THROUGH PIPES 9

Definition of boundary layer - Thickness and classification - Displacement and momentum thick nesses - Development of Laminar and Turbulent flows in circular pipes - - Major and minor losses of flow in pipes - Pipes in series and in parallel - Pipe network.

UNIT – 5 DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Dimensional analysis - Rayleigh's method - Buckingham P -Theorem - similitude and models - Scale effect and distorted models.

Total Hours: 45

OUTCOMES:

- The students will be able to get a basic knowledge of fluids in static, kinematic anddynamic equilibrium.
- They will also gain the knowledge of the applicability of physical laws in addressingproblems in hydraulics

TEXT BOOKS:

1. Kumar K.L., “Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2. Fox, Robert W. and McDonald, Alan T., “Introduction to Fluid Mechanics ", John Willey & Sons, 1995.

REFERENCES:

1. Streeter, Victor L. and Wylie, Benjamin E., " Fluid Mechanics ", McGraw-Hill Ltd., 1998.
2. Natarajan M.K., " Principles of Fluids Mechanics ", Anuradha Agencies, Vidayal Karuppur, Kumbakonam, 1995.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
II		CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES	3	0	0	3

AIM

To bring about a complete understanding of construction techniques in substructure super structure and repair construction.

OBJECTIVE

The main objective of this course is to make the student aware of

- The various construction techniques, practices
- The equipment needed for different types of construction activities.
- The student shall have a reasonable knowledge about the various construction procedures for sub to super structure
- The equipment needed for construction of various types of structures from foundation to super structure.
- Building services in a building

UNIT I CONCRETE TECHNOLOGY 9

Cements – Grade of cements - concrete chemicals and Applications – Grade of concrete - manufacturing of concrete – Batching – mixing – transporting – placing – compaction of concrete – curing and finishing - Testing of fresh and hardened concrete – quality of concrete – Extreme Weather Concreting - Ready Mix Concrete.

UNIT II CONSTRUCTION PRACTICES 9

Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick – – weather and water proof – roof finishes – acoustic and fire protection.

UNIT III SUB STRUCTURE CONSTRUCTION 9

Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points -Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV SUPER STRUCTURE CONSTRUCTION 9

Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks.

UNIT V CONSTRUCTION EQUIPMENT 9

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling,

Total Hours: 45

OUTCOME:

- Students completing the course will have understanding of different construction techniques, practices and equipments. They will be able to plan the requirements for substructure and superstructure a construction.

TEXT BOOKS :

1) Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.
2) Varghese, P.C. "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
3) Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.

REFERENCES:

1) Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2) 1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
II		HYDRAULICS ENGINEERING LAB	0	0	4	2

1. **FLOW MEASUREMENT**
   Calibration of Flow Measuring Instruments

2. **LOSSES IN PIPES**
   Estimation of major and minor losses

3. **PUMPS**
   Performance of Characteristics of Pumps

4. **TURBINES**
   Performance of Characteristics of turbines

5. **WATER MANAGEMENT PARAMETERS**
   Meteorological data collection and recording – Estimation of water Management parameters such as soil water, Field capacity, Infiltration capacity.

OUTCOMES:

- The students will be able to measure flow in pipes and determine frictional losses.
- The students will be able to develop characteristics of pumps and turbines.

LIST OF EQUIPMENTS
(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Venturimeter	1
2.	Orificemeter	1
3.	Reciprocating pump	1
4.	Jet pump	1
5.	Gear oil pump	1
6.	Pipe Friction	1

7.	Centrifugal pump	1

SEMESTER	CODE	COURSE TITLE	L	T	P	C
III		NUMERICAL METHODS	3	0	0	3

(COMMON TO MECH,AERO,AUTO,MECT, CIVIL& EEE)

OBJECTIVES:

In reality all equations cannot be solved in complelete form. Hence the next best solution is only Numerical Methods. Therefore Numerical Methods plays a pivotal role in the field of Engineering.

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

Method of false position,Newton-Raphson method for single variable, Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss- Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power Method.

UNIT II INTERPOLATION AND APPROXIMATION 9

Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference Formula (Stirling's and Bessel's).

UNIT IIINUMERICAL DIFFERENTIATION AND INTEGRATION 9

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both $1/3^{rd}$ and $3/8^{th}$) rules. Rombergs rule, Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

UNIT IV INITIALVALUEPROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of fourth order first and second order differential equations. Multistep Methods - Milne and Adam's-Bash forth predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total hours: 45

OUTCOME:

The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields

TEXT BOOK

1. A. Singaravelu ,"Numerical Methods" , Meenakshi Agency, Chennai

REFERENCES

1. Sastry, S.S., " Introductory Methods of Numerical Analysis (Third Edition) ", PrinticeHall of India, New Delhi, 1998.
2. T.Veerarajan, T.Ramachandran, " Numerical Methods with Programs in C and C++", Tata McGraw-Hill (2004).
3. Grewal, B.S. and Grewal, J.S., Numerical Methods in Engineering and Science Khanna Publishers, New Delhi, 1999.
4. N.Subramanian,Numerical Methods,SCM Publishers,Erode.

SEMESTER	CODE	SUBJECT	L	T	P	C
III		CONSTRUCTION MATERIALS	3	0	0	3

AIM

The aim of the course is to know about the various materials, both conventional and modern, that are commonly used in civil engineering construction.

OBJECTIVE

- He should be able to appreciate the criteria for choice of the appropriate material and the various tests for quality control
- The student will learn the use of the materials.
- The student will learn in detail the manufacturing process of all the materials
- Special Materials used for architectural purposes also will be taught in detail

UNIT -1 STONES – BRICKS – CONCRETE BLOCKS 9

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

UNIT -2 LIME – CEMENT – AGGREGATES – MORTAR 9

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

UNIT -3 CONCRETE 9

Concrete – Ingredients – Manufacture – Batching plants – Ready Mix Concrete – Properties of fresh concrete – Slump – Flow and compaction – Principles of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification – Mix proport ioning – IS method – High Strength Concrete and High Performance Concrete – Other types of Concrete.

UNIT -4 TIMBER AND OTHER MATERIALS 9

Timber - Industrial timber – Plywood – Veneer – Thermocole –Bitumen –Market forms Panels of laminates – Steel – Aluminium and Other Metallic Materials – Composition – Uses – Market forms – Mechanical treatment – Paints – Varnishes – Distempers.

UNIT -5 MODERN MATERIALS **9**

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles – Geo membranes and Geotextiles for earth reinforcement

Total Hours: 45

OUTCOME:

At the end of the course

- The student will learn the use of the materials.
- The student will learn in detail the manufacturing process of all the materials
- The students will learn Special Materials used for architectural purposes also will be taught in detail

TEXT BOOKS:

1. Rangwala, S.C., “Engineering Materials ", Charotar Publishing House, Anand, 2008

2. R.K.Rajput, “Engineering Matererials,S.Chand Publications,2008

3. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2008

REFERENCES:

1 Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2012.

2 Gambhir.M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004

3 Duggal.S.K. "Building Materials", 4th Edition, New Age International , 2008.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
III		ADVANCED MECHANICS OF SOLIDS	3	1	0	4

OBJECTIVE

- This subject is useful for a detailed study of forces and their effects along with some suitable protective measures for the safe working condition.
- This knowledge is very essential for an Engineer to enable him in designing all types of structures and machines.
- The student will study the causes of failure by various failure theories
- The student will learn the state of stress in three dimensions with respect to various theories
- To impart the knowledge of Unsymmetrical bending in beams

UNIT - 1 ENERGY PRINCIPLES 9

Strain energy and strain energy density - Strain energy in traction, shear, flexure and torsion - Castigliano's and Engessor's energy theorems - Principle of virtual work - application of energy theorems for computing deflections in beams and trusses - Maxwell's reciprocal theorem

UNIT - 2 INDETERMINATE BEAMS 9

Propped Cantilever and Fixed Beams - Fixed end moments and Reactions for standard cases ofloading - slopes and deflections in fixed beams - Continuous beams - Theorem of three moments - Analysis of continuous beams - S.F. and B.M. diagrams for continuous beams-slope and deflection in continuos beams (qualitative study only)

UNIT - 3 COLUMNS 9

Eccentrically loaded short columns - middle third rule - core section - Columns of unsymmetrical sections - Euler’s theory of long columns - Critical loads for prismatic columns with different end conditions Rankine - Gordon Formula eccentrically loaded long columns-- Thick Cylinders - Compound Cylinders

UNIT - 4 STATE OF STRESS IN THREE DIMENSIONS 9

Spherical and deviatric components of stress tensor - Determination of Principal stresses and principleplanes - Volumetric strains - Dilatation and distortion - theories of failure - Principal stress, principal strain, shear stress, strain energy and distortion energy theories - application in analysis of stress, load carrying capacity and design of members - Interaction problems and interaction curves.

UNIT -5 ADVANCED TOPICS IN BENDING OF BEAMS 9

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - curved beams - Winkler Bach Formula-stress concentration-fatique and fracture

Total Hours = 45

OUTCOMES:

The students will have

- Thorough understanding of the fundamental concepts of stress and strain in mechanics of solids and structures.
- the ability to analyse determinate beams and trusses to determine shear forces, bending moments and axial forces.
- a sufficient knowledge in designing shafts to transmit required power and also springs for its maximum energy storage capacities.

TEXT BOOKS:

1. Rajput , “Strength Of Materials” , Chand Publications, 2011
2. Dr.R.K.Bansal,”A text book for Strength of Materials”,Laxmi Publications,NewDelhi,2005
3. Srinath L.S., “Advanced Mechanics of Solid ", Tata McGraw Hill Publishing Company, New Delhi, 1994.

REFERENCES:

1. Junarkar S.B., “Mechanics of Structures ", Vol.1, 21st Edition, Charotar Publishing House,

Anand, India, 1995.

2. Kazimi S.M.A. “Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi,1991.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
III		APPLIED HYDRAULIC ENGINEERING	3	1	0	4

AIM

The purpose of this course is to get exposure about the application of hydraulic engineering in the field by means of studying the various devices, equipments, machinery, and structures.

OBJECTIVE

- Student is introduced to open channel flow characteristics including hydraulic jump and surges.
- Hydraulic machines viz flow through turbines and pumps including their performance characteristics and design aspects are taught.
- Student, at the end of the semester will have the abilities to analyse flow characteristics in open channel and
- Design hydraulic machines.
- All types of pumps, their working principle will be taught

UNIT -1 OPEN CHANNEL FLOW **9**

Open channel flow - types and regime of flow - Velocity distribution in open channel - wide open channel - specific energy - critical flow and its computation.

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 - minimum permissible velocity determination - non-erodible channels.

UNIT - 3 VARIED FLOW **9**

Dynamic equation of gradually varied flow - assumptions - characteristics of flow profiles - drawdown and backwater curves - profile determination - graphical integration,

direct step, standard step method-hydraulic jump - types - energy dissipation - surges - surge through channel transitions

UNIT -4 TURBINES **9**

Impact of jets on plane and curved plates - turbines - classification - radial flow turbines - draft tube - axial flow turbines - performance of turbines - similarity laws - centrifugal pump - minimum speed to start the pump - multistage pumps – cavitations.

UNIT - 5 PUMPS **9**

Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels - indicator diagram and its variation - savings in work done - rotary pumps.

Total Hours = 45

OUTCOMES:

- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

TEXT BOOKS:

1. Dr.R.K.Bansal,"A text book of Fluid Mechanics"Laxmi Publications,NewDelhi,2005
2. Jain A.K., " Fluid Mechanics (including Hydraulic Machines) ", Khanna Publishers, 8thedition, 1995.

REFERENCES:

1. Ramamirtham S., "Fluid Mechanics, Hydraulics and Fluid Mechines ", Dhanpat Rai &Sons, Delhi, 1998.
2. John A. Roberson, "Hydraulic Engineering ", Jaico Publishing House, 1998.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
III		PRACTICAL: SURVEY PRACTICAL – II LAB	0	0	4	2

OBJECTIVE

At the end of the course the student will posses knowledge about Survey field techniques.

LIST OF EXPERIMENTS

1. Tangential system (using theodolite, leveling staff)
2. Stadia system (using theodolite, leveling staff)
3. Subtense system (using theodolite, tape, cross staff, leveling staff)
4. Foundation marking (using theodolite, tape, ranging rods)
5. Simple curve - right / left handed (using theodolite, tape, ranging rods)
6. Transition curve (using theodolite, tape, ranging rods)

OUTCOMES:

- Students completing this course would have acquired practical knowledge on handlingsurvey instruments like Theodolite, Tacheometery and Total station and have adequate knowledge to carryout Triangulation and Astronomical surveying including general field marking for various engineering projects and curves setting.

LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No.	Description of Equipments	*Quantity*
1.	Chain	6
2.	Ranging Rod	12
3.	Arrow	30
4.	Tape	6
5.	Cross staff	6
6.	Peg	30

7.	Theodolite	6
8.	Tripod stand	6
9	Levelling Staff	6

SEMESTER	CODE	COURSE TITLE	L	T	P	C
III		PRACTICAL: STRENGTH OF MATERIALS LAB	0	0	4	2

OBJECTIVE

The Experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains. Relating these quantities, the student should be able to obtain the strength of the material and stiffness properties of structural elements.

LIST OF EXPERIMENTS

1. Tension test on mild steel and torsteel rods
2. Compression test on wooden specimen
3. Double shear test on mild steel and Aluminium rods
4. Torsion test on mild steel rods
5. Impact test on metal specimen
6. Hardness test on metals
7. Deflection test on metal beam
8. Compression test on Helical spring
9. Tension test on Helical spring
10. Y deflection test on carriage spring

The student should learn the use of deflectometer, extensometer, compressometer and strain gauges.

OUTCOMES:

- The students will have the required knowledge in the area of testing of materials andcomponents of structural elements experimentally.

LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No.	Description of Equipments	*Quantity*
1.	UTM of minimum 400 KN capacity	1
2.	Torsion testing machine for steel rods	1
3.	Izod impact testing machine	1

4.	Hardness testing machine Rockwell Vicker's (any 2) Brinnel	1 each
5.	Beam deflection test apparatus	1
6.	Extensometer	1
7.	Compressometer	1
8.	Dial gauges	few

SEMESTER	CODE	COURSE TITLE	L	T	P	C
IV		IRRIGATION ENGINEERING	3	0	0	3

AIM

The purpose of this course is to learn about the irrigation engineering aspects and to obtain knowledge about operation and management of irrigation water

OBJECTIVE

- At the end of the semester, the student shall understand the need and mode of irrigation.
- The student also shall know the irrigation management practices of the past, present and future.
- The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part.
- Water distribution efficiency and optimization techniques will be explained
- Finally, the student shall be in a position to conceive and plan any type of irrigation project.

UNIT -1 SOIL – PLANT WATER RELATIONSHIP 9

Definition – Need – Benefits- developments – Historical - Scope in the country and state. Soil – Water relationship - Wilting point – Soil fertility- Principal crops – Crop rotation – Crops and cropping season.

UNIT -2 CROP WATER REQUIREMENTS 9

Duty and Delta – Definitions – Factors affecting Duty – Methods of Improving Duty, Consumptive use of water (Evapo – Transpiration) – Estimation of Evapo – Transpiration – Blaney and Criddle Method – Penman Methods – Lysimeter.

UNIT -3 SOURCES, CONVEYANCE AND DISTRIBUTION OF WATER 9

Sources of Water – Rivers – Streams – Reservoirs and Tanks. Lift irrigation – Devices and equipment for Lift irrigation. Components of irrigation networks – Main and Branch canal – Distributors – Minors – Water courses and field chak. Water application methods – Surface irrigation – Border – Check and Furrow – Subsurface irrigation – Sprinkler and Drip irrigation.

UNIT -4 CONTROL AND REGULAR WORKS 9

Canal regulation works – Necessity and location of falls – Head and cross regulator – Canal escapes. Cross drainage works – Types of cross drainage work. River training works – Classification of River training works – Groynes or Spurs – Bank protection.

UNIT -5 IRRIGATION WATER MANAGEMENT 9

Irrigation Efficiencies – Water conveyance efficiency – Water application efficiency – Water storage efficiency – Water distribution efficiency. Need for optimization – Need for interdisciplinary and participation approach. Roles and responsibilities of farmer's and government agencies in Turn Over.

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Total Hours = 45

OUT COMES:

- The students will have knowledge and skills on Planning, design, operation andmanagement of reservoir system.
- The student will gain knowledge on different methods of irrigation including canal irrigation.

TEXT BOOKS

1. Garg, S.K., "Irrigation Engineering and Hydraulic Structures",Khanna Publishers,2009.
2. Sharma R.K., Irrigation Engineering and Hydraulic Structures, Oxford and IBH PublishingCompany, New Delhi, 1994.

REFERENCES :

1. Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P), Ltd.
2. Sathyanarayana Murthy, Irrigation Design and Drawing, Published by Mrs.L.Banumathi.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
IV		STRUCTURAL ANALYSIS	3	1	0	4

AIM

Preparation of influence lines and effect of rolling loads. Introduce classical methods in analyzing indeterminate structures (trusses, beams and plane frames).

OBJECTIVE

- The basics of a structures subjected to internal forces like axial forces, shearing forces, bending and torsional moments while transferring the loads acting on it will be taught
- Analysis of arches
- Structural analysis deals with analysing these internal forces in the members of the structures.
- Slope deflection and moment distribution methods will be used for calculation of deflection
- At the end of this course students will be conversant with classical method of analysis.

UNIT 1 DEFLECTION OF DETERMINATE STRUCTURES 9

Principles of virtual work for deflections – Deflections of pin-jointed plane frames and rigid plane frames – Willot diagram - Mohr's correction

UNIT 2 SLOPE DEFLECTION METHOD **9**

Continuous beams and rigid frames (with and without sway) – Simplification for hinged end – Support displacements.

UNIT 3 MOMENT DISTRIBUTION METHOD **9**

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway.

UNIT 4 MOVING LOADS AND INFLUENCE LINES **9**

(DETERMINATE & INDETERMINATE STRUCTURES)

Influence lines for reactions in statically determinate structures – influence lines for members forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections.Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames.

UNIT 5 ARCHES **9**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

Total Hours: 45

OUTCOMES:

Students will be able to

- analysis trusses, frames and arches
- analyse structures for moving loads and
- will be conversant with classical methods of analysis

TEXT BOOKS:

1 Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications Pvt. Ltd, New Delhi, 2003.

2 Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004

3 Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.

4 BhavaiKatti, S.S, "Structural Analysis – Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008

REFERENCES:

1 Devadas Menon, “Structural Analysis”, Narosa Publishing House, 2008

2 Ghali.A., Nebille and Brown. T.G., "Structural Analysis - A unified classical and matrix approach" Sixth Edition, SPON press, New York, 2013.

3 Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis"., PHI Learning Pvt. Ltd., New Delhi, 2011.

4 L.S. Negi & R.S. Jangid, “Structural Analysis”, Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
IV		ENVIRONMENTAL ENGINEERING – I	3	0	0	3

AIM

To learn the fundamental concepts of Environmental Impact Assessment in the field of environmental engineering.

OBJECTIVE

On completion of the course

- The student is expected to know about the design principles involved in treatment of municipal water.
- The student is expected to know laying of joints and testing of pipes
- The student will study about the Design principles of water treatment
- The student will learn about the analysis of water distribution
- The student will have a knowledge about how to supply water to a building

UNIT 1 PLANNING FOR WATER SUPPLY 9

Objectives of Public Water Supply – Design Period – Population Forecasting – Water Demand – Sources of Water – Source Selection – Water Quality – Characterisation – Water Quality Standards.

UNIT 2 CONVEYANCE SYSTEM **9**

Water Supply – Intake Structures – Pipe Materials – Hydraulics of Flow in Pipes – Transmission Main Design – Laying, Jointing & Testing of Pipes – Appurtenances – Pumps – Design of pumping mains.

UNIT 3 DESIGN PRINCIPLES OF WATER TREATMENT **9**

Objectives – Selection of unit operations and processes – Principles of coagulation and flocculation, sedimentation, filtration, disinfection – Design principles of flash mixer, flocculator, clarifiers, filters – Disinfection devices – Softening – Demineralisation – Aeration – Iron removal – Defluoridation – Operation and Maintenance aspects - Residue Management

UNIT 4 WATER DISTRIBUTION **9**

Requirements of Water Distribution – Components – Service Reservoirs – Network Design – Economics – Computer Applications – Analysis of Distribution Networks – Appurtenances – Operations and Maintenance – Leak Detection.

UNIT 5 WATER SUPPLY IN BUILDINGS **9**

Principles of Design of Water Supply in Buildings – House Service Connection – Design of water distribution pipes in buildings.

Total Hours = 45

OUTCOMES:

The students completing the course will have

- an insight into the structure of drinking water supply systems, including water transport,treatment and distribution
- an understanding of water quality criteria and standards, and their relation to public health,

- the ability to design and evaluate water supply project alternatives on basis of chosen selection criteria

TEXT BOOKS:

1. Garg, S.K., "Environmental Engineering I" , Khanna Publishers, New Delhi, 2005
2. Modi, P.N., "Environmental Engineering I", Standard Book House, Delhi – 6, 2006

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
2. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987
3. Punmia, B.C., Ashok K Jain and Arun K Jain, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2005

SEMESTER	CODE	COURSE TITLE	L	T	P	C
IV		MECHANICS OF SOILS	3	1	0	4

AIM

This course is aimed to develop analytical skills in dealing with soil as a medium of water flow, a medium for structural supports and a primary building material.

OBJECTIVE

The course introduces the basic principles of engineering behaviour of soils, and by the end of this course students should be able to:

- Give an Engineering classification of a given soil.
- Understand the principle of effective stress, and then calculate stresses that influence soil behaviour.
- Calculate water flow through ground, and understand the effects of seepage on the stability of structures.
- Determine soil deformation parameters, and calculate settlement magnitude and rate of settlement.

- Appreciate the difference between total and effective stress approaches in soil strength determination, and discriminate between drained and undrained conditions.
- Specify soil compaction requirements.

UNIT - 1 INTRODUCTION **9**

Nature of soil - Soil description and classification for engineering purposes - IS Classification system - Phase relationships - Soil compaction - Theory, comparison of laboratory and field compaction methods - Ground improvement by compaction.

UNIT -2 SOIL WATER AND WATER FLOW **9**

Soil water - static pressure in water - Permeability measurement in the laboratory and field - Seepage - Introduction to flow nets - Simple problems.

UNIT - 3 STRESS DISTRIBUTION AND SETTLEMENT **9**

Effective stress concepts in solids - Stress distribution in soil media - Use of influence charts - Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory.

UNIT -4 SHEAR STRENGTH **9**

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass - Measurement of shear strength, direct shear - Triaxial compression, UCC and Vane shear tests - Pore pressure parameters.

UNIT - 5 SLOPE STABILITY **9**

Slope failure mechanisms - Types - Infinite slopes - Finite slopes - Total stress analysis for saturated clay - Method of slicese - friction circle method - Use of stability number - Slope protection measures.

Tutorial = 15

Total Hours = 60

OUTCOMES:

The students will have

- Thorough understanding of the fundamental concepts of stress and strain in mechanics of solids and structures.
- the ability to analyse determinate beams and trusses to determine shear forces, bending moments and axial forces.
- a sufficient knowledge in designing shafts to transmit required power and also springs for its maximum energy storage capacities

TEXT BOOKS:

1. Punmia P.C., Ashok Kumar Jain,Arun Kumar Jain, " Soil Mechanics and Foundations ", Laxmi Publications Pvt.Ltd,New Delhi,2005
2. Arora K.R., " Soil Mechanics and Foundation Engineering ", Standard Publishers and Distributors, New Delhi, 1997.

REFERENCES:

1. Holtz R.D. and Kovacs W.D., “Introduction to Geotechnical Engineering ", Prentice-Hall, 2010
2. McCarthy D.F., “Essentials of Soil Mechanics and Foundations ", Prentice-Hall, 1997.
3. Sutten B.H.C., “Solving Problems in Soil Mechanics", Longman Group Scientific and Technical, U.K. England, 1994.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
IV		COMPUTER AIDED BUILDING DRAWING LAB	0	0	4	2

OBJECTIVE

At the end of this course the student should be able to draft on computer building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following:

1. Buildings with load bearing walls (Flat and pitched roof) – Including details of doors and windows
2. RCC framed structures
3. Office Buildings
4. Industrial buildings – North light roof structures – Trusses
5. Perspective view of one and two storey buildings

Total hours: 45 hours

OUTCOME:

- The students will be able to draft the plan, elevation and sectional views of the buildings, industrial structures, framed buildings using computer softwares.

REFERENCES:

1. Balagopal T.S. Prabhu, K. Vincent Paul, and C. Vijayan, "Building Drawing and Detailing," Spades Publishers, Calicut, 1987.
2. M.G. Shah, C.M. Kale, and S. Y. Patki, "Building drawing with an integrated approach to built environment – 4th Edition," Tata McGraw Hill, 2002.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
IV		SOIL MECHANICS LAB	0	0	4	2

OBJECTIVE

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

Cycle - 1

1. Grain size distribution - Sieve analysis
2. Grain size distribution - Hydrometer analysis
3. Atterberg limits test
4. Determination of moisture - Density relationship using standard proctor.
5. Permeability determination (constant head and falling head methods)

Cycle - 2

6. Determination of shear strength parameters
   a) Direct shear test on cohesion less soil
   b) Unconfined compression test in cohesive soil
7. Triaxial compression test
8. One dimensional consolidation test (Determination of co-efficient of consolidation only)
9. Specific gravity of soil grains
10. Relative density of sands

OUTCOMES:

- Students know the techniques to determine index properties and engineering properties
  such as shear strength, compressibility and permeability by conducting appropriate tests.

LIST OF EQUIPMENTS
(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Pyconometer	1
2.	Casagrande's Apparatus	2
3.	Plastic limit Apparatus	2
4.	Shrinkage Limit Apparatus	2
5.	Standard Proctor's Apparatus	1
6.	Hydrometer Apparatus	1

7.	Direct shear Apparatus	1
8.	Triaxial compression Apparatus	1

REFERENCES:

1. "Soil Engineering Laboratory Instruction Manual ", Published by the Engineering College Co-operative Society, Chennai, 1996.

2. Lambe T.W., "Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.

3. "I.S.Code of Practice (2720) Relevant Parts ", as amended from time to time.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
V		MODERN METHODS OF STRUCTURAL ANALYSIS	3	1	0	4

AIM

To learn advanced methods like matrix methods of structural analysis of structures, plastic theory, analysis of special structures like arches and suspension cables and influence line for indeterminate structures.

OBJECTIVE

- This course is in continuation of Structural Analysis I. Here in advanced method of analysis like Matrix method and Plastic Analysis are covered.
- Advanced topics such as FE method and Space Structures are covered.
- Advanced method of analysis like finite element and matrix will be taught

- After completion of the course the student will be able to Differentiate between various structural forms such as beams, plane truss, space truss, plane frame, space frame, arches, cables, plates and shells.
- The student studies to calculate the degree of static and kinematic indeterminacy of a given structure such as beams, truss and frames.

UNIT I FLEXIBILITY METHOD FOR INDETERMINATE FRAMES 9

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

UNIT II MATRIX STIFFNESS METHOD 9

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 9

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element.

UNIT 4 PLASTIC ANALYSIS OF STRUCTURES 9

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 9

Analysis of Space trusses using method of tension coefficients – Suspension bridges-cables with two and three hinged stiffening girders.

Total Hours = 45

OUTCOMES:

- The student will have the knowledge on advanced methods of analysis of structures

including space and cable structures

TEXT BOOKS

1. Vaidyanathan, R. and Perumal, P., "Comprehensive structural Analysis – Vol. I & II", Laxmi Publications, New Delhi, 2003
2. Manicka Selvam V.K.,Elementary Matrix Analysis of Structures, Khanna Publishers, Delhi,1994

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, 2003.
2. Vazirani V.N, & Ratwani, M.M, "Analysis of Structures", Khanna Publishers, Delhi
3. Structural Analysis – A Matrix Approach – G.S. Pandit & S.P. Gupta, Tata McGraw Hill

SEMESTER	CODE	COURSE TITLE	L	T	P	C
V		FOUNDATION ENGINEERING	3	1	0	4

AIM

To develop an understanding of the behavior of foundations for engineering structures and to gain knowledge of the design methods that can be applied to practical problems.

OBJECTIVE

At the end of this course student acquires

- The capacity to investigate the soil condition
- To design suitable foundation.
- The methods of minimizing settlement

- Design aspects of combined and mat foundation
- The knowledge about pressure distribution on retaining walls

UNIT -1 SITE INVESTIGATION AND SELECTION OF FOUNDATION 9

Introduction – Scope and objectives – Method of exploration boring – Sampling – disturbed and undisturbed sampling – sampling techniques – Bore log and report – Penetration tests (SPT and SCPT) – Data interpretation – Selection of foundation based on soil condition.

UNIT -2 SHALLOW FOUNDATION 9

Introduction – Location and depth of foundation – codal provisions – bearing capacity of shallow foundation on homogeneous deposits – bearing capacity from insitu tests – Factors influencing bearing capacity – codal provisions – Settlement – Components of settlement – Settlement of foundations on granular and clay deposits – Allowable and maximum differential settlements of buildings – Codal provision – Methods of minimizing settlement.

UNIT -3 FOOTINGS AND RAFTS 9

Types of foundation – structural design of spread footing – Design aspects of combined and mat foundation – Codal provisions.

UNIT -4 PILES 9

Types of piles – Factors influencing the selection of pile – Carrying capacity in granular and cohesive soils – Static and dynamic formulae – Capacity from insitu tests (SPT and SCPT) – Piles subjected to uplift – Negative skin friction – Group capacity – Settlement of pile groups – Interpretation of pile load test – Pile caps – Codal provisions.

UNIT -5 RETAINING WALLS 9

Earth pressure theory – Plastic equilibrium in soils – active and passive states – Rankine's theory – Coloumb's wedge theory – Classical and limit equilibrium solution – Earth pressure on retaining walls of simple configurations – pressure on the wall due to single line load alone – Graphical method (Culmann's method alone) – Stability of retaining wall.

Tutorial : 15 hours

Total Hours: 60 hours

OUTCOME:

Students will have the ability to select type of foundation required for the soil at a place and able to design shallow, foundation, deep foundation and retaining structures

TEXT BOOKS:

1. Punmia, B.C., Soil mechanics and foundations, Laxmi publications pvt. Ltd., New Delhi, 2005
2. Arora, K.R. Soil mechanics and foundation engineering, standard publishers and distributors,
   New Delhi, 1997.

REFERENCES:

1. Khan, I.H., A text book of Geotechnical Engineering, Prentice Hall of India, New Delhi,1999.
2. Gopal Ranjan and Rao, A.S.R. Basic and applied soil mechanics, Wiley Eastern Ltd., New Delhi (India), 1997.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
V		DESIGN OF REINFORCED CONCRETE ELEMENTS	3	1	0	4

AIM

To impart comprehensive knowledge on the design of reinforced concrete elements by Limit State method.

OBJECTIVES

- All the methods of design of Reinforced concrete structures will be studied
- This course covers the different types of philosophies related to Design of Reinforced Concrete Structures with emphasis on Limit State Method.

- The 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 and Design Aids are included.
- At the end of course the student shall be in a position to design the basic elements of reinforced concrete structures.
- Design of masonry wall will be taught

UNIT 1 METHODS OF DESIGN OF CONCRETE STRUCTURES 9

Concept of elastic method ultimate load method and limit state method- advantages of limit state method over other methods-design codes and specification -Introduction to IS 456 -limit state philosophy as detailed in current IS code.

UNIT 2 LIMIT STATE DESIGN FOR FLEXURE 9

Analysis and design of one way and two way slabs – rectangular slab subjected to uniformly distributed and concentrated loads – boundary conditions and corner effects – singly and doubly reinforced rectangular and flanged beams - design aids for flexure-deflection .

UNIT 3 LIMIT STATE DESIGN FOR SHEAR TORSION BOND AND ANCHORAGE 9

Behaviour of RC beams in shear and torsion-shear and torsion reinforcement-limit state design of RC members for combined bending shear and torsion- use of design aids

UNIT 4 LIMIT STATE DESIGN OF COLUMNS 9

Types of columns-analysis and design of short columns for axial, uniaxial and bi axial bending-design of long columns- use of design aids

UNIT 5 LIMIT STATE DESIGN OF FOOTING 9

Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns onlybeams,slabs and columns-Special requirements of detailing with reference to erection process

Total Hours = 45

OUTCOMES:

- The student shall be in a position to design the basic elements of reinforced concrete structures**.**

TEXT BOOKS:

1. Vargheese P C," Limit State Design of Reinforced Concrete", Prentice Hall of India, Private, Limited New Delhi, 2004
2. Unnikrishna Menon and Pillai,'Reinforced concrete Design",Tata Mc Graw hill,2007
3. Dayaratnam P," Brick and Reinforced Brick Structures", Oxford & IBH Publishing Company Private Limited 2008

REFERENCES:

1. S. Ramamrutham, R. Narayan,"Design of Reinforced Concrete Structures (conforming to IS 456) Dhanpat Rai, 1993
2. Krishna, Raju N. Pranesh, R.N.Reinforced Concrete Design:IS:456-2000 Principles and Practice"new age publications,2003
3. Bhavikatti, S S, "Design of R.C.C. Structural Elements Vol. I new age Publications,2005
4. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2007.
5. SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999

SEMESTER	CODE	COURSE TITLE	L	T	P	C
V		ENVIRONMENTAL ENGINEERING -II	3	0	0	3

OBJECTIVE

On completion of the course

- The student is expected to know about the design principles involved in treatment of municipal water.
- The student is expected to know laying of joints and testing of pipes
- The student will study about the Design principles of of water treatment
- The student will learn about the analysis of water distribution

- The student will have a knowledge about how to supply water to a building

UNIT -1WATER SUPPLY SYSTEMS – SOURCE & CONVEYANCE 9

Objectives – Population forecasting – Design period – Water demand characteristics – Sources of water – Source selection – Water quality parameters & significance – Standards – Intake structures – Conveyance – Hydraulics – Laying, jointing & testing of pipes – Pump selection – appurtenances

UNIT -2 DESIGN PRINCIPLES OF WATER TREATMENT 9

Objectives – Selection of unit operations and processes – Principles of flocculation, sedimentation, filtration, disinfection – Design principles of flash mixer, flocculator, clarifiers, filters – Disinfection devices – Softening – Demineralisation – Aeration – Iron removal – Defluoridation – Operation and Maintenance aspects - Residue Management

UNIT – 3 SEWERAGE SYSTEM: COLLECTION & TRANSMISSION 9

Sources of wastewater – Quantity of sanitary sewage – Storm runoff estimation – Wastewater characteristics and significance – Effluent disposal standover – Design of sewers – Computer applications – Laying, jointing and testing of sewers – Sewer appurtenances – Pump selection

UNIT -4SEWAGE TREATMENT & DESIGN PRINCIPLES 9

Objectives – Selection of unit operation and process – Design principles of primary and secondary treatment, screen chamber, grit chamber, primary sedimentation tanks, activated sludge process – Aeration tank & oxidation ditch – Trickling filter - Stabilisation ponds – Septic tanks with soak pits – Sludge: treatment and disposal – Biogas recovery – Sewage farming

UNIT -5DISPOSAL OF SEWAGE 9

Disposal on land – Disposal into water bodies – Oxygen sag curve – Streeter Phelp's model – Wastewater reclamation techniques

TOTAL HOURS: 45

OUTCOMES:

The students completing the course will have

- ability to estimate sewage generation and design sewer system including sewage pumpingstations
- required understanding on the characteristics and composition of sewage, self purification of streams
- ability to perform basic design of the unit operations and processes that are used insewage treatment

TEXT BOOKS:

1. Garg, S.K., "Environmental Engineering I", Khanna Publishers, New Delhi, 2005
2. Modi, P.N., "Environmental Engineering I", Standard Book House, Delhi – 6, 2008

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
2. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987

SEMESTER	CODE	COURSE TITLE	L	T	P	C
V		ENVIRONMENTAL ENGINEERING LAB	0	0	4	2

OBJECTIVE

This subject includes the list of experiments to be conducted for characterization of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage.

LIST OF EXPERIMENTS

CYCLE -I

1. Sampling and preservation methods and significance of characterization of water and wastewater.
2. Determination of P^H and turbidity Hardness
3. Determination of iron & fluoride
4. Determination of residual chlorine
5. Determination of Chlorides
6. Determination of Ammonia Nitrogen
7. Determination of Sulphate

CYCLE -II

8. Determination of Optimum Coagulant Dosage
9. Determination of available Chlorine in Bleaching powder
10. Determination of dissolved oxygen
11. Determination of suspended, volatile and fixed solids
12. B.O.D. test
13. C.O.D. test
14. Introduction to Bacteriological Analysis (Demonstration only)

Total hours: 45

OUTCOMES:

- The students completing the course will be able to characterize wastewater and conduct treatability studies.

REFERENCES

1. Standard methods for the examination of water and wastewater, APHA, 20th Edition, Washington, 1998

2. Garg, S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi

3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6

SEMESTER	CODE	COURSE TITLE	L	T	P	C
V		CONCRETE AND CONSTRUCTION TECHNOLOGY LABORATORY	0	0	4	2

OBJECTIVE

The Experimental work involved in this laboratory should make the student the properties and strength of the construction material

LIST OF EXPERIMENTS

Cycle -I

1. Compressive Strength Test on Bricks
2. Water Absorption Test on Bricks
3. Specific gravity Test on Cement
4. Soundness Test on Cement
5. Consistency and Setting Time Test on Cement
6. Compaction Factor test on Concrete

Cycle -II

7. Crushing Strength Test on Aggregates
8. Impact Resistance Test on Aggregates
9. Slump cone on concrete
10. Flow table test on concrete
11. Cube and Cylinder strength on concrete

OUTCOMES:

- Student knows the techniques to characterize various pavement materials through relevant tests.

LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Universal Testing Machine	1
2.	Slump cone	1
3.	Flow table	1
4.	Crushing test Apparatus	1
5.	Specific gravity Bottle	2
6.	Vicats Apparatus	2
7.	Le Chateliars Apparatus	1
8.	Compaction Factor Apparatus	1

TEXT BOOKS:

1 M.S. Shetty, Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2003

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VI		DESIGN OF REINFORCED CONCRETE AND MASONRY STRUCTURES	3	1	0	4

AIM

To bring about an exposure to advanced topics in structural design comprising of RCC retaining walls, water tanks, yield line theory, Design of staircases, box culvert and Brick Masonry structures

OBJECTIVES

- This course covers the design of reinforced concrete structures such as retaining wall, water tanks, staircases, flat slabs and bridges.
- At the end of the course student has a comprehensive design knowledge related to structures, systems that are likely to be encountered in professional practice.
- Principles of Prestressing will be studied
- Application of virtual work theory for design of slabs
- Design of bridges using IRC codes

UNIT I RETAINING WALLS 9

Design of cantilever and counterfort retaining walls

UNIT II WATER TANK 9

Underground rectangular tanks – Overhead circular and rectangular tanks – Design ofstaging and foundations.

UNIT III ADVANCED TOPICS 9

Design of staircases (ordinary and doglegged) – Design of flat slabs(basics)–deep beams-Prestressing and post tensioning (basics)

UNIT IV YIELD LINE THEORY 9

Assumptions - Characteristics of yield line - Application of virtual work method - square, rectangular, circular and triangular slabs - Design problems

UNIT V BRICK MASONRY 9

Introduction, Classification of walls, Lateral supports and stability, effective height of wall and columns, effective length of walls, design loads, load dispersion, permissible stresses, design of axially and eccentrically loaded brick walls

TOTAL: 45 PERIODS

OUTCOMES:

- The student shall have a comprehensive design knowledge related to various structural systems

TEXT BOOKS:

1. P.C.Varghese,"Advanced Reinforced Concrete structures", PHI Learning Pvt. Ltd., 09-Jan-2009
2. J. N. Bandyopadhyay," Design Of Concrete Structures" PHI Learning Pvt. Ltd., 2008

REFERENCES:

1. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.
2. Dayaratnam, P., "Brick and Reinforced Brick Structures", Oxford & IBH Publishing House, 1997 3.Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006.
4. Varghese.P.C., "Advanced Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2012

NOTE: IS 456:2000,SP 16, IRC Bridge codes, BIS 3370, ISI 343 are permitted in the Examinations.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VI		HIGHWAY ENGINEERING	3	0	0	3

AIM

The purpose of this course is to provide a knowledge on highway planning, geometric design of highways, highway maintenance and public transportation. In addition, rigid and Flexible pavements design, properties of highway materials and various practices adopted for construction.

OBJECTIVE

- The objective of the course is to educate the students on the various components of Highway Engineering.
- It exposes the students to highway planning, engineering surveys for highway alignment,
- Design of Geometric Elements of Highways and Urban roads, Rigid and Flexible pavements design.
- The students further learn the desirable properties of highway materials and various practices adopted for construction.
- This course enables the students to develop skill on evaluation of the pavements and to decide appropriate types of maintenance.

UNIT -1 HIGHWAY PLANNING AND ALIGNMENT 9

Highway Development in India, Macadam's Method of Road Construction, Jayakar Committee Recommendations and Realisations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute. Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques)Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards]

UNIT -2 GEOMETRIC DESIGN OF HIGHWAYS 9

Design of Horizontal Alignments – Superelevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors Affecting Sight Distances, PIEV Theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] Geometric Design of Hill Roads [IRC Standards Only]

UNIT -3 DESIGN OF RIGID AND FLEXIBLE PAVEMENTS 9

Rigid and Flexible Pavements- Components and their Functions Design Principles of Flexible and Rigid Pavements, Factors Affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic Design Practice for Flexible Pavements [CBR method, IRC Recommendations- Problems] Design Practice for Rigid Pavements – [IRC Recommendations-Problems]

UNIT -4 HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9

Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil – California Bearing Ratio Test, Field Density Test Aggregate - Crushing, Abrasion and Impact Tests- Bitumen - Penetration, Ductility, Viscosity, Binder Content and Softening Point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]

UNIT -5 HIGHWAY MAINTENANCE 9

Types of Defects in Flexible Pavements – Surface Defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Types of Pavement Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks, Spalling of Joints and Mud Pumping – and Special Repairs Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation Overlay Design by Benkleman Beam Method [Procedure only]

Total Hours = 45

OUTCOMES:

- The students completing this course would have acquired knowledge on planning, design,construction and maintenance of highways as per IRC standards and other methods.

TEXT BOOKS:

1. Khanna K and Justo C E G, “Highway Engineering”, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R,” Principles and Practice of Highway Engineering”, Khanna Technical Publications, Delhi, 2000

REFERENCES:

1. IRC Standards (IRC 37 - 2001 & IRC 58 -1998)
2. Bureau of Indian Standards (BIS) Publications on Highway Materials
3. MORTH Guidelines for Highway Engineering

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VI		DISASTER MITIGATION AND MANAGEMENT	3	0	0	3

AIM

The purpose of this course is to provide a knowledge in Disaster Management and create an awareness about disaster preparedness

OBJECTIVE

- To Understand basic concepts in Disaster Management
- To Understand Definitions and Terminologies used in Disaster Management
- To Understand the Challenges posed by Disasters
- To understand Impacts of Disasters

UNIT 1 INTRODUCTION **9**

Concept of disaster; Different approaches; Concept of Risk; Levels of disasters; Disaster phenomena and events *(Global, national and regional)*; Natural and man-made hazards

UNIT 2 RISK ASSESSMENT AND VULNERABILITY ANALYSIS **9**

Response time, frequency and forewarning levels of different hazards; Characteristics and damage potential of natural hazards; hazard assessment ;Dimensions of vulnerability factors; vulnerability assessment; Vulnerability and disaster risk; Vulnerabilities to flood and earthquake hazards

UNIT 3 DISASTER MANAGEMENT MECHANISM **9**

Concepts of risk management and crisis management ; Disaster management cycle ;Response and Recovery ; Development, Prevention, Mitigation and Preparedness; Planning for relief

UNIT 4 DISASTER RESPONSE **9**

Mass media and disaster management; Disaster Response Plan; Communication, Participation, and Activation of Emergency Preparedness Plan; Logistics Management; Psychological Response; Trauma and Stress Management; Rumour and Panic Management ;Minimum Standards of Relief; Managing Relief; Funding

UNIT 5 DISASTER MANAGEMENT IN INDIA **9**

Strategies for disaster management planning; Steps for formulating a disaster risk reduction plan; Disaster management Act and Policy in India; Organisational structure for disaster management in India; Preparation of state and district disaster management plans.

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation
- Draw the hazard and vulnerability profile of India, scenarious in the Indian context,
- Disaster damage assessment and management

TEXT BOOKS

1. Alexander, D. *Natural Disasters,* ULC press Ltd, London, 1993.
2. Carter, W. N. *Disaster Management: A Disaster Management Handbook,* Asian Development Bank, Bangkok, 1991.
3. Chakrabarty, U. K. *Industrial Disaster Management and Emergency Response,* Asian Books Pvt. Ltd., New Delhi 2007.

REFERENCES

1. Abarquez I. & Murshed Z. *Community Based Disaster Risk Management: Field Practitioner's Handbook,* ADPC, Bangkok, 2004.
2. Goudie, A. *Geomorphological Techniques,* Unwin Hyman, London 1990.
3. Goswami, S. C. *Remote Sensing Application in North East India,* Purbanchal Prakesh, Guwahati, 1997.
4. *Manual on Natural Disaster Management in India*, NCDM, New Delhi, 2001.
5. *Disaster Management in India*, Ministry of Home Affairs, Government of India, New Delhi, 2011.
6. *National Policy on Disaster Management,* NDMA, New Delhi, 2009.
7. *Disaster Management Act. (2005),* Ministry of Home Affairs, Government of India, New Delhi, 2005.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VI		DESIGN OF STEEL STRUCTURES	3	1	0	4

AIM

The aim of the course is to understand the basic concepts and the design of structural steel members subjected to compressive, tensile and bending loads, as per current codal (IS 800 -2007) provisions including connections.

OBJECTIVES:

- To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections.
- Design of structural systems such as roof trusses, gantry girders as per provisions of current code (IS 800 - 2007) of practice.

UNIT I INTRODUCTION 9

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Connections using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints.

UNIT II TENSION MEMBERS 6

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

UNIT III COMPRESSION MEMBERS 12

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 laced and battened type columns – Design of column bases – Gusseted base

UNIT IV BEAMS 9

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders - Intermediate and bearing stiffeners – Flange and web splices.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 9

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

Total Hours = 45

OUTCOMES:

- The students would have knowledge on the design of structural steel members subjected to compressive, tensile and bending forces, as per current code and also know to design structural systems such as roof trusses and gantry girders.

TEXT BOOKS:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013

2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Subramanian.N, "Design of Steel Structures", Oxford UniversityPress, New Delhi, 2013.

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002 .
2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005
3. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 Structures Publications, 2009.
5. IS800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VI		COMPUTER AIDED DESIGN AND DRAWING LAB	0	0	4	2

OBJECTIVE

At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

LIST OF EXPERIMENTS

1. Design and drawing of R.C.C. cantilever and counter fort type retaining walls with reinforcement details.
2. Design of solid slab and R.C. Tee beam bridges for IRC loading and reinforcement detail
3. Design of rectangular, pressed and hemispherical bottomed steel tank –staging – rivetedjoints detailed drawing
4. Design of circular, rectangular and inzte type water tank reinforcement details
5. Design of plate girder – twin girder deck type railway bridge – through type and deck type highway bridges – Truss girder bridges – detailed drawing – riveted connection

Total Hours = 45

OUT COMES:

- At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

TEXT BOOKS:

1. Structural design & drawing (concrete & steel) – Krishnaraju, CBS Publishers.
2. Design of steel structures – B.C.Punmia, Ashok kumar jain, Arun kumar jain, Laxmi publications Pvt. Ltd.

REFERENCES:

1. Krishnamurthy, D, Structural Design and Drawing Vol.II, CBS, Publishers & Distributors, Delhi, 1990
2. Krishnamurthy, D, Structural Design and Drawing Vol.III (Steel Structures), CBS, Publishers
& Distributors, Delhi, 1990

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
VI		DESIGN PROJECT	0	0	8	4

OBJECTIVE

To carry out a design project in one of the specializations of civil engineering with substantial multidisciplinary component

The students will carry out a project in one of the following civil engineering areas but with substantial multidisciplinary component involving Architecture, Mechanical Engg. Electrical Engg., Biotechnology, Chemical Engg., Computer science

· Structural Engineering

· Geotechnical Engineering

· Water Resources engineering and environmental Engg.

· Geomatics Engineering and surveying

· Construction management

· Transportation engineering

Student groups will be formed (4 in a group) and a faculty member will be allocated to guide them. There will be three reviews. First review will not carry any marks but the project topic will be finalized in it. Of remaining 2 reviews one will be carried out in the mid-semester and the last one by the end of semester.

OUTCOME:

- On completion of the design project students will have a better experience in designingvarious design problems related to Civil Engineering

The method of evaluation will be as follows:

1. Internal Marks: 50 marks (Decided by conducting 2 reviews by the guide appointed by the Institution)

2. Viva voce Examination: 50 marks (Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal Weightage)

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VII		ESTIMATION AND QUANTITY SURVEYING	3	1	0	4

OBJECTIVE

- This subject covers the various aspects of estimating of quantities of items of works involved in buildings, water supply and sanitary works, road works and irrigation works.
- This also covers the rate analysis, valuation of properties and preparation of reports for estimation of various items.
- At the end of this course the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents.
- Student should also be able to prepare value estimates.
- Student will also be able to Exercise on cash flow in Civil engineering projects

UNIT -1 ESTIMATION 9

Philosophy – purpose - Methods of estimation – advantages – types of estimates – approximate estimates – definite estimate – estimation of quantities for buildings, roads, canals and hydraulic structures – Sluices – Head and wing wall type, tower head, surplus weir, earthen dam.

UNIT -2 SPECIFICATIONS AND TENDERS 9

Specifications-Detailed and general specifications-construction specifications – sources –types of specifications – Tender notices – types – corrigendum notice – tender procedures – Drafting model tenders

UNIT -3 CONTRACTS 9

Contract – types of contracts – formation of contract - contract conditions - contract problems-contract for labour, material, design and construction – drafting of contract documents – construction contracts – arbitration and legal requirements.

UNIT -4 VALUE ENGINEERING 9

Basics - principles of valuation – Value and cost –value engineering – value analysis – phases in value Engineering – information – function – Escalation – evaluation - recommendation implementation – Audit-Depreciation-rent fixation.

UNIT -5 CASH FLOW AND COST CONTROL 9

Cash flow –cash inflow – outflow – cost control-tools and techniques – cost control in construction projects – Exercise on cash flow in Civil Engineering projects-report Preparation

TOTAL HOURS:45

OUTCOME:

- The student shall be able to estimate the material quantities, prepare a bill of quantities,make specifications and prepare tender documents. Student shall be able to prepare valueestimates.

TEXT BOOKS:

1. Estimating and costing in civil Engineering – B.N.Dutta, S.Dutta & Company, Lucknow,2005
2. Rangwala,"Estimating Costing and Valuation," - Charotar Publishing House ,2011

REFERENCES:

1. A text book on Estimating and costing – G.S.Birdie – Dhanpat Rai and Sons, New Delhi.1982
2. Fixation of fair rent - Mr. B.Kanagasabapathy, M/s. Ehilalarasi Kanagasabapathy, Thiruchirappalli.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VII		RAILWAY , AIRPORT , HARBOUR ENGINEERING	3	0	0	3

OBJECTIVE

- This course imparts to the students knowledge of planning, design, construction and maintenance of railway tracks.
- The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering.
- The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics.
- Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders.
- The students acquire knowledge on site investigation for location and planning of harbours.

UNIT -1 RAILWAY PLANNING AND DESIGN 9

Role of Indian Railways in National Development. Engineering Survey for Track Alignment. Permanent Way, its Components and Functions of Each Component, Gauges in Railway Tracks. Coning of Wheels. Geometric Design of Railway Tracks – Gradient, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Vertical Curves and Grade Compensation (Derivations of formulae and Problems)

UNIT -2 RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION 9

Points and Crossings, Signaling, Interlocking and Track Circuiting, Construction and Maintenance – Conventional and Modern methods (Remote Sensing, GIS & GPS) for Railway Alignment, Track Construction, Maintenance and Materials - Track Drainage. Lay outs of Railway Stations and Yards

UNIT -3 AIRPORT PLANNING AND DESIGN 9

Airport Planning, Components of Airports, Airport Site Selection Runway Design-Orientation, Geometric Design and Correction for Gradients Terminal area, Airport Layout, Airport Buildings, Passenger Facilities, Parking Area and Airport Zoning

UNIT -4 HARBOUR ENGINEERING & OTHER MODES OF TRANSPORT 9

Definition of Terms - Harbours, Ports, Docks, Tides and Waves. Harbours – Requirements, Classification – Site Investigation for Locations, Planning and Layouts Concept of Satellite Ports. Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids Coastal Structures-Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping, Inland Water Transport and Container Transportation. Pipe Ways, Rope Ways

UNIT -5 ECONOMIC EVALUATION OF TRANSPORT PROJECTS 9

Evaluation of Highway and Railway Projects- Cost Benefit Analysis (Benefit Cost Ratio, Net Present Value, International Rate of Returns (Problems) Environmental Impact Assessment, Financial Appraisal Build, Operate and Transfer for Highway and Railway Projects (Basic Concepts only)

Total Hours = 45

OUTCOME:

- The students completing this course would have acquired knowledge on planning, design,construction and maintenance of highways as per IRC standards and other methods.

TEXT BOOKS:

1. S. P. Bindra," A Course in Docks and Harbour Engineering",Dhanput Rai, 1992
2. Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers,Roorkee, 1994.
3. S.P. Arora, S.C. Saxena,"A Textbook of Railway Engineering"Dhanpat Rai Publications, 2001

REFERENCES:

1. Rangwala, Railway Engineering, Charotar Publishing House, 1995.
2. Rangwala, Airport Engineering, Charotar Publishing House, 1996.
3. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publication, Delhi, 1992

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
VII		ELECTIVE – I	3	0	0	3

The Elective Subject Can be selected from Elective List

SEMESTER	COURSE CODE	COURSE TITLE	L	T	P	C
VII		ELECTIVE – II	3	0	0	3

The Elective Subject Can be selected from Elective List

SEMESTER	CODE	COURSE TITLE	L	T	P	C
VII		PROJECT WORK& VIVA VOCE	0	0	12	6

OBJECTIVE

- The objective of the project work is to enable the students to form the groups of not more than 3 members on a project involving theoretical and experimental studies relatedto the branch of study.

- Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

- The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

- Each student shall finally produce a comprehensive report covering backgroundinformation, literature survey, problem statement, project work details and conclusion.

- This final report shall be typewritten form as specified in the guidelines.

- The continuous assessment shall be made as prescribed in the regulations

OUTCOME:

- On Completion of the project work students will be in a position to take up any challengingpractical problems and find solution by formulating proper methodology.

ELECTIVES

SEMESTER	CODE	COURSE TITLE	L	T	P	C
		ELECTIVE - HYDROLOGY	**3**	**0**	**0**	**3**

AIM

The aim of the course is to understandof all the components of the hydrological cycle.

OBJECTIVE

- The mechanics of rainfall, its spatial and temporal measurement and their applications will be understood.
- The mechanics of rainfall, its distribution and measurement of rainfall using Hydrograph.
- Simple statistical analysis and application of probability distribution of rainfall and run off shall also be understood.
- Student will also learn simple methods of flood routing and ground water hydrology.

UNIT-I PRECIPITATION 9

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

UNIT-II ABSTRACTION FROM PRECIPITATION 9

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT-III HYDROGRAPHS 9

Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

UNIT-IV FLOODS AND FLOOD ROUTING 9

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

UNIT-V GROUND WATER HYDROLOGY 9

Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

Total Hours : 45

OUTCOMES:

- The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation.
- The students are able to apply the various methods of field measurements and empiricalformulae for estimating the various losses of precipitation, stream flow, flood and floodrouting.
- The students will know the basics of groundwater and hydraulics of subsurface flows.

TEXT BOOKS

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2006
2. Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

REFERENCES

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd.,

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - REMOTE SENSING TECHNIQUES AND APPLICATIONS	3	0	0	3

AIM

The aim of the course is to possess knowledge of Remote Sensing Techniques and its application in natural resource management.

OBJECTIVE

- Students will learn about the land use mapping techniques,site suitability techniques
- Students will learn about the use of zone mapping for water bodies
- Students will learn about the use of mapping techniques for Agriculture and Earth sciences
- Students will also learn about the recent techniques used for GPS system

UNIT -1 INTRODUCTION **9**

Definition – Physics of remote sensing – electromagnetic radiation (EMR) – remote sensing windows – interaction of EMR with atmosphere, earth surface, soils, water and vegetation – platform and sensors – image interpretations.

UNIT -2 LAND USE STUDIES **9**

Definition of land use – land use / land cover classification – schemes and levels of classification systems with RS data – land use mapping – change detection – urban land use planning, site suitability analysis, transportation planning.

UNIT -3 WATER RESOURCES **9**

Areal assessment of surface water bodies – Capacity survey of water bodies – mapping of snow-covered areas – flood risk zone mapping – identification of groundwater potential zones, recharge areas – droughts, definition, drought assessment and management.

UNIT -4 AGRICULTURE, SOIL AND FORESTRY **9**

Crop inventory mapping – production estimation – command area monitoring – soil mapping – crop stress detection - estimation of soil erosion – forest types and density mapping – forest fire risk zone mapping.

UNIT -5 EARTH SCIENCE **9**

Lithology – lithological mapping – structural mapping – Geomorphology – nature and type of landforms – identification – use of remote sensing data for landslides – targeting mineral resources – Engineering geology and Environmental geology.

Total Hours : 45

OUTCOMES:

On completion of the course the students will have knowledge on

- Principles of Remote Sensing and GIS
- Analysis of RS and GIS data and interpreting the data for modeling applications

TEXT BOOKS

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman., Remote Sensing and Image Interpretation. V Edn. John Willey and Sons (Asia) Pvt. Ltd., New Delhi, 2004
2. Lo. C.P.and A.K.W.Yeung, Concepts and Techniques of Geographic Information Systems. Prentice-Hall of India Pvt. Ltd., New Delhi, 2002

REFERENCES

1 .Chandra,A.M,Geo Informatics,New Age International(P) Limited,Publishers.

2. Fazal,Shahab,GIS Basics,New Age International(P) Limited,Publishers.

3. Space Applications Centre. Manual for Forest mapping and Damage detection using satellite data, Report No.IRS-UP/SAC/FMDD/TN/16/90,1990, pp-253.

4. Sabins, F.F.Jr. Remote sensing principles and interpretation, W.H.Freeman &Co., 1978.

5. Manual of Remote Sensing Vol. II. American Society of Photogrammetry

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - HOUSING PLANNING AND MANAGEMENT	3	0	0	3

OBJECTIVE

- The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation.
- An introduction to housing planning
- Construction and financing of housing projects.
- The course focuses on cost effective construction materials and methods.
- Emphasis has also been given on the principles of sustainable housing policies and programmes.

UNIT -1 INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT -2 HOUSING PROGRAMMES 9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT -3 PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT -4 CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, BuildingCenters – Concept, Functions and Performance Evaluation

UNIT -5 HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems)

Total Hours : 45

OUTCOME:

- The students should have a comprehensive knowledge of planning, design, evaluation,construction and financing of housing projects.

TEXT BOOKS

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House,Bombay, 1997.

REFERENCES

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat),Nairobi, 1994.
3.National Housing Policy, 1994, Government of India.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -TRAFFIC ENGINEERING AND MANAGEMENT	3	0	0	3

OBJECTIVE

- The students acquire comprehensive knowledge of traffic surveys and studies such as 'Volume Count', 'Speed and delay', 'Origin and destination', 'Parking', 'Pedestrian' and 'Accident surveys'.
- They achieve knowledge on design of 'at grade' and 'grade separated' intersections.
- They also become familiar with various traffic control and traffic management measures
- To give an overview of Traffic engineering - Various surveys to be conducted, traffic regulation, management and traffic safety

UNIT -1 INTRODUCTION 9

Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics

UNIT -2 TRAFFIC SURVEYS AND ANALYSIS 9

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Problems

UNIT -3 TRAFFIC CONTROL 9

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design

UNIT -4 GEOMETRIC DESIGN OF INTERSECTIONS 9

Conflicts at Intersections, Classification of Intersections at Grade, - Chanallised and Unchanallised Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Chanallisation and Rotary design (Problems), Grade Separators

UNIT -5 TRAFFIC MANAGEMENT 9

Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)

Total Hours : 45

OUTCOMES:

On completing this course, the Students will be able to

- Analyse traffic problems and plan for traffic systems various uses

- Design Channels, Intersections, signals and parking arrangements
- Develop Traffic management Systems

TEXT BOOKS

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.

REFERENCES

1. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
3. Guidelines of Ministry of Road Transport and Highways, Government of India.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - MANAGEMENT OF IRRIGATION SYSTEMS	3	0	0	3

OBJECTIVE

- At the end of the semester, the student shall have a clear concept of irrigation water management practices of the past, present and future.
- He/she shall also be able to appreciate the importance due and duly given to stake holders.
- The structural and non structural activities for the management of water resources
- The management plans involved in scheduling
- Case studies on use of ground water will be taught

UNIT -1 IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems – Supply and demand of water – Cropping pattern – Crop rotation – Crop diversification – Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies.

UNIT -2 IRRIGATION SCHEDULING 9

Time of irrigation – Critical stages of water need of crops – Criteria for scheduling irrigation – Frequency and interval of irrigation

UNIT -3 MANAGEMENT 9

Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT -4 OPERATION 9

Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study

UNIT -5 INVOLVEMENT OF STAKE HOLDERS 9

Farmer's participation in System operation – Water user's associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

Total Hours : 45

OUTCOME:

At the end of the course the students will do

- The structural and non structural activities for the management of water resources
- The management plans involved in scheduling

TEXT BOOKS

1. Dilip Kumar Majumdar, “Irrigation Water Management – Principles and Practice”, Prentice
   Hall of India Pvt. Ltd., New Delhi, 2000
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 1990
2. Maloney, C. and Raju, K.V., “Managing Irrigation Together”, Practice and Policy in India, Stage Publication, New Delhi, India, 1994

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - PREFABRICATED STRUCTURES	3	0	0	3

OBJECTIVE

- To learn the design prefabricated structures
- At the end of this course the student shall be able to appreciate modular construction, industrialized construction
- They shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods using these elements.
- They shall be able to design the joints in prefabricated elements
- They shall also be able to design the loadings in prefabricated elements

UNIT –1 INTRODUCTION **9**

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection.

UNIT –2 PREFABRICATED COMPONENTS **9**

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT –3 DESIGN PRINCIPLES **9**

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT –4 JOINT IN STRUCTURAL MEMBERS **9**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT –5 DESIGN FOR ABNORMAL LOADS **9**

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Total Hours : 45

OUTCOME:

- The student shall be able to design some of the prefabricated elements and also have the

knowledge of the construction methods in using these elements.

TEXT BOOKS

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for

construction and manufacturing, Academic Press Inc., 1994

REFERENCES

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -GROUND IMPROVEMENT TECHNIQUES	3	0	0	3

OBJECTIVE

- After this course, the student is expected to identify basic deficiencies of various soil deposits
- Further he/she is in a position to decide various ways and means of improving the soil and implementing techniques of improvement.
- About the drainage and dewatering techniques available
- About the various treatments available for soil
- About the reinforcement and grout techniques

UNIT -1 INTRODUCTION 9

Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, laterite and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

UNIT -2 DRAINAGE AND DEWATERING 9

Drainage techniques - Well points - Vaccum and electroosmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

UNIT -3 INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

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 only - relative merits of various methods and their limitations.

UNIT -4 EARTH REINFORCEMENT 9

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 GROUT TECHNIQUES 9

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils.

Total Hours : 45

OUTCOME:

- Student will be in a position to identify and evaluate the deficiencies if any in the deposits ofa project area and capable of providing alternate methods to improve its character suitableto the project so that the structures built will be stable and serve.

TEXT BOOKS

1. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGrawHill, 1994.
2. Purushothama Raj, P. "Ground Improvement Techniques", Laxmi Publications,New Delhi, 2005

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.
2. Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS	3	0	0	3

OBJECTIVE

- At the end of this program the, student is expected to assess the dynamic properties of soil
- Also about the various design parameters required for the design of machine foundation as well as design of foundation for various reciprocating machines.
- About the different vibratory systems available for designing
- About the dynamic properties of soil
- About the various isolation techniques available

UNIT -1 INTRODUCTION **9**

Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping

UNIT -2 WAVES AND WAVE PROPAGATION **9**

Wave propagation in an elastic homogeneous isotropic medium- Raleigh, shear and compression waves-waves in elastic half space

UNIT -3 DYNAMIC PROPERTIES OF SOILS **9**

Elastic properties of soils-coefficient of elastic, uniform and non-uniform compression - shear-effect of vibration dissipative properties of soils-determination of dynamic properties of soil- codal provisions

UNIT -4 DESIGN PROCEDURES **9**

Design criteria -dynamic loads - simple design procedures for foundations under reciprocating machines - machines producing impact loads - rotary type machines

UNIT -5 VIBRATION ISOLATION **9**

Vibration isolation technique-mechanical isolation-foundation isolation-isolation by location-isolation by barriers- active passive isolation tests.

Total Hours : 45

OUTCOME:

- At the end of the course, student will have the knowledge to analyse structures subjected

to dynamic loading and to design the structures for seismic loading as per code provisions.

TEXT BOOKS

1. Kameswara Rao, "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi,2003
2. Swamisaran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt. Ltd., 1999

REFERENCES

1. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998
2. IS code of Practice for Design and Construction of Machine Foundations, McGraw-Hill, 1996.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - GEOGRAPHICAL INFORMATION SYSTEM	3	0	0	3

OBJECTIVE

- At the end of the course the student will posses knowledge about GIS Techniques and its application in the field of Civil Engineering
- To provide exposure to applications of GIS in various application domains through case studies
- Students will learn about the use of zone mapping for water bodies
- Students will learn about the use of mapping techniques for Agriculture and Earth sciences
- Students will also learn about the recent techniques used for GPS system

UNIT -1 GIS TECHNIQUE AND DATA INPUT 9

MAP – Types of Maps – Development of GIS – Components of GIS – Hardware, software, organisation – Types of data – Spatial and non-spatial data – Print, Line and Polygon – Vector and Raster data – Database structures – Files – Vector and Raster data structures.

UNIT -2 DATA ANALYSIS AND MODELLING 9

Data Retrieval – Query – Simple Analysis – Spatial Analysis – Overlay – Vector Data Analysis – Raster Data Analysis – Modelling using GIS – Digital Elevation Model – Cost and path analysis – Expert Systems – Artificial Intelligence – Integration with GIS

UNIT -3 DATA OUTPUT AND ERROR ANALYSIS 9

Data Output – Types – Devices used – Raster and Vector Display Devices – Printers – Plotters – Photowrite Devices – Sources of Errors – Types of Errors – Elimination – Accuracies

UNIT -4 GIS APPLICATIONS IN RESOURCE MANAGEMENT 9

Fields of Applications – Natural Resources – Agriculture – Soil – Water Resources – Wasteland Management - Social Resources - Cadastral Records – LIS

UNIT -5 ADVANCED GIS APPLICATION 9

AM/FM – Utility Network Management – Integration with Remote Sensing – Knowledge based techniques – Multicriteria Techniques – Introduction to Object Oriented Data base Models

Total Hours: 45

OUTCOME:

On completion of the course the students will have knowledge on

- Principles of Remote Sensing and GIS
- Analysis of RS and GIS data and interpreting the data for modeling applications

TEXT BOOKS

1. Burrough P A, Principles of GIS for Land Resources Assessment, Oxford Publication, 2000
2. Michael N Demers, Fundamentals of Geographical Information Systems, Second Edition, John Wiley Publications, 2002

REFERENCES

1. Paul A Longley, Michael F Goodchild etal, Geographical Information Systems Volume I and II, Second Edition, John Wiley Publications, 1999.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -ELECTRONIC SURVEYING	3	0	0	3

OBJECTIVE

- At the end of the course the student will posses knowledge about Electronic surveying
- To understand the working of EDM equipment and solve the surveying problems with an EDM equipment
- About the propagation of electromagnetic waves and its main principles
- Various implementations of surveying
- The student will Study about different EDM instruments and Total Station.

UNIT I FUNDAMENTALS 9

Methods of measuring distance, historical development, basic principles of EDM, classifications,applications and comparison with conventional surveying.

UNIT II BASIC ELETRONICS 9

Fundamentals of electronics, resonant circuits, semiconductors, Lasers, Cathode ray tube, photo multiplier tube, transducers, oscillators, frequency mixing, modulation and demodulation, Kerrcell modulator, measurement of phase difference, reflectors and power sources.

UNIT III PROPAGATION OF ELECTROMAGNETIC WAVES 9

Definition, classification, applications, propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions, reference refractive index, first velocity correction, computation of refractive index for microwaves, measurement of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction

UNIT IV ELECTROMAGNETIC DISTANCE MEASURING SYSTEM 9

Electro-optical system, measuring principle, working principle, sources of error, infrared EDM instruments, Laser EDM instruments and total station. Microwave system, measuring principle,working principle, sources of error, microwave EDM instruments, comparison with Electrooptical system, care and maintenance of EDM instruments, Modern Positioning

Systems. EDM traversing, trilateration and base line measurement using EDM.

UNIT V FIELD STUDIES **9**

Study of different EDM instruments and Total Station. EDM traversing, trilateration and base line measurement using EDM.

TOTAL: 45 PERIODS

OUTCOME:

At the end of the course the students will do

- The different EDM instruments and Total Station.

TEXTBOOKS

1.Satheesh Gopi,K.Sathikumar,"Advanced Surveying"Dorling Publication,2008
2.Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.

REFERENCES

1. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983.
2.Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement, Adam Hilger Ltd., 1967.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -AIR POLLUTION MANAGEMENT	3	0	0	3

OBJECTIVE

- This subject covers the sources, characteristics and effects of air
- About noise pollution and the methods of controlling the same.
- The student is expected to know about source inventory and control mechanism.
- To impart knowledge on the sources, effects
- The control techniques of air pollutants and noise pollution

UNIT -1 SOURCES AND EFFECTS OF AIR POLLUTANTS 9

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

UNIT -2 DISPERSION OF POLLUTANTS 9

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

UNIT -3 AIR POLLUTION CONTROL 9

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

UNIT -4 AIR QUALITY MANAGEMENT 9

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

UNIT -5 NOISE POLLUTION 9

Sources of noise pollution – Effects – Assessment - Standards – Control methods - Prevention

Total Hours : 45

OUTCOMES:

The students completing the course will have

- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable

TEXT BOOKS

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996

REFERENCES

1. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New Yark, 1997
2.Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company,New Delhi, 1991.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - BRIDGE STRUCTURES	3	0	0	3

OBJECTIVE

- At the end of this course the student shall be able to choose appropriate bridge structure and design it for given site conditions.
- To impart exposure on various aspects of structural design of common types of steel and concrete bridges
- Compare the behaviour of bridge structures with that of the normal reinforced concrete structures.
- Understand the performance of composite members.
- Finally to learn the design of bridge structures.

UNIT -1 INTRODUCTION 9

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders

UNIT -2 STEEL BRIDGES 9

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 -3 REINFORCED CONCRETE SLAB BRIDGES 9

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 -4 REINFORCED CONCRETE GIRDERS BRIDGES 9

Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

UNIT -5 PRESTRESSED CONCRETE BRIDGES 9

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.

Total Hours: 45

OUTCOMES:

- To develop an understanding of an appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
- To help the student develop an intuitive feeling about the sizing of bridge elements,

  ie., develop a clear understanding of conceptual design
- To understand the load flow mechanism and identify loads on bridges.

To carry out a design of bridge starting from conceptual design, selecting suitable bridge,eometry to sizing of its elements

TEXT BOOKS

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

REFERENCES

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -STORAGE STRUCTURES	3	0	0	3

OBJECTIVE

- The main objective of this course is to impart the principles involved in designing structures which have to store different types of materials.
- The student at the end of the course shall be able to design concrete and steel material retaining structures.
- The student at the end of the course shall be able to design water tanks and steel silos
- The student at the end of the course shall be able to design prestressed water tanks
- The student at the end of the course shall be able to design steel bunkers

UNIT -1 STEEL WATER TANKS 9

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNIT -2 CONCRETE WATER TANKS 9

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of underground tanks – Design of base slab and side wall – Check for uplift.

UNIT -3 STEEL BUNKERS AND SILOS 9

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT -4 CONCRETE BUNKERS AND SILOS 9

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

UNIT -5 PRESTRESSED CONCRETE WATER TANKS 9

Principles of circular prestressing – Design of prestressed concrete circular water tanks.

Total Hours : 45

OUTCOMES:

- At the end of the course the student shall be able to design concrete and steel material storage structures.

TEXT BOOKS

1. Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998.
2. Krishna Raju N., Advanced Reinforced Concrete Design, CBS Publishers and Distributors, New Delhi, 1998.

REFERENCES:

1. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006. 2. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - TALL BUILDINGS	3	0	0	3

OBJECTIVE

- At the end of this course the student should have understood the problems associated with large heights of structures with respect to loads (wind and earthquake and deflections of the structure).
- He should know the rudimentary principles of designing tall buildings as per the existing course.
- To provide an insight to the design of tall buildings.
- To enlighten the students on modern techniques available for the analysis of tall buildings

UNIT -1 INTRODUCTION 9

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations.

Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

UNIT -2 THE VERTICAL STRUCTURE PLANE 9

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing-Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

UNIT – 3 COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD 9

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UNIT -4 APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS 9

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings- Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

UNIT -5 OTHER HIGH-RISEBUILDING STRUCTURE 9

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

Total Hours: 45

OUTCOME:

- At the end of this course the student should have an understanding on the behaviour of tallbuildings subjected to lateral building. The students should have knowledge about therudimentary principles of designing tall buildings as per the existing codes.

TEXT BOOKS

1. WOLFGANG SCHUELLER " High - rise building Structures", John Wiley and Sons.
2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design,JohnWiley 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 TallBuildings, CBS Publishers and Distributors, Delhi, 1996.
4. Taranath.B.S., Structural Analysis and Design of Tall Buildings, Mc Graw Hill 1998.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -STRUCTURAL DYNAMICS	3	0	0	3

OBJECTIVE

- At the end of this course the student is expected to know how to arrive at the dynamic forces and structures
- They also learn how to idealise the structure into systems of reduced number of degrees of freedom and analyse these systems for the forces.
- They learn about the discritization of various structures
- They learn about the seismic design of various structures
- He should also be able to interpret the results.

UNIT -1 PRINCIPLES OF DYNAMICS 9

Difference between static loading and dynamic loading – Nature of dynamic loads – Wind, Earthquake and Impact Loads – Damping – Viscous and structural damping – single degree offreedom (SDOF) Systems – Formulation of equation of motion – Newton's Law and D'Alembert'sprinciples – Examples of SDOF modeling.

UNIT – 2SINGLE DEGREE FREEDOM SYSTEMS 9

Free vibration response of SDOF system – Response of undamped and damped SDOF system to harmonic excitation – characteristic of resonance – Response to impulse and an arbitrary forcing function – Duhamel Integral formulation.

UNIT – 3MULTIDEGREE OF FREEDOM SYSTEMS 9

MDOF systems – examples – Lumped parameter model – Formulation of equation of motion–Free vibration of MDOF systems as Eigen value problem – concept of mode shapes

and naturalfrequencies – 2 DOF example – orthogonal properties of normal modes.

UNIT – 4 SUPERPOSITION PRINCIPLES 9

Harmonic excitation of 2 DOF system – Principle of mode superposition (principle only) for dynamic analysis – vibration isolation – vibration measuring instruments.

UNIT – 5 DESIGN FOR WIND AND EARTHQUAKE 9

Effect of wind and earthquake on structures – Principles of aseismic design – Methods of Vibration control – codal provisions for design for wind and earthquake (explanation of provisions only – no design)

Total Hours : 45

OUTCOME:

- At the end of the course, student will have the knowledge to analyse structures subjected

  to dynamic loading and to design the structures for seismic loading as per code provisions.

TEXT BOOKS

1. Mario Paz," Structural Dynamics Theory and Computation", Van Nostrand Reinhold, 2004
2. Anil K.Chopra, "Dynamics of Structures Theory and Applications to Earthquake Engineering" Pearson Education., 2003.

REFERENCES

1. Clough R.W. and Penzien, J., Dynamics of Structures, McGraw-Hill, 1990
2. Craig R.R. Jr., Structural Dynamics – An Introduction to Computer Methods, John Wiley andSons, 1981

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -WIND ENGINEERING	3	0	0	3

OBJECTIVES

- At the end of this course the student should be able to appreciate the forces
- Also about the forces generated on structures due to normal wind as well as gusts.
- He should also be able to analyse the dynamic effects created by these wind forces.
- He should also be able to analyse the dynamic effects produced due to chimney,tower and silos
- He should also be able to analyse the application in design and its implementations

UNIT –1 INTRODUCTION 9

Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

UNIT –2 EFFECT OF WIND ON STRUCTURES 9

Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

UNIT –3 EFFECT ON TYPICAL STRUCTURES 9

Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

UNIT –4 APPLICATION TO DESIGN 9

Design forces on multistorey building, towers and roof trusses.

UNIT –5 INTRODUCTION TO WIND TUNNEL 9

Types of models (Principles only) – Basic considerations – Examples of tests and their use.

Total Hours: 45

OUTCOME:

At the end of the course the student

- able to analyse the dynamic effects created by these wind forces.
- able to analyse the dynamic effects produced due to chimney,tower and silos
- able to analyse the application in design and its implementations

TEXT BOOKS

1. Peter Sachs, "Wind Forces in Engineering, Pergamon Press, New York, 1992.
2. Lawson T.V., Wind Effects on Buildings, Vols. I and II, Applied Science and Publishers, London, 1993.

REFERENCES

1. Devenport A.G., "Wind Loads on Structures", Division of Building Research, Ottowa, 1990.
2. Wind Force on Structures – Course Notes, Building Technology Centre, AnnaUniversity, 1995

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -TOTAL QUALITY MANAGEMENT	3	0	0	3

OBJECTIVE

- To understand the Total Quality Management concept and principles
- The various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.
- To understand the statistical approach of quality systems involved

UNIT -1 INTRODUCTION 9

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 9

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) 9

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 9

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 9

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: 45

OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK

1.Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian
reprint 2004). ISBN 81-297-0260-6.
2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991

REFERENCES

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5^{th} Edition),
South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -COMPUTER AIDED DESIGN OF STRUCTURES	3	0	0	3

OBJECTIVE

- The main objective of this programme is to train the student in the use of computers
- Creating a computer code as well as using commercially
- Available software for the design of Civil Engineering structures.
- Structural analysis involved with the help of finite element techniques
- The design and optimization involved in steel and RCC structures

UNIT –1 INTRODUCTION **9**

Fundamentals of CAD - Hardware and software requirements -Design process - Applications and benefits.

UNIT –2 COMPUTER GRAPHICS **9**

Graphic primitives - Transformations -Wire frame modeling and solid modeling -Graphic standards –Drafting packages

UNIT –3 STRUCTURAL ANALYSIS **9**

Fundamentals of finite element analysis - Principles of structural analysis -Analysis packages and applications.

UNIT –4 DESIGN AND OPTIMISATION **9**

Principles of design of steel and RC Structures -Applications to simple design problems – Optimisation techniques - Algorithms - Linear Programming – Simplex method

UNIT –5 EXPERT SYSTEMS **9**

Introduction to artificial intelligence - Knowledge based expert systems -Rules and decision tables –Inference mechanisms - Simple applications.

Total Hours: 45

OUTCOME:

- Students will be able to implement ideas of computer aided design with advantages and demerits.

TEXT BOOKS

1. Groover M.P. and Zimmers E.W. Jr., "CAD/CAM, Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi, 2000
2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House,New Delhi, 2006

REFERENCES

1. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Oxford, 1990.
2. Rao S.S., "Optimisation Theory and Applications", Wiley Eastern Limited, New Delhi, 1977.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -INDUSTRIAL WASTE MANAGEMENT	3	0	0	3

OBJECTIVE

- This subject deals with the pollution from major industries and methods of controlling the same.
- The student is expected to know about the polluting potential of major industries in the country and the methods of controlling the same.
- The major sources involved in the cleaner production from various industries
- It also deals with the various treatment techniques involved
- Specifically it also involves about the hazardous waste management

UNIT -1 INTRODUCTION **9**

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT -2 CLEANER PRODUCTION **9**

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT -3 POLLUTION FROM MAJOR INDUSTRIES 9

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT -4 TREATMENT TECHNOLOGIES 9

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved in organics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal

UNIT -5 HAZARDOUS WASTE MANAGEMENT 9

Hazardous wastes - Physico chemical treatment – solidification – incineration – Secured land fills

Total Hours: 45

OUTCOMES:

The students completing the course will have

- an insight into the pollution from major industries including the sources and characteristics of pollutants
- ability to plan minimization of industrial wastes
- ability to design facilities for the processing and reclamation of industrial waste water

TEXT BOOKS

1. M.N.Rao & A.K.Dutta, "Wastewater Treatment", Oxford - IBH Publication, 2008
2. W .W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company,
New Delhi, 2000

REFERENCES

1. T.T.Shen, "Industrial Pollution Prevention", Springer, 1999.
2. R.L.Stephenson and J.B.Blackburn, Jr., "Industrial Wastewater Systems Hand book", Lewis Publisher, New York, 1998

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -INDUSTRIAL STRUCTURES	3	0	0	3

OBJECTIVE

- This course deals with some of the special aspects with respect to Civil Engineering structures in industries.
- About the functional requirements involved in the design
- At the end of this course the student shall be able to design RCC structures.
- At the end of this course the student shall be able to design Steel structures.
- At the end of this course the student shall be able to design prefabricated structures.

UNIT –1 PLANNING **9**

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT –2 FUNCTIONAL REQUIREMENTS **9**

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

UNIT –3 DESIGN OF STEEL STRUCTURES **9**

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

UNIT –4 DESIGN OF R.C. STRUCTURES **9**

Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

UNIT –5 PREFABRICATION **9**

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

Total Hours: 45

OUTCOMES:

- At the end of this course the student shall be able to design some of the structures used in industries.

TEXT BOOKS

1. N. Subramanian,"Design of Steel Structures: Theory and Practice,OxfordUniversity Press, Incorporated, Mar-2011
2. P.C.Varghese,"Advanced Reinforced Concrete structures", PHI Learning Pvt. Ltd., 09-Jan-2009

REFERENCES

1. Henn W. Buildings for Industry, vols.I and II, London Hill Books, 1995
2. Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau ofIndian Standards, New Delhi 1990

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -SMART STRUCTURES AND SMART MATERIALS	3	0	0	3

OBJECTIVE

- This course is designed to give an insight into the latest developments regarding smart materials and their use in structures.
- It deals with the measuring techniques for various materials
- It deals with the concepts of sensors for various materials
- It deals with the concepts of signal processing and control systems for various materials
- Further, this also deals with structures which can self adjust their stiffness with load.

UNIT –1 INTRODUCTION **9**

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT –2 MEASURING TECHNIQUES **9**

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT –3 SENSORS 9

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques.Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT –4 ACTUATORS 9

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.

UNIT –5 SIGNAL PROCESSING AND CONTROL SYSTEMS 9

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

Total Hours: 45

OUTCOME:

At the end of the course the students will able to

- designed to give an insight into the latest developments regarding smart materials and their use in structures.

TEXT BOOKS

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.

REFERENCES

1. L. S. Srinath – Experimental Stress Analysis – Tata McGraw-Hill, 1998.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw-Hill, 1998.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE -FINITE ELEMENT ECHNIQUES	3	0	0	3

OBJECTIVE

- At the end of this course the student shall have a basic knowledge of finite element method
- They shall be able to analyses linear elastic structures, that he has studied about in core courses, using finite element method.
- It deals with finite element analysis of one dimensional problems
- It deals with finite element analysis of two dimensional problems
- It deals with finite element analysis of isoparametric problems and its applications with software packages

UNIT –1 INTRODUCTION – VARIATIONAL FORMULATION 9

General field problems in Engineering – Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS. The method of weighted residuals – The Ritz method.

UNIT –2 FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS **9**

One dimensional second order equations – discretisation of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

UNIT –3 FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS **9**

Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices – boundary conditions – solution techniques.

UNIT –4 ISOPARAMETRIC ELEMENTS AND FORMULATION **9**

Natural coordinates in 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensional – Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

UNIT –5 APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS **9**

Equations of elasticity – plane elasticity problems – axisymmetric problems in elasticity – Bending of elastic plates – Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow.

Total Hours: 45

OUTCOME:

- Students will be in a position to develop computer codes for any physical problems usingFE techniques.

TEXT BOOK

1. Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, Third Edition, Prentice Hall, India, 2003
2. S.S.Rao, “The Finite Element Method in Engineering”, Pergaman Press, 2003.

REFERENCES

1. J.N.Reddy, “An Introduction to Finite Element Method”, McGraw-Hill, Intl. Student Edition,1985.
2. Zienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4/e,McGraw-Hill, Book Co.

SEMESTER	CODE	COURSE TITLE	L	T	P	C
-		ELECTIVE - DESIGN OF PLATE AND SHELL STRUCTURE	3	0	0	3

OBJECTIVE

- At the end of this course the student shall understand the rudimentary principles involved in the analysis
- About the design of rectangular plates
- About the design of thin shells
- About the Analysis of shells
- About the design of folded plates

UNIT -1 THIN PLATES WITH SMALL DEFLECTION 9

Laterally loaded thin plates – governing differential equations – Simply supported and fixed boundary conditions

UNIT -2 RECTANGULAR PLATES 9

Simply supported rectangular plates – Navier's solution and Levy's method.

UNIT -3 THIN SHELLS **9**

Classification of shells-structural actions – membrane theory

UNIT -4 ANALYSIS OF SHELLS **9**

Analysis of spherical dome – cylindrical shells – folded plates

UNIT -5 DESIGN OF SHELLS **9**

Design of spherical dome – cylindrical shells – folded plates

Total Hours: 45

OUTCOME:

At the end of the course the students will do

- the design of rectangular plates
- the design of thin shells
- the Analysis of shells
- the design of folded plates

TEXT BOOKS

1. G.S. Ramaswamy, Design and Construction of Shell Structures, CBS Plublishers, New Delhi, 1996
2. S. Timoshenko &S. Woinowsky – Krieger, "Theory of Plates and Shells", McGraw Hill Book Company,2010

REFERENCES

1. Szilard R, Theory and analysis of plates, Prentice Hall Inc, 1995
2. Chatterjee B. K., Theory and Design of Concrete Shells, Oxford & IBH, New Delhi, 1998