GALGOTIAS UNIVERSITY

Syllabus of

B.TECH

Name of School: SCHOOL OF CIVIL ENGINEERING

Department: CIVIL ENGINEERING

Year: 2017-21

Curriculum and Syllabi

B. Tech: Civil Engineering

School of Civil Engineering

Plot no-2, Sector-17A, Yamuna Expressway,Gautam Budh Nagar, UP (India) 203201
www.galgotiasuniversity.edu.in

Curriculum Plan - B. Tech. Civil Engineering

Semester 1

Sl. No.	Course Code	Course Title	L	T	P	C
1	BTCE1001	Introduction to Civil Engineering	0	0	2	1
2	BCSE1002	Computer Programming and Problem Solving	0	0	4	2
3	PSSO1001	Psychology and Sociology	2	0	0	2
4	MATH1001	Multivariable Calculus	3	0	0	3
5	MATH1002	Exploration with CAS- I	0	0	2	1
6	PHYS1001	Engineering Physics	3	0	0	3
7	PHYS1002	Engineering Physics Lab	0	0	2	1
8	CHEM1001	Engineering Chemistry	3	0	0	3
9	CHEM1003	Engineering Chemistry Lab	0	0	2	1
10	BTME1002	Product Design using Graphics	0	0	4	2
11	SLBT-1001	Basic English	0	0	4	2
12	JAPA1001/FREN1001/GERN1001	Japnese-1/French-1/German-1	0	0	2	1
		Total				**22**

Semester 2

Sl. No.	Course Code	Course Title	L	T	P	C
1	BCSE 1003	Application Oriented Programming using Python	3	0	0	3
2	UC3	Introduction to Python	0	0	4	2
3	UC16	Universal Human Values and Ethics	0	0	4	2
4	MATH1003	Matrices and Differential Equations	3	0	0	3
5	MATH1004	Exploration with CAS- II	0	0	2	1
6	PC1	Advanced Physics (Material Science)	3	0	0	3
7		Advanced Physics Lab (Material Science Lab)	0	0	2	1
8	UC6	Environmental Science	3	0	0	3
9	UC12	Basic Electrical and Electronics Engineering Lab	0	0	2	1
10	BTME1003	Product Manufacturing	0	0	2	1
11	UC18	Soft Skill - 2	0	0	4	2

12	UC25	Foreign Language 2 (from Basket)	0	0	2	1
		Total				**23**

Semester 3

Sl. No.	Course Code	Course Title	L	T	P	C
1	PC2	Maths III (from basket)	3	0	0	3
2	UC14	Engineering Mechanics	3	0	0	3
3	BCIV2001	Fluid Mechanics	3	0	0	3
4	BCIV2002	Surveying	3	0	0	3
5	BCIV2003	Construction Engineering	3	0	0	3
6	BCIV2004	Fluid Mechanics Lab	0	0	2	1
7	BCIV2005	Surveying Practices	0	0	2	1
8	BCIV2006	Construction Engineering Lab	0	0	2	1
9	BCIV2007	Embedded PBL -1	0	0	2	1
10	UC19	Soft Skill - 3	0	0	4	2
		Total				**21**

Semester 4

Sl. No.	Course Code	Course Title	L	T	P	C
1	PC3	Maths IV (from basket)	3	0	0	3
2	UC15	Engineering Thermodynamics	3	0	0	3
3	UE2	Science Course (from basket)	3	0	0	3
4	BCIV2008	Mechanics of Materials	3	0	0	3
5	BCIV2009	Hydrology & Hydraulic Systems	3	0	0	3
6	BCIV2010	Water Supply & Treatment System	3	0	0	3
7	BCIV2011	Mechanics of Materials Lab	0	0	2	1
8	BCIV2012	Water Supply & Treatment System Lab	0	0	2	1
9	BCIV2013	Embedded PBL -2	0	0	2	1
10	UC20	Soft Skill - 4	0	0	4	2
		Total				**23**

Semester 5

Sl. No.	Course Code	Course Title	L	T	P	C
1		Numerical Methods	2	0	0	2
2	BCIV3001	Structural Analysis	3	0	0	3
3	BCIV3002	Design of Reinforced Concrete Structures	3	0	0	3
4	BCIV3003	Geotechnical Engineering	3	0	0	3
5	BCIV3004	Waste Water Treatment & Disposal	3	0	0	3
6		Numerical Methods Lab	0	0	2	1
7	BCIV3005	Structural Analysis Lab	0	0	2	1
8	BCIV3006	Geotechnical Engineering Lab	0	0	2	1
9	BCIV3007	Embedded PBL-3	0	0	2	1
10	UC21	Soft Skill-5	0	0	4	2
11	BCIV3008	Skill Course- 1 (CIVIL CAD)	0	0	4	2
		Total				**22**

Semester 6

Sl. No.	Course Code	Course Title	L	T	P	C
1	UE1	Management Systems	3	0	0	3
2	UE3	Humanities Course (from basket)	3	0	0	3
3	BCIV3009	Design of Steel Structures	3	0	0	3
4	BCIV3010	Transportation Engineering	3	0	0	3
5		Program Elective (from basket) - 1	3	0	0	3
6	BCIV3011	Transportation Engineering Lab	0	0	2	1
7	UC22	Soft Skill - 6	0	0	4	2
8	BCIV3012	Embedded PBL-4	0	0	2	1
9	BCIV3013	Skill Course- 2 (STAAD PRO)	0	0	4	2
		Total				**21**

Semester 7

Sl. No.	Course Code	Course Title	L	T	P	C
1	UC23	Management Course (From Basket)	3	0	0	3
2		Program Elective (from basket) - 2	3	0	0	3
3		Program Elective (from basket) - 3	3	0	0	3
4		Program Elective (from basket) - 4	3	0	0	3
5		Program Elective (from basket) - 5	3	0	0	3
6	BCIV9998	Project Work -1	0	0	6	3
7	BCIV4001	Internship	0	0	0	1
		Total				**19**

Semester 8

Sl. No.	Course Code	Course Title	L	T	P	C
1	BCIV9999	Project Work -2	0	0	18	9
2	UC4	Comprehensive Examination	0	0	0	0
3	UC28	Professional Ethics and Values	0	0	0	0
		Total				**9**

Curriculum-B. Tech. Electronics and Instrumentation Engineering-Program Core courses

S. No	Course code	Course Name	L	T	P	C	Category
1	PC1	Advanced Physics (from basket)	3	0	0	3	Science
2	PC2	Maths III (from basket)	3	0	0	3	Science
3	PC3	Maths IV (from basket)	3	0	0	3	Science
4	PC4	Electromagnetic Field Theory	3	0	0	3	Science
5	PC5	Network Analysis and Systems	3	0	0	3	Engineering
6	PC6	Network Analysis and Systems Lab	0	0	2	1	Engineering
7	PC7	Electrical Measurement and Instrumentation	3	0	0	3	Engineering
8	PC8	Electrical Measurement and Instrumentation Lab	0	0	2	1	Engineering

9	PC9	Electrical Machine-I	3	0	0	3	Engineering
10	PC10	Electrical Machine-I Lab	0	0	2	1	Engineering
11	PC11	Electronic Devices and Circuits	3	0	0	3	Engineering
12	PC12	Digital Electronics and Circuits	3	0	0	3	Engineering
13	PC13	Fundamentals of Power System	3	0	0	3	Engineering
14	PC14	Control Systems	3	0	0	3	Engineering
15	PC15	Control Systems Lab	0	0	2	1	Engineering
16	PC16	Electrical Machine-II	3	0	0	3	Engineering
17	PC17	Electrical Machine-II Lab	0	0	2	1	Engineering
18	PC18	Power System Analysis	3	0	0	3	Engineering
19	PC19	Microprocessors and Microcontrollers	3	0	0	3	Engineering
20	PC20	Microprocessors and Microcontrollers Lab	0	0	2	1	Engineering
21	PC21	Power Electronics	3	0	0	3	Engineering
22	PC22	Electric Drives	2	0	0	2	Engineering
23	PC23	Power Electronics and Drives Lab	0	0	2	1	Engineering
24	PC24	Power System Protection and Switchgear	3	0	0	3	Engineering
25	PC25	Power System and Switchgear lab	0	0	2	1	Engineering
26	PC26	Embedded PBL -1	0	0	2	1	Engineering
27	PC27	Embedded PBL -2	0	0	2	1	Engineering
28	PC28	Embedded PBL -3	0	0	2	1	Engineering
29	PC29	Embedded PBL -4	0	0	2	1	Engineering
30	PC30	ITS-1	0	0	4	2	Engineering
31	PC31	ITS-2	0	0	4	2	Engineering
		Total Credits				66	

* PBC COURSES

PROGRAMME CORES

1. COURSE NUMBER AND NAME:

PC4 - ENGINEERING GEOLOGY LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. P.C. Varghese (2012), *Engineering Geology for Civil Engineers*, PHI Learning private limited. ISBN: 978-81-203-4495-2.
2. Parbin Singh, (2004), *Engineering & General Geology*, S.K. Kataria and Sons- Delhi. ISBN: 978-93-501-4267-7.
3. Garg. S.K. (2004), *Physical and Engineering Geology*, Khanna Publishers – Delhi. ISBN: 978-81-740-9032-4.
4. Jerome V. Degraff Robert B. Johnson (2011), *Principles of Engineering Geology*, Wiley India Pvt Ltd. ISBN: 978-81-265-3314-5.
5. Dr. D.V. Reddy (2010), *Engineering Geology* 1st Edition, Vikas Publishing House. ISBN: 978-81-259-1903-2.
6. Chadha S. K. (2009), *Elements of Geological Maps for Geology, Geography & Civil Engineering*, CBS Publishers & Distributors- New Delhi. ISBN: 978-81-239-0372-9.
7. Gautam Mahajan (2011), *Evaluation and Development of Ground Water*, APH Publishers. ISBN: 978-81-313-0339-9.

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5. CATALOGUE DESCRIPTION

Engineering Geology is the application of the geological sciences to civil engineering practice for the purpose of recognizing the location, design, construction, operation and maintenance of engineering works. Engineering geologists investigate and provide geologic and geotechnical recommendations, analysis and design associated with human development. The understanding of how geologic processes impact man-made structures and knowledge of methods by which to mitigate for hazards resulting from adverse natural and man-made conditions.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. Characterize and classify various minerals and rocks on the basis of their engineering properties.
2. Assess geological hazards and develop mitigation frameworks.
3. Use seismic and electrical methods to investigate subsurface and develop a native construction plan incorporating all relevant aspects of geology.
4. Work in a multidisciplinary team to identify geological features of prospective civil engineering project sites.
5. Analyze ground water movements and deal with ground water problems.

8. COURSE CONTENT

List of Experiments:

1. To conduct a study on rock formation and rock cycle.
2. To conduct a microscopic study for the identification of rocks
3. To conduct a microscopic study for the identification of minerals and their physical properties
4. To conduct a study on interior of earth on the basis of seismic model.
5. To study various geological features ; Folds and Faults
6. To conduct a microscopic study for the identification of soils and to study distribution of soils in India.
7. To study soil formation and soil erosion
8. To study various land forms, ocean structures and its compositions.
9. To conduct a study on Aquifers, groundwater and permeability of soils.
10. To conduct a study on history of earth and its evolution to present forms and its future
11. To measure dip and strike of folds with Clinometers and Brunton compass and to study geological Maps

1. COURSE NUMBER AND NAME:

PC5 - SURVEYING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Punmia B.C. (2005), *Surveying*, Volume 1, 16th Edition Laxmi Publications. ISBN: 9788170080794
2. Punmia B.C. (2005), *Surveying*, Volume 2, 15th Edition Laxmi Publications. ISBN: 9788170080800
3. Satheesh Gopi (2010), *GPS Principles and Applications*, Tata Mc Graw Hill publishing company Ltd. ISBN: 9780070141704
4. Subramaniyan R. (2010), *Surveying and Levelling*, Oxford University Press. ISBN: 9780195684247
5. Kanetkar T.P. (2006), *Surveying and Levelling*, Vol I, Pune. ISBN: 9788185825113
6. Kanetkar T.P. (2008), *Surveying and Levelling*, Vol II, Pune. ISBN: 9788185825007

5. CATALOGUE DESCRIPTION

Surveying is the most useful and necessary part in Civil Engineering. In the present curriculum the following topics are discussed. Introduction to the care and use of optical surveying instruments, Transits, Total Stations and Auto Levels, use of cloth tapes, steel tapes and electronic distance machines, reduction of slope measurements to horizontal and vertical components, Measurement, field data reduction and adjustment of a closed traverse, Horizontal and Vertical curves, earthwork, and coordinates, Extensive field work, field notes and electronic data collection, introduction to geodetic surveying and Triangulation surveying.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. Learn about basics involved in different types of surveying like tape, compass, leveling, and theodolite (total station).
2. Demonstrate skills in performing measurement of distance, angles, leveling, and curve setting.
3. Develop skills for estimating distance between given points, area of a given plot and earthwork involved in cuttings and fillings.

4. Develop skill to carry out tachometry, geodetic surveying wherever situation demands.
5. Develop skills to apply error adjustment to the recorded reading to get an accurate surveying output.

8. COURSE CONTENT

Unit I: Plane Surveying and Theodolite **10 lecture hours**

Introduction to plane surveying, conventional tape measurement, electronic distance measurement – Meridians, Azimuths and bearings – Theodolites – Temporary and permanent adjustment – Horizontal and Vertical angle measurements – Electronic total station.

Unit II: Leveling and Contouring **9 lecture hours**

Differential leveling, Longitudinal & cross section leveling, Refraction & curvature correction, Reciprocal leveling -Tachometry – Stadia tachometry, tangential tachometry & substance tachometry- Contouring.

Unit III: Calculation of Earthwork and GPS **9 lecture hours**

Area, volume calculation of earth work – Introduction to Global positioning system – GPS surveying methods.

Unit IV: Curve Surveying **7 lecture hours**

Definitions, designation of curve, elements of simple curve - Settings of simple circular curve, Compound and reverse curve- Transition curve – Introduction to vertical curves.

Unit V: Geodetic surveying **10 lecture hours**

Introduction to geodetic surveying, Triangulation surveying – Base line measurement & correction, Satellite station. Surveying adjustments – Principle of least square and adjustment of triangulation network.

1. COURSE NUMBER AND NAME:

PC6 - CONSTRUCTION ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Rangwala, (2011), Engineering Materials, 38th edition, Charotar Publishing House Pvt. Ltd. ISBN: 978-93-80358-26-0.
2. Ashok Kumar Jain, Dr. B.C. Punmia, Arun Kumar Jain (2009), Building Construction, Laxmi Publications Pvt. Ltd, ISBN: 978-81-318-0428-5.
3. M. L. Gambhir, (2009), Concrete Technology, Tata McGraw Hill Education, ISBN: 978-00-701-5136-9.
4. P. C. Varghese, (2009), Engineering Materials, 1st edition, PHI Learning, ISBN: 978-81-203-2848-8.
5. S. K. Duggal, (2008), Building Materials, 3rd Edition, New Age International Publishers, ISBN: 978-81-224-2392-1
6. Sushil Kumar (2010), Building Construction, Standard Publishers Distributors, ISBN: 978-81-801-4168-3.
7. M. S. Shetty, (2009), ConcreteTechnology: Theory and Practice, S.Chand Publishers, ISBN: 978-81-219-0003-4
8. A. R. Santhakumar (2006), Concrete Technology, Oxford University Press, ISBN: 978-01-956-7153-7

5. CATALOGUE DESCRIPTION

The construction of buildings and structures relies on having a thorough understanding of building materials. Without this knowledge it would not be possible to build safe, efficient and long-lasting buildings, structures and dwellings. This course provides an over-view of the basic properties of wide range of building material available to civil engineers for various usages. Students also learn the standard testing procedures of engineering materials as per provision of various IS Codes. Besides this students also learn about various bonds used for construction of brick and stone masonry widely, plastering, damp proofing its requirements and methods used in construction, need and significance of ventilation, methods of insulation, construction equipment used. Last module of course introduces students to repairs and rehabilitation of structures, crack pattern, causes of deterioration of structures, assessment of damages and methods employed for repairs

and restoration. Upon completion, students should be able to demonstrate relevant BIS testing procedure to be carried out to ascertain the quality of building materials, able to choose the modern construction materials appropriate to the climate and functional aspects of the buildings, supervise the construction techniques to be followed in brick and stone masonry, concreting, flooring, roofing, plastering, damp proofing etc.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. Develop ability to choose the modern construction materials appropriate to the climate and functional aspects of the buildings.
2. Supervise the construction technique to be followed in brick and stone masonry, concreting, flooring, roofing and plastering etc.
3. Understand the properties of cement and its laboratory testing methods.
4. Determine quality of fine aggregate and course aggregate.
5. Learn about the different properties of concrete.

8. COURSE CONTENT

Unit I: Properties of Construction Materials **9 lecture hours**

Physical and Mechanical properties of construction materials – Bricks - Stones - Structural Steel and Aluminum – Roofing Material – Physical descriptions of asbestos sheets, GI sheets, tubes and light weight roofing materials - Timber and its Products – Modern materials – Neoprene - Thermo Cole - Vinyl flooring - decorative panels and laminates - anodized aluminum - architectural glass and ceramics - Ferro cement – PVC - Polymer base materials and FRP.

Unit II: Construction Technology **9 lecture hours**

Introduction to Masonry design, Principles of construction– Bonding – Reinforced brick work — Stone masonry – Hollow block masonry - Pointing - Plastering – DPC Floor and Roof Construction: Floors, General Principles – Types of floors – Floor coverings – Types of roofs.

Unit III: Properties of cement **9 lecture hours**

ASTM classification of Cement – Properties of Cement - Testing of Cement – Field Testing – Laboratory Testing methods – Setting time of cement – soundness of cement – fineness and compressive strength of cement - Heat of Hydration.

Unit IV: Fine Aggregate and Coarse Aggregate **9 lecture hours**

Fine aggregate – Properties and testing methods – Bulking of Sand – sieve analysis – fineness modulus of sand - Cement mortar – properties and uses, Chemical Admixtures- Plasticizer – super plasticizer – air entraining agents etc.

Unit V: Properties of Concrete **9 lecture hours**

Concrete – selection of materials for concrete - water cement ratio - Properties of fresh concrete - workability – measurement of workability – Strength of concrete – gain of strength with age – testing of hardened concrete - Compressive strength - Tensile strength – Flexural strength – modulus of elasticity of concrete – Introduction to Mix Design of concrete.

1. COURSE NUMBER AND NAME:

PC7 - SURVEYING PRACTICES

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Punmia B.C. (2005), *Surveying*, Volume 1, 16th Edition Laxmi Publications. ISBN: 9788170080794
2. Punmia B.C. (2005), *Surveying*, Volume 2, 15th Edition Laxmi Publications. ISBN: 9788170080800
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4. Subramaniyan R. (2010), *Surveying and Levelling*, Oxford University Press. ISBN: 9780195684247.
5. Kanetkar T.P. (2006), *Surveying and Levelling*, Vol I, Pune. ISBN: 9788185825113.
6. Kanetkar T.P. (2008), *Surveying and Levelling*, Vol II, Pune. ISBN: 9788185825007

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5. CATALOGUE DESCRIPTION

Surveying is the most useful and necessary part in Civil Engineering. In the present curriculum the following topics are discussed. Introduction to the care and use of optical surveying instruments, Transits, Total Stations and Auto Levels, use of cloth tapes, steel tapes and electronic distance machines, reduction of slope measurements to horizontal and vertical components, Measurement, field data reduction and adjustment of a closed traverse, Horizontal and Vertical curves, earthwork, and coordinates, Extensive field work, field notes and electronic data collection, introduction to geodetic surveying and Triangulation surveying.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Learn about basics involved in different types of surveying like tape, compass, leveling, and theodolite (total station).
2. Demonstrate skills in performing measurement of distance, angles, leveling, and curve setting.

3. Develop skills for estimating distance between given points, area of a given plot and earthwork involved in cuttings and fillings.
4. Develop skill to carry out tachometry, geodetic surveying wherever situation demands.
5. Develop skills to apply error adjustment to the recorded reading to get an accurate surveying output.

8. COURSE CONTENT

List of Experiments:

1. Chain Survey- Determination of area by perpendicular offsets
2. Chain Survey- Measurement of distance by chaining & ranging
3. Compass Survey- Plotting & adjustment of closed traverse
4. Theodolite Survey- Measurement of horizontal angles by method of repetition
5. Measurement of Vertical Angles and Determination of Height of an Object
6. Plane Table Survey- Radiation method
7. Levelling- Rise & Fall method
8. Levelling- Height of collimation method
9. Trigonometrical Levelling- Single plane method
10. Curve Surveying- Setting out a simple circular curve by Rankine's method
11. Contouring- To determine the contours for a given location
12. GPS Survey- Coordinates & Distance measurement using GPS
13. Total Station- Measurement of Altitude of Given Elevated Points
14. Total Station- Measurement of distance & coordinates of given points
15. Stereoscope- Use of stereoscope for 3D viewing
16. Stereoscope- Determination of height of objects from a stereo pair using the parallax bar

1. COURSE NUMBER AND NAME:

PC8 - CONSTRUCTION ENGINEERING LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Rangwala, (2011), *Engineering Materials*, 38th edition, Charotar Publishing House Pvt. Ltd. ISBN: 978-93-80358-26-0.
2. Ashok Kumar Jain, Dr. B.C. Punmia, Arun Kumar Jain (2009), *Building Construction*, Laxmi Publications Pvt. Ltd, ISBN: 978-81-318-0428-5.
3. M. L. Gambhir, (2009), *Concrete Technology*, Tata McGraw Hill Education, ISBN: 978-00-701-5136-9.
4. P. C. Varghese, (2009), Engineering Materials, 1st edition, PHI Learning, ISBN: 978-81-203-2848-8.
5. S. K. Duggal, (2008), *Building Materials*, 3rd Edition, New Age International Publishers, ISBN: 978-81-224-2392-1
6. Sushil Kumar (2010), *Building Construction*, Standard Publishers Distributors, ISBN: 978-81-801-4168-3.
7. M. S. Shetty, (2009), *ConcreteTechnology: Theory and Practice*, S.Chand Publishers, ISBN: 978-81-219-0003-4
8. A. R. Santhakumar (2006), *Concrete Technology*, Oxford University Press, ISBN: 978-01-956-7153-7

5. CATALOGUE DESCRIPTION

The construction of buildings and structures relies on having a thorough understanding of building materials. Without this knowledge it would not be possible to build safe, efficient and long-lasting buildings, structures and dwellings. This course provides an over-view of the basic properties of wide range of building material available to civil engineers for various usages. Students also learn the standard testing procedures of engineering materials as per provision of various IS Codes. Students should be able to demonstrate relevant BIS testing procedure to be carried out to ascertain the quality of building materials, able to choose the modern construction materials appropriate to the climate and functional aspects of the buildings, supervise the construction techniques to be followed in brick and stone masonry, concreting, flooring, roofing, plastering, damp proofing etc.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Demonstrate the relevant BIS testing procedure to be carried out to ascertain the quality of building materials.
2. Develop ability to choose the modern construction materials appropriate to the climate and functional aspects of the buildings.
3. Supervise the construction technique to be followed in brick and stone masonry, concreting, flooring, roofing and plastering etc.

8. COURSE CONTENT

A. Tests on Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Soundness of cement.
5. Tensile strength

B. Tests on Fine Aggregate

1. Sieve analysis of sand
2. Specific Gravity of fine Aggregate
3. Bulking of sand

C. Tests on Bricks

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength

D. Tests on Coarse Aggregate

1. Crushing value of aggregate
2. Impact value of aggregate
3. Water absorption of aggregate
4. Sieve Analysis of Aggregate
5. Specific gravity & bulk density
6. Grading of aggregates.

E. Tests on Fresh Concrete

1. Workability Tests – Slump Test & Compaction Factor Test
2. Flow Test

F. Tests on Hardened Concrete

1. Compressive Strength Test
2. Flexural Strength Test
3. Split Tensile Strength Test
4. Non Destructive Testing of Concrete

G. Mix Design

1. Concrete mixed design as per Indian Standard recommendation guidelines.

1. COURSE NUMBER AND NAME:

PC9 - MECHANICS OF MATERIALS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Ramamrutham S. and Narayanan R. (2008), *Strength of Materials*, 3rd Edition, Dhanpat Rai Publications Company, ISBN: 9788187433545.
2. Gere J. M. and Timoshenko S. P. (2008), *Mechanics of Materials*, 8th Edition, CBS Publishers & Distributors, ISBN: 9780534417932.
3. Popov E. P. (2009), *Engineering Mechanics of Solids*, 2nd Edition, Prentice Hall Publisher, ISBN: 9788120321076.
4. Bansal R. K. (2010), *Strength of Materials*, 4th Edition, Laxmi Publications, ISBN: 9788131808146.

5. CATALOGUE DESCRIPTION

Students learn the concept of stresses and strains, elastic constants, principal stresses and strains and torsion. Students learn the concept of shear force diagram and bending moment diagram. Students also learn to calculate deflection of beams by different methods and the concept of strain energy. Students understand different formulas to calculate critical load on columns. Upon completion, students should be able to calculate stresses, strains, shear force and bending moment for beams, deflections in beams by different methods and critical load on columns.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Understand the concepts of stress and strain.
2. Understand torsion.
3. Analyse shear force and bending moment for different types of beams.
4. Calculate deflections in beams and trusses.
5. Study compression member, columns and finding buckling and crushing load.

8. COURSE CONTENT

Unit I: Stresses and Strains **9 lecture hours**

Simple Stress and Strain: Introduction - Normal and Shear stresses - Stress - Strain Diagrams, Elastic Constants - One Dimensional Loading of members of varying cross-section - Principal stresses and strains - Mohr's circle.

Torsion: Introduction - Torsion of shafts of circular section - torque and twist- shear stress due to torque - Tensor notations - Failure Criteria.

Unit II: Shear Force and Bending Moment **9 lecture hours**

Types of beams and supports - shear force and bending moment diagram - bending stresses and shear stresses in beams

Unit III: Deflection of Beams **9 lecture hours**

Introduction - Failure Criteria of beams - Theory of bending - deflection of beams by Macaulay's method - moment area method and conjugate beam method - application of principal of impulse and momentum.

Unit IV: Strain Energy **9 lecture hours**

Stain Energy - Castigliano's theorem - calculation of deflection in statically determinate beams and trusses - Module load methods - Williot Mohr's diagram.

Unit V: Theory of Columns **9 lecture hours**

Theory of Columns - long column and short column - Euler's formula - Rankine's formula - Secant formula - beam column.

1. COURSE NUMBER AND NAME:

PC10 - FLUID MECHANICS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. R.K. Bansal (2010), A Textbook of Fluid Mechanics and Hydraulic Machines 9th Ed. Laxmi Publication, ISBN- 9788131808153.
2. P. N. Modi and S. M. Seth (2011), Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications. ISBN- 9788189401269.
3. D.S. Kumar (2004), Fluid Mechanics and Fluid Power Engineering, Katson Publishing House, ISBN - 9788185749181.
4. V.L. Streeter, (2001), Fluid Mechanics, McGraw Hill Book Co. ISBN – 9780071156004.

5. CATALOGUE DESCRIPTION

Fluid mechanics including fluid statics and dynamics; conservation of mass, momentum, and energy; incompressible flow; flow of a real fluid--including laminar and turbulent flow; dimensional analysis and similitude; applications to engineering problems.

6. PREREQUISITE: MAT

7. COURSE OUTCOMES

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

1. To find frictional losses in a pipe when there is a flow between two places.
2. Calculation of conjugate depth in a flow and to analyse the model and prototype.
3. Find the dependent and independent parameters for a model of fluid flow.
4. To study of the dimensional homogeneity of fluids.
5. Explain the various methods available for the boundary layer separation.

8. COURSE CONTENT

Unit I: Fluid Properties and Hydrostatics **9 lecture hours**

Density – Viscosity – Surface tension – compressibility – capillarity – Hydrostatic forces on plane – inclined and curved surfaces – buoyancy – centre of buoyancy – metacentre.

Unit II: Fluid Dynamics **10 lecture hours**

Control volume – Fluid Kinematics - Types of flows; Steady flow, Unsteady flow, Uniform and Non Uniform flow, Rotational flow, Irrotational flow, 1-D, 2-D, 3-D flows– Streamline and Velocity potential lines- Euler and Bernoulli's equations and their applications – moment of momentum – Momentum and Energy correction factors – Impulse – Momentum equation-Navier-Stokes Equations-Applications.

Unit III: Open Channel Flow **10 lecture hours**

Flow through pipes – Open Channels and Measurement pipe flow: Darcy's law – Minor losses – Multi reservoir problems – pipe network design – Moody's diagram – Hagen Poiseuille equation – Turbulent flow. Specific Energy – Critical flow concept – specific force – Hydraulic jump – uniform flow and gradually varying flow concepts. – Measurement of pressure – flow – velocity through pipes and open channels.

Unit IV: Dimensional Analysis **7 lecture hours**

Dimensional homogeneity – Raleigh and Buckingham π theorems – Non-dimensional numbers – Model laws and distorted models-Module quantities-Specific quantities

Unit V: Boundary layers **9 lecture hours**

Boundary layers – Laminar flow and Turbulent flow – Boundary layer thickness – momentum – Integral equation – Drag and lift-Separation of boundary layer-Methods of separation of boundary layer.

1. COURSE NUMBER AND NAME:

PC11 - WATER SUPPLY AND TREATMENT SYSTEMS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Garg S.K. (2010), *Environmental Engineering Vol. I Water Supply Engineering*, Khanna Publishers. ISBN: 9788174091208
2. H.S.Peavy, D.R.Rowe & George Tchobanoglous (2005), *Environmental Engineering*, McGraw-Hill Company, New Delhi. ISBN: 9789380358246
3. Nathanson, Jerry A. (2007), *Basic Environmental Technology*: *Water Supply, Waste Management, and Pollution Control*, 5th ed., PHI Learning Private Limited ISBN: 978-81-203-3836-4
4. Rangwala (1999), *Water supply & Sanitary Engineering*, Charotar Publishing House, Anand-16th Edition. ISBN: 9788185594590
5. Metcalf and Eddy (2003), *Wastewater Engineering, Treatment and reuse*, Tata McGraw-Hill Edition, Fourth edition. ISBN:9780070495395

5. CATALOGUE DESCRIPTION

Water supply and its treatment system are attached with the life cycle of every human being. To identify the problems associated with the treatment of the water and its supply it is essential to have the knowledge this course. Students learn Effect of population dynamics on water demand, Physicochemical Principles applied in water treatment, Unit operations, principles and processes for pretreatment and treatment of raw water, Principles, functions and design of different treatment units and processes. Upon completion, students should be able to design and construct the water treatment plant for the single unit, residential area or for society.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. The type of unit operations and processes involved in water treatment plants.
2. Unit operations and processes required for satisfactory treatment of water.
3. The design of unit operation or process appropriate to the situation by applying physical, chemical, biological and engineering principles.

4. To study unit operations & advanced Processes in Water treatment its disinfection and aeration and softening.
5. The design of water treatments units in a cost effective and sustainable way and evaluate its performance to meet the desired health and environment related goals.

8. COURSE CONTENT

Unit I: Water sources- classification and Distribution **8 lecture hours**

Water demand, Factors governing water demands and seasonal variations, Effect of population dynamics on water demand, Principles for forecasting of water-demand and its calculations, Self-purification of surface water bodies – Oxygen sag curve, permissible values for drinking water.

Unit II: Water Treatments Units **9 lecture hours**

Physicochemical Principles applied in water treatment, Unit operations, principles and processes for pretreatment and treatment of raw water, pre-chlorination and chlorination, principles and objectives for designing chlorination systems, General design considerations for designing water treatment plants

Unit III: Unit Operations & Processes **10 lecture hours**

Principles, functions and design of screen, grit chambers, flash mixers, flocculators, sedimentation tanks and sand filters- Slow sand and rapid sand filters, layouts – Flash mixer – Clariflocculator – Slow sand and rapid sand filters.

Unit IV: Disinfection Processes in Water treatment **9 lecture hours**

Principles, Objectives, Unit Operations & Advanced Processes in Water treatment, Disinfection – Aeration – iron and manganese removal, Defluoridation and demineralization – Water softening.

Unit V: Water supply systems **9 lecture hours**

Various water supply systems - Water supply networks - Various water storage systems

1. COURSE NUMBER AND NAME:

PC12 - MECHANICS OF MATERIALS LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Ramamrutham S. and Narayanan R. (2008), *Strength of Materials*, 3rd Edition, Dhanpat Rai Publications Company, ISBN: 9788187433545.

2. Gere J. M. and Timoshenko S. P. (2008), *Mechanics of Materials*, 8th Edition, CBS Publishers & Distributors, ISBN: 9780534417932.

3. Popov E. P. (2009), *Engineering Mechanics of Solids*, 2nd Edition, Prentice Hall Publisher, ISBN: 9788120321076.

4. Bansal R. K. (2010), *Strength of Materials*, 4th Edition, Laxmi Publications, ISBN: 9788131808146.

5. CATALOGUE DESCRIPTION

Students learn the concept of stresses and strains, elastic constants, principal stresses and strains and torsion. Students learn the concept of shear force diagram and bending moment diagram. Students also learn to calculate deflection of beams by different methods and the concept of strain energy. Students understand different formulas to calculate critical load on columns. Upon completion, students should be able to calculate stresses, strains, shear force and bending moment for beams, deflections in beams by different methods and critical load on columns.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Conduct tension and compression tests on the components.
2. To determine hardness, impact strength, fatigue strength of the specimens.
3. Measure strain and load using specific gauges.
4. Measure torsion in mild steel.
5. Compression and tension test on helical springs.

8. COURSE CONTENT

List of Experiments

1. Tension test on a mild steel rod, thin and twisted bars.
2. Compression test on Bricks, Concrete blocks.
3. Double shear test on Mild steel and Aluminium rods.
4. Impact test on metal specimen (Charpy test and Izod test).
5. Hardness test on metals (Steel, Copper and Aluminium) - Brinnell and Rockwell Hardness Number.
6. Deflection test – Verification of Maxwell theorem.
7. Compression and tension test on helical springs.
8. Fatigue test on Steel.
9. Torsion test on mild steel

1. COURSE NUMBER AND NAME:

PC13 - FLUID MECHANICS LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. R.K. Bansal (2010), A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publication, ISBN- 9788131808153.
2. P. N. Modi and S. M. Seth (2011), Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications. ISBN- 9788189401269.
3. D.S. Kumar (2004), Fluid Mechanics and Fluid Power Engineering, Katson Publishing House, ISBN - 9788185749181.
4. V.L. Streeter, (2001), Fluid Mechanics, McGraw Hill Book Co. ISBN – 9780071156004.

5. CATALOGUE DESCRIPTION

Fluid mechanics including fluid statics and dynamics; conservation of mass, momentum, and energy; incompressible flow; flow of a real fluid--including laminar and turbulent flow; dimensional analysis and similitude; applications to engineering problems.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. To find frictional losses in a pipe when there is a flow between two places.
2. Calculation of conjugate depth in a flow and to analyse the model and prototype.
3. Find the dependent and independent parameters for a model of fluid flow.
4. To study of the dimensional homogeneity of fluids.
5. Explain the various methods available for the boundary layer separation.

8. COURSE CONTENT

1. Verification of Bernoullis Theorem
2. Metacentric Height
3. Calibration of V- Notch
4. Calibration of Rectangular Notch

5. Calibration of Trapezoidal Notch
6. Calibration of Venturimeter
7. Calibration of Orificemeter
8. Losses in Pipes

1. COURSE NUMBER AND NAME:

PC14 - WATER SUPPLY & TREATMENT SYSTEM LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Garg S.K. (2010), *Environmental Engineering Vol. I Water Supply Engineering*, Khanna Publishers. ISBN: 9788174091208
2. H.S.Peavy, D.R.Rowe & George Tchobanoglous (2005), *Environmental Engineering*, McGraw-Hill Company, New Delhi. ISBN: 9789380358246
3. Nathanson, Jerry A. (2007), *Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control*, 5th ed., PHI Learning Private Limited ISBN: 978-81-203-3836-4
4. Rangwala (1999*), Water supply & Sanitary Engineering*, Charotar Publishing House, Anand-16th Edition. ISBN: 9788185594590
5. Metcalf and Eddy (2003), *WastewaterEngineering, Treatment and reuse*, Tata McGraw-Hill Edition, Fourth edition. ISBN: 9780070495395

5. CATALOGUE DESCRIPTION

Water supply and its treatment system are attached with the life cycle of every human being. To identify the problems associated with the treatment of the water and its supply it is essential to have the knowledge this course. Students learn Effect of population dynamics on water demand, Physicochemical Principles applied in water treatment, Unit operations, principles and processes for pretreatment and treatment of raw water, Principles, functions and design of different treatment units and processes. Upon completion, students should be able to design and construct the water treatment plant for the single unit, residential area or for society.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. The type of unit operations and processes involved in water treatment plants.
2. Unit operations and processes required for satisfactory treatment of water.
3. The design of unit operation or process appropriate to the situation by applying physical, chemical, biological and engineering principles.

4. To study unit operations & advanced processes in water treatment its disinfection and aeration and softening.
5. The design of water treatments units in a cost effective and sustainable way and evaluate its performance to meet the desired health and environment related goals.

8. COURSE CONTENT

No. of Experiments

1. To determine the pH of a given water sample.
2. To determine the total solids, suspended solids, dissolved solids and volatile solids in wastewater.
3. To determine the turbidity and specific conductivity of the given water samples.
4. To determine the Alkalinity of given water sample.
5. To determine total hardness, permanent hardness and temporary hardness for given water sample.
6. To determine the chloride concentration of a given water sample.
7. To determine amount of sulphates in a given sample
8. To determine the dissolved oxygen content in a given water sample.
9. To determine BOD of the given wastewater sample.
10. To determine the COD of given sample.
11. To determine the optimum dosage of coagulant for turbidity removal of a given water sample.

1. COURSE NUMBER AND NAME:

PC15 - STRUCTURAL ANALYSIS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Vazirani & Ratwani (2003), *Analysis of Structures*, Vol. 1 & II, Khanna Publishers, ISBN: 0125249853.
2. S. Ramamrutham (2004), *Theory of Structures*, 5thEdition, Dhanpat Rai Publications, ISBN: 978041528091
3. C. S. Reddy (2010), *Structural Analysis*, 3rd Edition, Tata McGraw Hill, ISBN: 9780070702769.
4. Kenneth M. Leet, Gilbert A, Uang C. M. (2010*), Fundamentals of Structural Analysis*, 4th Edition, Tata McGraw Hill, ISBN:9780071289382

5. CATALOGUE DESCRIPTION

Structural analysis is the determination of the effects of loads on physical structures and their components. Structures subject to this type of analysis include all that must withstand loads, such as buildings, bridges, vehicles, machinery, furniture, attire, soil strata, prostheses and biological tissue. Structural analysis incorporates the fields of applied mechanics, materials science and applied mathematics to compute a structure's deformations, internal forces, stresses, support reactions, accelerations, and stability. The results of the analysis are used to verify a structure's fitness for use, often saving physical tests. Structural analysis is thus a key part of the engineering design of structures.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Identify the method of analysis for statically indeterminate structures.
2. Understand the difference between statically determinate structures and statically indeterminate structures.
3. Use the influence line diagram for analysing beam.
4. Understand strain energy method to analyse arches.

5. Analyse multi-storeyed frame buildings.

8. COURSE CONTENT

Unit I: Theorem of Three Moments **9 lecture hours**

Static indeterminacy - Theorem of three moments - analysis of propped cantilevers - fixed & continuous beam - bending moment and shear force diagram.

Unit II: Strain Energy Method **9 lecture hours**

Static indeterminacy - Strain energy method - analysis of indeterminate structures, beams, pin jointed and rigid jointed structures - temperature effect - bending moment and shear force diagram.

Unit III: Influence Line **9 lecture hours**

Influence line - influence lines for bending moment and shear force for beams, Muller Breaslau's principle - Maxwell's reciprocal theorem - Maxwell Betti's theorem.

Unit IV: Analysis of Arches **9 lecture hours**

Two hinged and three hinged parabolic arches - circular arches - cables - tension forces in towers - influence line for horizontal thrust and bending moment.

Unit V: Approximate Methods for Analysis of Multi-storeyed Frames **9 lecture hours**

Substitute frame method - portal method - cantilever method and Kani's method.

1. COURSE NUMBER AND NAME:

PC16 - DESIGN OF REINFORCED CONCRETE STRUCTURES

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Gambhir, M.L., (2011), "*Fundamentals of Reinforced Concrete Design*", Prentice-Hall of India. ISBN: 9788120330481.
2. S Unnikrishna Pillai & Devdas Menon, (2005), *Reinforced Concrete Design*, Tata McGraw Hill, ISBN: 9780070141100.
3. Varghese, P.C., (2009), *Limit State Design of Reinforced Concrete*, 2nd ed. ISBN: 9788120320390.
4. Gurcharan Singh (2005), *Design of R.C.C. Structures* in S. I. Units, Standard Publishers Distributors.
5. B. C. Punmia (2003), *Design of reinforced concrete structures*, Lakshmi Publishers.
6. IS:456 (2000) & SP:16

5. CATALOGUE DESCRIPTION

Students will learn the concept of working stress method and limit state method, tee beam and ell beam sections, under reinforced sections, balanced sections and over reinforced sections. Students will also learn the concept of designing one way slab and two way slab, short column and long column, axially and eccentrically loaded columns. Students will understand the concept of designing footings. Upon completion, students should be able to design beams, slabs, columns and footings by different methods.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Understand the behavior of structural members and the concept of design.
2. Calculate moment of resistance for different types of RC beam sections.
3. Design any type of RC beam.
4. Understand the difference between one way slab and two way slab.
5. Know the concept of short column and long column.

8. COURSE CONTENT

Unit I: Material Properties and Design Concepts **9 lecture hours**

Material properties: Compressive strength, tensile strength, design stress-strain curve of concrete - modulus of elasticity - grades of concrete - different types and grades of reinforcing steel - design stress-strain curve of steel.Introduction to design concepts, elastic behaviour of rectangular section, under, balanced and over reinforced section. Deflection and cracking in beams and slabs using IS code provisions. Design of singly reinforced beams by working stress method.

Unit II: Introduction to Limit State Design **9 lecture hours**

Philosophy and principle of limit state design along with the assumptions, partial safety factors, characteristic load and strength. Introduction to stress block parameters, concept of balanced, under reinforced and over reinforced sections, limit state of collapse in flexure of rectangle and flanged sections with examples. Limit state of collapse in shear and torsional strength of sections with examples

Unit III: Limit state design of beams **9 lecture hours**

Design principles and procedures for critical sections for bending moment and shear forces. Flexural and shear design example of singly and doubly reinforced simply supported and cantilever beams using the codal provision. Detailing of longitudinal and shear reinforcement, anchorage of bars, check for development length. Reinforcement requirements, slenderness limits for beams for lateral stability. Flexural and shear design of simply supported T and L beams. Design of rectangular section for torsion.

Unit IV: Limit State Design of Slabs **9 lecture hours**

Introduction to one way and two way slabs, design of one way cantilever, simply supported and continuous slab, design of two way slabs.

Unit V: Limit State Design of Compression Members **9 lecture hours**

General design aspects of compression members. Design of short axially loaded columns with reinforcement detailing. Design of columns with uniaxial bending and biaxial bending using SP- 16 charts, design of long column.

1. COURSE NUMBER AND NAME:

PC17 - GEOTECHNICAL ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. K.R.Arora (2011), Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, Delhi, ISBN: 978-81-801-4112-6.

2. Arun Kr. Jain, B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations, Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.

3. Gopal Ranjan, A.S.R Rao (2000), Basic and Applied Soil Mechanics 2nd Edition, New Age International. ISBN: 978-81-224-1223-9.

4. William Powrie, Soil Mechanics: Concepts and Applications, Second Edition, Spon Press. ISBN: 978-04-153-1156-4.

5. Karl Terzaghi, Soil Mechanics in Engineering Practice, Warren Press. ISBN: 978-14-465-1039-1.

6. Aysen (2004), Problem Solving in Soil Mechanics, Taylor & Francis Group. ISBN: 978-04-153-8392-9.

5. CATALOGUE DESCRIPTION

Basics of soil mechanics is very essential for a civil engineers, its properties can be easily understand by weight volume relations and classification of soil by index properties. Effect of water and air within the soil has given the lot of scope for research, and results compressibility and consolidation respectively. The most important parameters of soil which affects the shear strength of soil are its cohesion and friction angles. Concept of stress distribution in soils has been analyzed by Boussinesq's equation, Westergaard's equation and earth pressure is also analyzed for various cases.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. Give an engineering classification of a given soil.
2. Understand the principle of effective stress, and then calculate stresses that influence soil behavior.

3. Determine soil deformation parameters, and calculate settlement magnitude and rate of settlement.
4. Specify soil compaction requirements.
5. Conduct laboratory tests, and obtain soil properties and parameters from the test observations and results.

8. COURSE CONTENT

Unit I: Weight volume relations and Index properties **12 lecture hours**

Distribution of soil in India, Soil - Types, 3-phase diagram, Weight-volume relations, Classification, Index properties (Atterberg's limits), Theory of compaction, Importance of geotechnical engineering.

Unit II: Soil water and Permeability **8 lecture hours**

Soil water - Effective and neutral stresses – Flow of water through soils – Permeability – Darcy's law –Seepage and flow-nets - Quick sand conditions.

Unit III: Stress distribution in soils **8 lecture hours**

Vertical pressure distribution- Boussinesq's equation for point load and uniformly distributed loads of different shapes– Newmark's influence chart – Westergaard's equation – Isobar diagram – Pressure bulb - Contact pressure, Earth Pressures Theories.

Unit IV: Compressibility and Consolidation **8 lecture hours**

Compressibility – e-log p curve – Pre-consolidation pressure - Primary consolidation – Terzaghi'sconsolidation theory - Laboratory consolidation test – Determination of C_v by Taylor's and Casagrande's methods.

Unit V: Shear strength of soils **9 lecture hours**

Stress analysis by Mohr's circle - Mohr's strength theory – Shear strength of soils – Mohr-Coloumb strength envelope – Laboratory shear tests – Direct shear test – Triaxial compression – Unconfined compression test – Vane shear test – Shear strength of saturated cohesive soils – Shear strength of cohesion less soils - conditions for liquefaction.

1. COURSE NUMBER AND NAME:

PC18 - HYDROLOGY AND HYDRAULIC SYSTEMS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Subramanya K. (2008), Engineering Hydrology, Tata McGraw Hill Co., Graw Hill Co. ISBN: 9780074624494.
2. Varshney R.S. (2012), EngineeringHydrology, Nem Chand & Brothers Publishers. ISBN: 8185240688.
3. Das (2009), Hydrology & Soil Conservation Engineering, Prentice-Hall of India. ISBN: 9788120335868.
4. Modi P. N. and Seth S. M. (2011), Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications, ISBN-9788189401269.
5. Bansal R. K. (2010), A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publication, ISBN-9788131808153.

5. CATALOGUE DESCRIPTION

Introduction to Hydrology, Hydrologic Processes, Atmospheric and Subsurface Water and hydrologic measurements. Unit Hydrograph, Hydrologic Design, Design Storm, Precipitation, streamflow and hydrograph analysis. Hydrologic flood routing. Statistical analysis in water resources. Groundwater hydrology.Engineering applications.

6. PREREQUISITE:-

7. COURSE OUTCOMES

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

1. Know the precipitation potential & analysis of precipitation data.
2. Get exposure about the stream flow measurements & runoff computations.
3. Implement the hydraulic principles involved as well as its applications to engineering problems.

8. COURSE CONTENT

Unit I: Introduction **9 lecture hours**

Definition – Development of hydrology – hydrologic design – Hydrologic failures – Importance in Engineering – Hydrological budget.

Unit II: Hydro Meteorology **9 lecture hours**

Weather and hydrology – General circulation Temperature humidity – Wind – Diurnal and monsonic wind systems.

Unit III: Precipitation and Abstraction **9 lecture hours**

Formation of precipitation – forms of precipitation – types of precipitation – Rainfall measurement – gauges – recorders – processing precipitation data – check for consistency – supply of missing data – Aerial mean mass curve technique – Intensity duration frequency curves. Process of evaporation, transpiration – Infiltration factors affecting evaporation – Measurement of evaporation and infiltration indices – Horton's equation.

Unit IV: Pumps **9 lecture hours**

Centrifugal pump – velocity triangle – characteristic curves – specific speed – applications – Reciprocating pump – types – Indicator diagram – acceleration and friction – air vessels.

Unit V: Turbines **9 lecture hours**

Classification – Pelton Turbine – Francis Turbine – Kaplan Turbine - velocity triangle – characteristic curves – specific speed.

1. COURSE NUMBER AND NAME:

PC19 - WASTE WATER TREATMENT & DISPOSAL

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

1. TEXT BOOKS/ REFERENCE BOOKS

1. Garg.S.K, (2010), Environmental Engineering-Sewage Disposal and Air Pollution Engineering, 1st Edition, Khanna Publishers, ISBN- 978-81-740-9230-4.
2. Metcalf & Eddy, (2002), Wastewater Engineering Treatment & Reuse, Tata McGraw-Hill Education, ISBN: 978-00-704-9539-5.
3. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, (2001), Environmental Engineering, Tata McGraw-Hill Education, ISBN No: 978-00-710-0231-8.
4. Hammer & Hammer Jr., Water and Wastewater Technology, 7th Edition, ISBN-978-81-203-4601-
5. Rakesh Kumar, R.N.Singh, (2009), Municipal Water and Wastewater Treatment, Teri Press, ISBN: 978-81-799-3188-2.
6. Dr.P.N.Modi, (2008), Sewage Treatment Disposal and Wastewater Engineering, 2nd Edition, ISBN-978-81-900-8932-4.
7. Shyam. R.Asolekar, Soli. J.Arceivala, Wastewater Treatment for Pollution Control and Reuse, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-00-706-2099-5.

5. CATALOGUE DESCRIPTION

Proper treatment of wastewater reduces health risks to humans and animals and prevents surface and groundwater contamination. Inadequate treatment of wastewater allows bacteria, viruses, and other disease-causing pathogens to enter groundwater and surface water. This course provides an overview of type of units operations and processes involved in wastewater treatment and disposal including design of primary and secondary treatment units. On completion of this course students will be able to identify the need for primary and secondary treatment of wastewater in a cost-effective and sustainable way. The students will also learn the importance of wastewater treatment to protect water resources.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Demonstrate an ability to recognize the type of unit operations and processes involved in wastewater treatment plants.

2. Demonstrate an ability to choose the appropriate unit operations and processes required for satisfactory treatment of wastewater.
3. Demonstrate an ability to design individual unit operation or process appropriate to the situation by applying physical, chemical, biological and engineering principles.
4. Demonstrate ability in design of wastewater treatments units in a cost effective and sustainable way and evaluate its performance to meet the desired health and environment related goals.
5. Recognize the importance of wastewater treatment to protect the water resources.

8. COURSE CONTENT

Unit I: Wastewater Treatment **9 lecture hours**

Physical, chemical and biological principles involved in wastewater treatment and designing of unit-operations and processes. Permissible standards for wastewater disposal.

Unit II: Pre and Primary Treatment **10 lecture hours**

Objectives-Unit operations and processes-Principles, functions and design of flash mixers, screens, sedimentation tanks and sand filters-Disinfection-Aeration, grit chambers and primary sedimentation tanks.

Unit III: Secondary Treatment **8 lecture hours**

Secondary Treatment-Activated Sludge Process and Trickling filters; other treatment methods-Stabilization Ponds and Septic Tanks-Advances in Sewage Treatment

Unit IV: Sewage Disposal and Sludge Management **9 lecture hours**

Methods-Dilution-Self-purification of surface water bodies-Oxygen Sag Curve-Land disposal-Sewage Farming-Deep well injection-Soil dispersion system-Thickening-Sludge digestion-Bio-gas recovery, Drying beds-Conditioning and Dewatering-Sludge disposal. Introduction to solid waste management, landfills and EIA

Unit V: Waste Disposal System **9 lecture hours**

Wastewater Treatment-Typical layouts-Screens-Grit Chamber-Sedimentation tanks-Trickling filter-Activated Sludge, sludge Digester-Septic tanks-Soil Dispersion System-Waste Stabilization pond.

1. COURSE NUMBER AND NAME:

PC20 - STRUCTURAL ANALYSIS LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Vazirani & Ratwani (2003), Analysis of Structures, Vol. 1 & II, Khanna Publishers, ISBN: 0125249853.
2. S. Ramamrutham (2004), Theory of Structures, 5thEdition, Dhanpat Rai Publications, ISBN: 978041528091
3. C. S. Reddy (2010), Structural Analysis, 3rd Edition, Tata McGraw Hill, ISBN: 9780070702769.
4. Kenneth M. Leet, Gilbert A, Uang C. M. (2010), Fundamentals of Structural Analysis, 4th Edition, Tata McGraw Hill,ISBN: 9780071289382

5. CATALOGUE DESCRIPTION

Through this course students will learn various methods for finding slope and deflection of indeterminate structures. They will learn also difference between the methods used for find slope and deflections. They will understand advantage and disadvantage of different methods for solving indeterminate structures for design purposes.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Understand different methods used for finding slope and deflections.
2. Determine the deflection of indeterminate structures and will be able to calculate deflection of different types of structures.
3. Determine the slope of indeterminate structures and will be able to calculate slope of different types of structures.

8. COURSE CONTENT

No. of Experiments

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
2. To determine the Flexural Rigidity of a given beam.

3. To verify the Moment - area theorem for slope and deflection of a given beam.
4. Deflection of a fixed beam and influence line for reactions.
5. Deflection studies for a continuous beam and influence line for reactions.
6. Study of behaviour of columns and struts with different end conditions.
7. Experiment on three hinged arch.
8. Experiment on two hinged arch.
9. Deflection of a statically determinate pin jointed truss.
10. Unsymmetrical Bending of curved beam.

1. COURSE NUMBER AND NAME:

PC21 - GEOTECHNICAL ENGINEERING LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. K.R.Arora (2011), Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, Delhi, ISBN: 978-81-801-4112-6.
2. Arun Kr. Jain, B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations, Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.
3. Gopal Ranjan, A.S.R Rao (2000), Basic and Applied Soil Mechanics 2nd Edition, New Age International. ISBN: 978-81-224-1223-9.
4. William Powrie, Soil Mechanics: Concepts and Applications, Second Edition, Spon Press. ISBN: 978-04-153-1156-4.
5. Karl Terzaghi, Soil Mechanics in Engineering Practice, Warren Press. ISBN: 978-14-465-1039-1.
6. Aysen (2004), Problem Solving in Soil Mechanics, Taylor & Francis Group. ISBN: 978-04-153-8392-9.

5. CATALOGUE DESCRIPTION

Basics of soil mechanics is very essential for a civil engineers, its properties can be easily understand by weight volume relations and classification of soil by index properties. Effect of water and air within the soil has given the lot of scope for research, and results compressibility and consolidation respectively. The most important parameters of soil which affects the shear strength of soil are its cohesion and friction angles. Concept of stress distribution in soils has been analyzed by Boussinesq's equation, Westergaard's equation and earth pressure is also analyzed for various cases.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Give an engineering classification of a given soil.
2. Understand the principle of effective stress, and then calculate stresses that influence soil behavior.
3. Determine soil deformation parameters, and calculate settlement magnitude and rate of settlement.

4. Specify soil compaction requirements.
5. Conduct laboratory tests, and obtain soil properties and parameters from the test observations and results.

8. COURSE CONTENT

List of Experiments:

1. To determine moisture content of soil
2. To determine the specific gravity of soil fraction passing 4.75mm I.S sieve by density bottle/Pycnometer bottle
3. To determine the grain size distribution curve for given soil sample by sieve analysis and hydrometer analysis.
4. To determine the consistency limits (i.e. Liquid limit, Plastic limit & Shrinkage limit)of given samples
5. To determine in-situ density of compacted soils by using core cutter & pouring cylinder methods.
6. To determine the relative density of given coarse grained materials
7. To determine the maximum dry density and optimum moisture content for the given soil sample.
8. To determine coefficient of permeability of given soil sample by constant head and variable head method.
9. To determine unconfined compressive strength of a given soil sample
10. To determine shear strength of a given soil specimen using vane shear apparatus
11. To determine shear strength of a given soil specimen using direct shear apparatus
12. To determine the shear parameters of soil by Undrained Triaxial Test

1. COURSE NUMBER AND NAME:

PC22 - DESIGN OF STEEL STRUCTURES

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Ramachandra (2004), *Design of Steel structures*, Vol. I & Vol. II, 4th Edition, Standard Publishers Distributors, ISBN: 9780071544115.
2. Vajrani V. N., Ratwani M. M. and Mehra H. (2012), *Design and Analysis of Steel Structures*, 18th Edition, Oscar Publications, ISBN: 9788174092953.
3. Syal I. C. (2009), *Design of Steel Structures*, Standard Publishers Distributors, New Delhi, ISBN: 9788180141270.
4. Ramchandra (2006), *Non Linear Analysis of Steel Structures*, Standard Publishers Distributors, ISBN: 9788180140785.
5. IS: 800-2007 & Steel Table.

5. CATALOGUE DESCRIPTION

Students will understand the design of simple and built up beams, laterally supported and unsupported beams, design of plate girders, curtailment of flange plates, design of stiffeners and splices and design of gantry girder. Students will also understand the design of roof trusses, design of different types of overhead water tanks and design of beams and columns under combined stresses. Upon completion, students should be able to design simple and built up beams, plate girders, roof trusses and different types of overhead water tanks.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Understand the concept of plate girders, gantry girders and roof trusses.
2. Calculate moment of resistance for different types of beam sections, load carrying capacity of column sections.
3. Design simple beam, built up beam, plate girders, roof trusses and overhead water tanks.
4. Design of structures is required for the development of society.

8. COURSE CONTENT

Unit I: Design of Connection **9 lecture hours**

Design of Connections – Riveted - Welded - Bolted – Solution of simple problems.

Unit II: Design of beams **9 lecture hours**

Simple and built-up beams – design of laterally supported and unsupported beams - concept of shear.

Unit III: Design of Compression Members **9 lecture hours**

Design of column – built up section – single and double lacing - batten.

Unit IV: Plate Girders **9 lecture hours**

Plate girders - design of plate girders - curtailment of flange plates - design of stiffeners and splices - gantry girder.

Unit V: Roof Trusses **9 lecture hours**

Roof Trusses - Calculation of dead load, live load, wind load - Design of joints – supports - members for pitched roof truss - purlins.

1. COURSE NUMBER AND NAME:

PC23 - TRANSPORTATION ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Khanna.S.K and Justo. C.E.G., (2011), Highway Engineering, Ninth Edition.
2. Kadiyali.L.R, and Lal.N.B, (2005), Principles and Practice of Highway Engineering, Fourth Edition, Khanna Publishers, ISBN- 9788174091659.
3. Chakroborthy Partha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.
4. Rao.G.V, (1996), Principlesof Transportation and Highway Engineering, Tata McGraw-Hill Co, ISBN- 9780074623633.
5. Khisty.C.J, and Lall.B.K, (2003), Transportation Engineering, Indian Edition, Prentice-Hall of India, ISBN- 9788120322127.

5. CATALOGUE DESCRIPTION

Highway Engineering is a prominent aspect of surface transport. With basic knowledge of materials and soil mechanics, highway engineering deals with planning, design, construction, operation and maintenance of all types of roads. During the course, the students learn all aspects of Highway Engineering in detail. Upon completion, the student shall possess the basic knowledge of Highway Engineering along with an overview of advanced concepts like multi modal transport and Intelligent Transport Systems. The students should be able to perform the basic duties of a Highway Engineer.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. Design various geometric elements of highways.
2. Understand the procedure to collect the traffic data for design and traffic management.
3. Test the highway materials as per IS/IRC guidelines.
4. Do structural design of flexible and rigid pavements.
5. Know various highway constructions techniques and its maintenance.

8. COURSE CONTENT

Unit I: Highway and Traffic Planning **8 lecture hours**

Introduction to Transportation modes – Highway alignment and field surveys – Master Plan – Transport economics – Traffic Studies – Volume, speed, origin and destination studies.
Introduction to Multi-modal Transportation, Automated Transport systems, High urban transport, Impact of transport on environment.

Unit II: Highway Geometrics **14 lecture hours**

Highway classification (Rural and Urban roads), Road Geometrics – Highway cross section elements – camber – Sight Distance, Horizontal Alignment Design, Super Elevation, Extra widening, Transition curves, Set back distance, Design of Vertical curves.

Unit III: Traffic Engineering **6 lecture hours**

Traffic characteristics, road user & vehicular characteristics, traffic studies, traffic operations, traffic control devices, intelligent transport systems, Intersections, Interchanges, Parking Layout & Road signs.

Unit IV: Highway Materials and Construction **8 lecture hours**

Material requirement for pavements – Soil classification for Highway – Soil tests – CBR and Plate Load Test, Aggregate – materials testing and specification, Bitumen – material testing and specification construction of bituminous and rigid pavements, Highway Maintenance – Material recycling.

Unit V: Highway Design **9 lecture hours**

Pavement Analysis – Factors affecting pavement thickness – Soil – Wheel load – Temperature – environmental factors; Flexible Pavement Design – Axle Load surveys – CBR method of Design, Rigid Pavement Design – IRC method.

1. COURSE NUMBER AND NAME:

PC24 - QUANTTY SURVEYING AND ESTIMATING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. B.N. Datta (2010), *Estimating and costing*, USBPD. ISBN 9788174767295.
2. Rangwala (2011), *Specifications of Estimating, Costing and Valuation*, Charotar Publishing House Pvt. Ltd. ISBN 9789380358543.
3. Vazirani, V. N. (2013), *Civil Engineering Estimating Costing & Valuation*, Khanna publishers. ISBN 9788174091277.

5. CATALOGUE DESCRIPTION

Through this course the student will learn about various types of estimates and different estimating procedures for different structural elements. They also learn rate analysis and making bill of quantities.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

2. Prepare a detailed estimate for different types of structures.
3. Prepare valuation reports and cost quality control.
4. Estimates the quantity of items and analyse its rates considering material, labour and machinery cost with the help of software.

8. COURSE CONTENT

Unit I: Estimation of building **10 lecture hours**

Estimation of building works – Procedure of estimating, Types of estimates, detailed estimate of buildings including sanitary & electrical fittings.

Unit II: Estimate of R.C.C and Steel works **9 lecture hours**

Estimate of R.C.C and Steel works - Scheduling - Slab - beam - column & trusses, Road – earthwork fully in banking, cutting, partly cutting & partly filling - Detailed estimate for WBM, Bituminous road.

Unit III: Rate analysis & preparation of bills **8 lecture hours**

Rate analysis - preparation of bills – Data analysis of rates for various items of works – abstract estimates for Building projects – Introduction to software for Bill of Quantities & estimates.

Unit IV: Valuation **9 lecture hours**

Valuation- rent fixation, tenders, - contracts –accounting procedure, measurement book, stores, cost & quality control – PWD & CPWD practice.

Unit V: Detailed specifications and Schedule of Rates **9 lecture hours**

Specifications of various items of works - Schedule of Rates.

1. COURSE NUMBER AND NAME:

PC25 - TRANSPORTATION ENGINEERING LAB

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Khanna.S.K, and Justo. C.E.G., (2011), Highway Engineering, Ninth Edition, Nem.
2. Kadiyali.L.R, and Lal.N.B, (2005), Principles and Practice of Highway Engineering, Fourth Edition, Khanna Publishers, ISBN- 9788174091659.
3. Chakroborthy Partha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.
4. Rao.G.V, (1996), Principles of Transportation and Highway Engineering, Tata McGraw-Hill Co, ISBN- 9780074623633.
5. Khisty.C.J, and Lall.B.K, (2003), Transportation Engineering, Indian Edition, Prentice-Hall of India, ISBN- 9788120322127.

5. CATALOGUE DESCRIPTION

Highway Engineering is a prominent aspect of surface transport. With basic knowledge of materials and soil mechanics, highway engineering deals with planning, design, construction, operation and maintenance of all types of roads. During the course, the students learn all aspects of Highway Engineering in detail. Upon completion, the student shall possess the basic knowledge of Highway Engineering along with an overview of advanced concepts like multi modal transport and Intelligent Transport Systems. The students should be able to perform the basic duties of a Highway Engineer.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Design various geometric elements of highways.
2. Understand the procedure to collect the traffic data for design and traffic management.
3. Test the highway materials as per IS/IRC guidelines.
4. Do structural design of flexible and rigid pavements.
5. Know various highway constructions techniques and its maintenance

8. COURSE CONTENT

List of Experiments:

1. Aggregate Crushing Value Test
2. Aggregate Impact Test
3. Los Angeles Abrasion Test
4. Shape Test
5. Penetration Test of Bitumen
6. Ductility Test 0f Bitumen
7. Softening Point Test of Bitumen
8. Flash and Fire Point Test of Bitumen
9. Viscosity Test of Bitumen
10. Spot Test
11. California Bearing Ratio Test

1. COURSE NUMBER AND NAME:

PC26 - INTERNSHIP

2. CREDITS AND CONTACT HOUR

L	T	P	C
-	-	-	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS:-

5. CATALOGUE DESCRIPTION

The prime purpose of Industrial training is to prepare students for employment in their chosen profession. Studies at university should be enhanced by providing them opportunity to relate academic and professional aspects of engineering disciplines with industrial experience. The Industrial Internship Program is a three-way partnership of students, university and employer that has benefits for all participants. Industrial Internship ensures that interns get to learn the basics by doing and assisting senior engineers on real projects. Practical experience gained during internship is as important as grades in engineering courses. With the hands-on training, students learn how to apply class-taught skills in solving real life problems. Students will attend Industrial internship of four weeks in any industry or reputed organization after the examination in summer vacation.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. Apply engineering knowledge in solving real-life problems.
2. Attain new skills and be aware of the state-of-art in engineering disciplines of their own interest.
3. Get exposure to real-life-working environment & practices, and to attain the professionalisms.
4. Work with multi-tasking professionals and multidisciplinary team.
5. Prepare a technical report, to improve presentation and other soft skills.

8. COURSE CONTENT

Exposure to real life problems at various reputed industries engaged in areas of Civil Engineering.

1. COURSE NUMBER AND NAME:

PC27 – SKILL COURSE- 1 (CIVIL CAD)

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	4	2

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

5. CATALOGUE DESCRIPTION

6. PREREQUISITE:-

7. COURSE OUTCOMES

8. COURSE CONTENT

1. COURSE NUMBER AND NAME:

PC28 – SKILL COURSE- 2 (STAAD PRO)

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	4	2

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

5. CATALOGUE DESCRIPTION

6. PREREQUISITE:-

7. COURSE OUTCOMES

8. COURSE CONTENT

1. COURSE NUMBER AND NAME:

PC29 – EMBEDDED PBL- 1

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

5. CATALOGUE DESCRIPTION

6. PREREQUISITE:-

7. COURSE OUTCOMES

8. COURSE CONTENT

1. COURSE NUMBER AND NAME:

PC30 – EMBEDDED PBL- 2

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

5. CATALOGUE DESCRIPTION

6. PREREQUISITE:-

7. COURSE OUTCOMES

8. COURSE CONTENT

1. COURSE NUMBER AND NAME:

PC31 – EMBEDDED PBL- 3

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

5. CATALOGUE DESCRIPTION

6. PREREQUISITE:-

7. COURSE OUTCOMES

8. COURSE CONTENT

1. COURSE NUMBER AND NAME:

PC32 – EMBEDDED PBL- 4

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

5. CATALOGUE DESCRIPTION

6. PREREQUISITE:-

7. COURSE OUTCOMES

8. COURSE CONTENT

PROGRAMME ELECTIVES

1. COURSE NUMBER AND NAME:
PE1 - ADVANCED STRUCTURAL ANALYSIS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Negi, L., Jehangir, R., "Structural Analysis", Tata McGraw Hill Publication company Ltd., 1st Edition, 2004.

2. Gupta, R., Pandit, G. S., Gupta, S. P., "Theory of Structures", Tata McGraw Hill Publication Company Ltd., 1st Edition, Vol. II, 2013.

3. Wang, C. K., "Intermediate Structural Analysis", McGraw-Hill, New Delhi, 1983.

Reference Books:

4. Sterling, J., Kinney, "Intermediate Structural Analysis "Oxford of IBH Publishing Company.

5. Norris, C. H., Wilbur, J. B., "Elementary Structural Analysis," McGraw Hill International Book Edition, 4th Sub- Edition, 1990.

6. Jain, A. K., "Advanced Structural Analysis", Nem Chand Bros, Roorkee, India.

5. CATALOGUE DESCRIPTION
This course of Advanced Structural Analysis enables the students to understand the behavior of indeterminate structures. It helps the students to know the concepts of elastic analysis and plastic analysis. The objective is to teach students about the concepts of matrix analysis of structures.

6. PREREQUISITE:

7. COURSE OUTCOMES
On completion of this course, the students will be able to
1. Understand the concept of kinematic indeterminacy, static indeterminacy and plastic analysis.
2. Analyse continuous beams, plane frames and pin jointed plane trusses.
3. Calculate flexibility matrix and stiffness matrix for different types of structures, shape factor and plastic moment of resistance for beam sections.

8. COURSE CONTENT

Unit I: Slope deflection method **9 Lecture Hours**

Kinematic indeterminacy - Slope deflection method - analysis of continuous beams and portals - bending moment and shear force diagram.

Unit II: Moment distribution method **9 Lecture Hours**

Moment distribution method - analysis of continuous beams and portals - bending moment and shear force diagram.

Unit III: Plastic Analysis **9 Lecture Hours**

Plastic moment of resistance - shape factor - collapse load - analysis of continuous beams and portals.

Unit IV: Flexibility matrix **9 Lecture Hours**

Concept of flexibility matrix - analysis of continuous beams - plane frames and pin jointed plane trusses.

Unit V: Stiffness matrix **9 Lecture Hours**

Stiffness matrix for beam element - analysis of continuous beams - plane frames & pin jointed plane trusses.

1. COURSE NUMBER AND NAME:

PE2 - ADVANCED CONCRETE DESIGN

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Pillai, S. U., Mennon, D., "Reinforced Concrete Design", Tata McGraw Hill Publications, New Delhi, 2nd Edition, 2003.
2. Raju, N. K., "Advanced Reinforced Concrete Design", CBS Publishers, New Delhi, 2nd Edition, 2013.
3. Sinha, S. N., "Reinforced Concrete Design", Tata McGraw Hill Publications, New Delhi, 2nd Edition, 2007.
4. IS 456: 2000, "Plain and Reinforced Concrete - Code of Practice", 4th Revision, BIS, New Delhi.
5. SP 16: "Design Aid for RC to IS: 456-1978", BIS, New Delhi.
6. SP 34: "Handbook on Concrete Reinforcement and Detailing", BIS, New Delhi.

5. CATALOGUE DESCRIPTION

Students will learn the concept of design of structures, design of combined foundation and raft foundation. Students will also learn yield line theory, design of retaining walls. Upon completion, students should be able to design water tanks, foundations, bridges and shear walls and understand the concept of yield line theory.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Understand the behavior of various structural members and the concept of design.
2. Design the staircases, retaining walls, water tanks, continuous beams and footings.
3. Design of structures is required for the development of society.

8. COURSE CONTENT

UNIT-I: Design of Stair Cases **9 lecture hours**

General specifications, Types of stair cases, Loads on stair cases, Effective span of stairs, Design of dog legged stair case, Design of open well stair case

UNIT-II: Retaining Walls **9 lecture hours**

General specifications, Forces acting on retaining walls, Stability consideration, Wall proportioning, Design of cantilever type retaining walls, Design of counterfort type retaining walls.

UNIT-III: Design of Water Tanks **9 lecture hours**

Types of water tanks, Design of circular water tanks resting on ground with rigid base, Design of circular water tanks resting on ground with flexible base, Design of overhead water tank (Intze type tank).

UNIT-IV: Design of Continuous Beams **8 lecture hours**

Design of continuous RC beams, Moment redistribution.

UNIT-V: Design of Footings **10 lecture hours**

Types of foundation - Design of isolated footing - combined footing – Concept of raft footing - well foundations.

1. COURSE NUMBER AND NAME:

PE3 - PRE-STRESSED CONCRETE

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Raju, N. K., "Pre-stressed concrete", Tata McGraw Hill, New Delhi, 1st Edition, 2012.
2. Ramamruthum, S., "Pre-stressed Concrete", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2003.
3. Lin, T. Y., Burns, N. H., "Design of pre- stressed Concrete Structures", John Wiley and Sons. New York, 3rd Edition, 1981.

5. CATALOGUE DESCRIPTION

This course imparts comprehensive knowledge on the Prestressed Concrete. It brings about an understanding of the behaviour of Prestressed Concrete and develops an understanding of the various prestressing systems. This course imparts comprehensive knowledge for analysis of sections for flexure and deflection. It also imparts comprehensive knowledge for Losses of Pre-Stress, Transfer of Prestress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members.

6. PREREQUISITE:

7. COURSE OUTCOMES

Having successfully completed this course, the student will demonstrate:

1. An ability to analysis of sections for flexure and deflection
2. An ability to analyse the Losses of pre stressed members.
3. An ability to analyse the Transfer of Prestress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members
4. An ability to visualize and work on multi-disciplinary tasks
5. Skills to use modern engineering tools, software and equipment to analyze and design.

8. COURSE CONTENT

UNIT-I: Basic Principles of Pre-Stressing, Prestressing Systems 9 lecture hours

Basic concepts of prestressing, High strength concrete and steel, Stress-strain characteristics and properties, Various prestressing systems, Pre-tensioning and Post- tensioning systems with anchorages, Advantages and limitations of prestressed concrete.

UNIT-II: Analysis of Sections for Flexure 9 lecture hours

Basic assumptions, Analysis of stresses in concrete due to pre- stress and loads for different types of cross section, Pressure line or thrust line, Cable profile, Concept of load balancing, Cracking moment.

UNIT-III: Losses of Pre-Stress & Deflections 9 lecture hours

Nature of losses in pre-stress, Various losses encountered in pre-tensioning and post tensioning methods, Deflection, Factors influencing deflection, Elastic deflection under transfer loads and due to different cable profile. Deflections limits as per IS-1343. Effects of creep on deflection, crack widths.

UNIT-IV: Flexural and Shear Strength of Prestressed Concrete Sections 9 lecture hours

Types of flexural failure, IS code recommendations for flexure, Ultimate flexural strength of section. Shear and principal stresses, Ultimate shear resistance of prestressed concrete members, Shear reinforcement.

UNIT-V: Transfer of Prestress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members 9 lecture hours

Transmission of pre-stress in pre-tensioned members, Transmission length, Bond stresses, Codal provisions for bond and transmission length, Anchorage stress in post- tensioned member. Bearing stress and bursting tensile force, IS code provisions.

1. COURSE NUMBER AND NAME:

PE4 - BRIDGE ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1.Victor D. J. (2008), Essentials of Bridge Engineering, 6th Edition, Oxford University Press, ISBN: 9788120417175.

2.Ramachandra (2004), Design of Steel structures, 4th Edition, Standard Publishers Distributors, ISBN: 9780071544115.

3.Duggal S. K. (2008), Design of Steel Structures, 3rd Edition, Tata McGraw-Hill, ISBN: 9780070260689.

4.IRC Bridge Code.

5. CATALOGUE DESCRIPTION

A bridge is a structure built to span physical obstacles such as a body of water, valley, or road, for the purpose of providing pas-sage over the obstacle. There are many different designs that all serve unique purposes and apply to different situations. Designs of bridges vary depending on the function of the bridge, the nature of the terrain where the bridge is constructed and anchored, the material used to make it, and the funds available to build it.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Understand IRC Code.
2. Design and detailing of plate girder and steel truss bridges.
3. Design and detailing box culvert.
4. Design piers, abutments etc.

8. COURSE CONTENT

Unit I: Introduction **9 lecture hours**

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method.

Unit II: R.C.C. Slab Culvert **9 lecture hours**

Courbon's method of load distribution. RCC Slab culvert, dead load BM and SF,BM and SF for IRC class AA tracked vehicle, BM and SF for IRC class AA wheeled vehicle, BM and SF for IRC Class A loading, structural design of slab culvert.

Unit III: T-Beam Bridge and Box Culvert **9 lecture hours**

Proportioning of components, analysis of slab using IRC class AA tracked vehicle, structural design of slab, analysis of cross girder for dead load and IRC class AA tracked vehicle, structural design of cross girder, analysis of main girder using COURBON'S method, calculation of dead load and SF, calculation of live load BM and SF using IRC class AA tracked vehicle, structural design of main girder. Box Culverts

Unit IV: Design of Plate Girders **9 lecture hours**

Design and detailing of plate girder and steel truss type bridges.

Unit V: Design of Substructures **9 lecture hours**

Design of piers and pier caps - abutments and bearings.

1. COURSE NUMBER AND NAME:

PE5 - APPLICATIONS OF MATRIX METHODS IN STRUCTURAL ANALYSIS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Pundit G.S., & Gupta S.P., (2008), Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd.
2. Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach". Sixth Edition, 2007, Chapman & Hall.
3. Devdas Menon,"Advanced Structural Analysis"(2009), Narosa Publishing House
4. DevdasMenon,"Structural Analysis"(2008), Narosa Publishing House, 2008
5. A.S.Meghre& S.K.Deshmukh, "Matrix Methods of Structural Analysis" (2010) Charotar Publishing House Pvt. Ltd.
6. Kanchi M. B. "Matrix Methods of Structural Analysis" (2002), Wiley Eastern Limited, New Delhi,

5. CATALOGUE DESCRIPTION

Students learn the behavior of indeterminate structures, concepts of static indeterminacy and kinematic indeterminacy. Students understand the use of flexibility matrix method and stiffness matrix method for analyzing structures. Students also learn the use of software package STAAD – PRO. Upon completion, students should be able to analyze structures by flexibility matrix method and stiffness matrix method and use STAAD – PRO software package for analyzing indeterminate structures.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Know the concept of static and kinematic indeterminacy.
2. Understand the concept of flexibility method and stiffness method.
3. Analyze plane trusses & plane frames.

8. COURSE CONTENT

Unit I: Introduction to Flexibility Matrices and Stiffness Matrices 9 lecture hours

Static and kinematic indeterminacy - stiffness and flexibility coefficients-flexibility and stiffness matrices- relationship between flexibility and stiffness matrices- properties of stiffness and flexibility matrices - concept of co-ordinates-Classification of Structures – Stability-Settlement of supports- solution of simple problems.

Unit II: Analysis of Beams 9 lecture hours

Flexibility and stiffness matrices for beams - solution of problems - bending moment diagram.

Unit III: Analysis of Plane Truss 9 lecture hours

Flexibility and stiffness matrices for plane truss - solution of problems - internal forces due to thermal expansion - lack of fit.

Unit IV: Analysis of Plane Frame 9 lecture hours

Flexibility and stiffness matrices for plane frame - solution of problems - bending moment diagram.

Unit V: Use of Software Packages 9 lecture hours

Analysis of beam, plane truss & plane frame by STAAD-PRO.

1. COURSE NUMBER AND NAME:

PE6 - EXPANSIVE SOIL AND GROUND IMPROVEMENT TECHNIQUES

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Swami Saran (2008), Analysis and Design of sub structures 2nd edition, Limit State Design, Oxford & IBH Publishing Co. Pvt Ltd., 66, Janpath, New Delhi. ISBN: 978-81-204-1700-7.

2. F.H.Chen (1995), Foundations in Expansive Soils, Elseivier Publications. ISBN:978-04-444-3036-6.

3. R.E.Peck, W.E.Hansen&T.H.Thornburn (2004), Foundation Engineering, John Wiley. ISBN: 978-04-716-7585-3.

4. Varghese P.C (2009), Foundation Engineering 1st Edition, Prentice-Hall of India Private Limited. ISBN: 978-81-203-2652-1.

5. NiharRanjanPatra (2012), Ground improvement techniques 1st Edition, Vikas Publishing House. ISBN: 978-93-259-6001-5.

6. Nelson, John D. Nelson, Ron Miller (1997), Expansive Soils: Problems and Practice in Foundation and Pavement Engineering New edition, Wiley-Interscience. ISBN: 978-04-711-8114-9.

7. P. Purushothama Raj (1999), Ground Improvement Techniques 1st Edition, Laxmi Publications. ISBN: 978-81-318-0594-7.

8. Rao (1990), Engineering with Geo-synthetics, Mcgraw-hill Education. ISBN: 978-00-746-0323-9.

5. CATALOGUE DESCRIPTION

Expansive soils are soils that expand when water is added, and shrink when they dry out. This continuous change in soil volume causes homes built on this soil to move unevenly and crack. Each year in the United States, expansive soils cause $2.3 billion in damage to houses, other buildings, roads, pipelines, and other structures. This is more than twice the damage from floods, hurricanes, tornadoes, and earthquakes combined.

Ground improvement techniques are one of the important aspects for soil stabilization. It can be done by adding materials, stone column, sand drains etc. Compaction is required for the Ground improvement techniques and its type vary with the type of soils. Sometime grouting and geo-textiles materials are also used for Ground improvement.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Know the physical & mineralogical properties of expansive soil.
2. Predict heave and shrinkage.
3. Conduct tests for identification of swelling soil.
4. Design suitable method for improving properties of expansive soil.
5. Choose correct method for ground improvement.
6. Select correct stabilizing material for expansive soils.
7. Design grouting process for various soil engineering problems.

8. COURSE CONTENT

Unit I: Origin, Occurrence and Identification of Expansive Soils 9 lecture hours

Occurrence and distribution in India - Moisture equilibrium - Soil, structure, environmental interaction - Distress symptoms case histories - Soil Structure - Clay mineralogy Swell potential - Field exploration - laboratory tests for identification.

Unit II: Chemical stabilization and Special Foundation 9 lecture hours

Mechanical alteration – Sand cushion technique - CNS concept – Chemical stabilization with lime, flyash and cement – Special foundations – Under-reamed piles – Straight-shafted drilled piers - Belled piers – Granular pile-anchors.

Unit III: Introduction to Ground Improvement Techniques 9 lecture hours

Need and objectives of ground improvement, classification of ground modification techniques, suitability and feasibility, emerging trends in ground improvement, methods of de-watering, sumps and interceptor ditches, single, multi stage well points, vacuum well points, Horizontal wells, foundation drains, blanket drains, criteria for selection of fill material around drains, Electro-osmosis.

Unit IV: Stabilization 9 lecture hours

Soil improvement by adding materials, lime, flyash, cement and other chemicals and bitumen, sand column, stone column, sand drains, prefabricated drains, lime column, soil-lime column, stabilization of soft clay or silt with lime, bearing capacity and settlement of treated soils, improvement in slope stability, control methods.

Unit V: Grouting 9 lecture hours

Introduction, suspension grout, solution grout, grouting equipments and methods, grouting, design and layout granular piles – ultimate bearing capacity and settlement, method of construction, load test.

1. COURSE NUMBER AND NAME:

PE7- ADVANCED GEOTECHNICAL ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Varghese P.C (2009), Foundation Engineering 1st Edition, Prentice-Hall of India Private Limited. ISBN: 978-81-203-2652-1.
2. B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5
3. Shashi K. Gulhati & Manoj Datta (2005), Geotechnical Engineering 1st edition, Tata McGraw Hill Ltd. ISBN: 978-00-705-8829-5.
4. Donald P Coduto, William A. Kitch, Man-chu Ronald Yeung (2010), Geotechnical Engineering: Principles and Practices 2nd revised Edition, Pearson Education. ISBN: 978-01-313-5425-8.
5. Joseph E. Bowles (2006), Foundation Analysis and Design 5th edition, McGraw-Hill, New York. ISBN: 978-00-711-8844-9.
6. Braja M. Das (2007), Principles of Foundation Engineering 6th Edition, Nelson Engineering. ISBN: 978-81-315-0202-0.
7. Ramamurthy (2010), Engineering in Rocks for Slopes, Foundations and Tunnels, PHI Learning Private Limited. ISBN: 978-81-203-4168-5.

5. CATALOGUE DESCRIPTION

Geotechnical engineering is essential to understand the bearing capacity of soil and failure of soil in terms of settlements. First it requires soil exploration and type of soil decide the foundation for the structures e.g. shallow and deep foundation. Bearing capacity and failure conditions of soil would be analyzed by the Terzaghi's theory. Slope stability shows the failure conditions of soils. Finally earth pressure also has been discussed.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Comprehend and utilize the geotechnical literature to establish the framework for foundation design.

2. Plan and implement a site investigation program including subsurface exploration to evaluate soil/structure behavior and to obtain the necessary design parameters.
3. Carry out slope stability analysis for various fills and slopes.
4. Determine allowable bearing pressures and load carrying capabilities of different foundation systems.
5. Understand theories of earth pressures and designing of retaining walls.

8. COURSE CONTENT

Unit I: Soil Exploration and Types of Foundations **6 lecture hours**

Objective of site investigation - reconnaissance – detailed site investigation - methods of exploration – geophysical methods - seismic refraction survey. Depth of exploration – factors governing location and depth of foundation – types of foundations – selection of foundation – plate load test – standard penetration test.

Unit II: Capacity and Settlements of Shallow Foundations **10 lecture hours**

Terzaghi's theory of bearing capacity – general and local shear failure - effect of water table – design of footings – settlement of footings - immediate and time dependent settlement – permissible limits – differential settlement, introduction to Codal provisions.

Unit III: Deep Foundations **10 lecture hours**

Classification and selection of piles – static and dynamic formulae for single pile capacity – efficiency and capacity of pile groups – design of pile group – settlement of pile groups– load test on piles.

Unit II: Slope Stability **9 lecture hours**

Failure of infinite and finite slopes – Swedish circle method – Factor of safety - slope stability of earth dams, introduction to Bishop's method – IS codes.

Unit V: Theories of Earth Pressure **10 lecture hours**

Definitions – Earth pressure at rest – Rankine's active and passive earth pressures - Coulomb's earth pressure theories – types of retaining walls and its design. Introduction of tunneling, ground improvement methods – compaction, deep compaction and fiber reinforced plastic and geo-textiles.

1. COURSE NUMBER AND NAME:

PE8 - HIGHWAY PAVEMENT DESIGN

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. ChakroborthyPartha, and Das Animesh, (2003) "Principles of Transportation Engineering", Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.

2. Yoder.E.J., and Witczak. M. W., Principles of Pavement Design, Second Edition, John Wiley & Sons, ISBN-9780471977803.

3. Garber. Nicholas J., and Hoel. Lester A., (2009), Traffic & Highway Engineering, Fourth Edition, Cengage Learning, ISBN-9780495082507.

4. S.K. Sharma (1998), Principles, Practice and Design of Highway Engineering, S. Chand & Co Ltd, New Delhi.

5. Bruce.A.G. and Clarkeson.J., (1952), Highway Design and Construction, Third Edition, International Textbook Co.

5. CATALOGUE DESCRIPTION

Highway pavement design is the most important part of the traffic engineering. In this part principles and design of flexible and rigid pavement pavement will have discussed. Also the idea about pavement evaluation and its maintenance is required for better design.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Learn the basic principles of flexible and rigid pavements.

2. Demonstrate the ability to analyse and design the flexible and rigid pavements by applying various methods and thorough in construction procedures and the functions of pavements.

3. Ability to critically evaluate flexible and rigid pavements by deflection measurement.

4. Demonstrate the ability to apply strengthening techniques and rehabilitation of pavements.

8. COURSE CONTENT

Unit I: General Principles of Pavement Design **10 lecture hours**

Components of a road and functions – factors affecting pavements stability – equivalent single wheel load – vehicle and traffic factors – moisture factors – climate factors – soil factors – stress distribution in different conditions – modulus of elasticity of various layers.

Unit II: Flexible Pavement Design **6 lecture hours**

Empirical method using soil classification tests – estimation of CBR value method of designing pavement – plate bearing test method Ashpalt Institute method – AASSO method – Burmister design method.

Unit III: Rigid Pavement Design **9 lecture hours**

Stresses in concrete pavement – IRC method – design of steel reinforcements – design of different joints in concrete pavements and their functions – construction of concrete pavements and their functions.

Unit IV:Pavement Evaluation **10 lecture hours**

Distresses in flexible pavements – distress in rigid pavements – service ability index – structural evaluation of flexible and rigid pave-ments – evaluation by deflection measurement – strengthening of pavements – flexible overlays – rigid overlays.

Unit V: Highway Maintenance **10 lecture hours**

Maintenance of Bituminous surface concrete roads and low cost roads – maintenance shoulders and drainage system – maintenance of bridges and road structures.

1. COURSE NUMBER AND NAME:

PE9 - TRAFFIC ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Kadiyali.L.R. (2008), Traffic Engineering and Transportation Planning, Khanna Publishers, ISBN-9788174092205.
2. ChakroborthyPartha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.
3. Khisty.C.J., and Lall.B.K., (2003) "Transportation Engineering", Indian Edition, Prentice-Hall of India , ISBN- 9788120322127.
4. Papacostas.C.S., and Prevedouros.P.D., (2001) "Transportation Engineering and Planning", Indian Edition, Prentice-Hall of India , ISBN- 9788120321540.
5. Garber. Nicholas J. and Hoel. Lester A., (2009), Traffic & Highway Engineering, Fourth Edition, Cengage Learning, ISBN-9780495082507.

5. CATALOGUE DESCRIPTION

Traffic engineering and its management are the most important now a days. Its necessity followed by the traffic studies and its regulation. The most important is its management. Students will also study about the pavement design principles and pavement design of flexible and rigid pavement.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Perform traffic studies.
2. Know importance of traffic management.
3. Identify the specification of traffic facilities

8. COURSE CONTENT

Unit I: Traffic Studies **10 lecture hours**

Road user and Vehicle Characteristics - Traffic Studies -Traffic volume and composition - speed, Headway - Concentration and Delay & Flow principles - Capacity and level of service.

Unit II: Traffic Facilities **6 lecture hours**

Signals - Islands - Types and General layout of at-grade and grade separated intersections.

Unit III: Traffic Regulations and Management **9 lecture hours**

Traffic signs and markings - Parking practices - Traffic management measures.

Unit IV: General Principles and Flexible Pavement Design **10 lecture hours**

Factors affecting pavements stability – equivalent single wheel load – vehicle, soil, traffic & Climatic factors - stress distribution in different conditions - CBR method of design - AASSO method & Burmister design method.

Unit V: Rigid Pavement Design **10 lecture hours**

Stresses in concrete pavement – IRC method – design of steel reinforcements – Function of joints, design of joints in concrete pavements - Joint Fillers and sealant.

1. COURSE NUMBER AND NAME:

PE10 - ADVANCED TRANSPORTATION ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Chandra's., and Agarwal. M.M., (2007), Railway Engineering, Oxford University Press India, ISBN- 9780195687798.

2. Rangwala.S.C, Rangwala.P.S., (2008), Airport Engineering, Charotar Publishing House Pvt. Limited, ISBN-9788185594972.

3. Oza.H.P and Oza. G.H., (2011), Dock and Harbour Engineering, Sixth Edition, Charotar Publishing House Pvt., ISBN-9789380358383.

4. Arora.S.P., and Saxena. S.C., (2001), A Textbook of Railway Engineering, Sixth Edition, Dhanpat Rai Publications.

5. Khanna.S.K, and Arora.M.G. (1971), Airport Planning and Design, Nem Chand & Bros.

6. Rangwala.S.C, (1965), Principles of Railway Engineering, Charotar Publishing house.

5. CATALOGUE DESCRIPTION

The importance of transportation engineering is very useful in our daily life. So the basics knowledge of transportation modes are important. The basic modes are railways, aircraft etc. So we will go through the introduction, characteristics, design and safety of railway, airport, dock and harbour. The understanding of the geometrical part of the transportation is more important.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Demonstrate the ability to identify the components of railway track, their functions, alignment and the station yards.
2. Recognize and identify the requirement of an airport and the principle involved in it.
3. Learn to classify the harbours and demonstrate the ability to identify the components of a dock.

8. COURSE CONTENT

Unit I: Introduction to Railway Engineering **9 lecture hours**

History and administrative setup of Indian Railways; rail gauges, permanent way – functions, requirements, sections in embankment and cutting, stresses in different components of track, Types of joints and fastenings.

Unit II: Track Geometrics and Safety **9 lecture hours**

Requirements of Railway alignment, vertical alignment and horizontal alignment, points and crossings – terminologies, Turnouts – Types and design aspects, Signals classification and their functions, train operation control systems, interlocking of tracks.

Unit III: Introduction to airports and Aircraft Characteristics **9 lecture hours**

Air transport development in India, national and international organizations in air transport, aircraft characteristics and their impact on planning of an airport, selection of site for an airport, airport obstruction, imaginary surfaces, runway orientation clam period and wind coverage.

Unit IV: Geometric Designs and Airport Traffic control Aids **9 lecture hours**

Runway and taxiway geometric designs, exit taxiway, its design and fillet curves, runway configuration, separation clearance, design of apron and their layout. Visual aids, marking and lighting of runway and apron area, wind and landing direction indicator.

Unit V: Docks and Harbour Engineering **9 lecture hours**

Historical development in India , tides, winds & waves, docks, harbours, break waters, jetties, landing stages & wharves, dry docks, transit sheds, cargo handling, , inland water transport. Maintenance.

1. COURSE NUMBER AND NAME:

PE11 - GROUND WATER ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. David Keith Todd (2005), Groundwater Hydrology, Third Edition, John Wiley & Sons Singapore. ISBN: 9780471059370.

2. Raghunath H.M. (2007), Groundwater, Third Edition, New Age International. ISBN: 9788122419047.

3. Abdel-Aziz ismailkashef (2008), Groundwater Engineering, McGraw-Hill International Editions, Newyork. ISBN: 9780071005333.

5. CATALOGUE DESCRIPTION

This course covers fundamentals of subsurface flow and transport, emphasizing the role of groundwater in the hydrologic cycle, the relation of groundwater flow to geologic structure, and the management of contaminated groundwater. Introduction and definitions, groundwater storage and supply, Darcy's Law and its limitation, Dupuit approximation, steady and unsteady flows in confined and unconfined aquifers, radial flow towards wells, storage coefficient and safe yield in a water-table aquifer, design of wells, methods of drilling and construction, development of maintenance of wells.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. Identify the ground water flow & prediction.
2. Implement the Methods of improving the ground water potential.
3. Manage the ground water sources.

8. COURSE CONTENT

Unit I: Occurrence and Movement of Groundwater **10 lecture hours**

Introduction to Hydrologic cycle – Origin and Age of groundwater, classification of groundwater, aquifer - water table - Darcy's Law, Coefficient of Transmissibility and storage - Flow rates and equation.

Unit II: Well Hydraulics **9 lecture hours**

Geophysical methods, study of radial flow - well flow, Multiple well system - characteristic well losses, open well, tube well, well depth, well screen - head losses through the screen gravel packing and formation stabilization.

Unit III: Analysis and Evaluation of Pumping Test **9 lecture hours**

Definition of terms - static water level, pumping level, drawdown – residual, drawdown pumping rate -automatic water level re-corder - time drawdown analysis - distance drawdown analysis, Jacob's methods, pumping test methods.

Unit IV: Pollution of Groundwater **8 lecture hours**

Injection methods-monitoring: - Cement lime, Lime - flyash and chemical stabilization, Deep mixing techniques.

Unit V: Groundwater Assessment and Budgeting **9 lecture hours**

Hydrological equilibrium - rain gauge network, runoff procedure for conducting infiltration test – artificial recharge, rainwater harvesting – calculation of groundwater storage capacity and groundwater potential.

1. COURSE NUMBER AND NAME:

PE12 - ADVANCED HYDROLOGY

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Das and Saikia (2012), Watershed Management. PHI Learning Private Ltd. ISBN-9788120346765.

2. Wurbs & James (2009), Water Resources Engineering. PHI Learning Private Ltd. ISBN – 9788120321519.

3. Viessmen, Jr. & Lewis (2012), Introduction to Hydrology, 5th ed. PHI Learning Private Ltd. 9788120333680.

4. Agarwal, V.C. (2012), Groundwater Hydrology. PHI Learning Private Ltd.ISBN – 9788120346192.

5. Larry W. Mays (2010), Water Resources Engineering. Wiley Publications. ISBN - 978-0470460641.

6. Subramanya, K., (2008) Engineering Hydrology, 3rd ed. Tata McGraw-Hill. ISBN - 9780070648555.

5. CATALOGUE DESCRIPTION

In this course, the student develops an ability to tackle water resources problems. The course relates theory to surface hydrology, groundwater hydrology, irrigation practices and canal irrigation. The importance of the course is in presenting a solid theoretical base from which practical applications in various aspects of water resources engineering can be made.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Identify the different types & methods of irrigation for better water management.
2. Know the occurrence & distribution of natural waters of the earth.
3. Implement the practices of structural design facilities for water resources project.
4. Implement and study the planning and management for single & multipurpose projects.

8. COURSE CONTENT

Unit I: Hydrograph **9 lecture hours**

Runoff - Factors affecting runoff – measurement – stream gauging – stage discharge relationship – Hydrograph components – Hydrograph separation – Module hydrograph – Derivation of Module Hydrograph – S. Hydrograph – Synthetic hydrograph.

Unit II: Ground Water Hydrology **9 lecture hours**

Ground water-Aquifers, Permeability & transmissibility- steady flow towards a well in confined & water table aquifer - Dupits & Theims equation - measurement of yield of an open well - Tube well & infiltration galleries. Interference among wells-well losses, comparison of well and flow irrigation.

Unit III: Canal Irrigation **9 lecture hours**

Sediment Transport- Importance & Mechanics of transport, bed load & suspended load- Estimation, Design of channels in India- Regime channels- Kennedy and Lacey's theory, Water logging- causes- effects- control measures, canal lining, Land Reclamation.

Unit IV: Dams and Reservoirs **9 lecture hours**

Classification of dams - factors governing their selection – elementary design of gravity dam – earthen dam – arch dam – spillways – energy depositors – spillway gates – important dams in India – Yield of reservoir – storage capacity – strategies and operation – sedimentation process – effects and control measures

Unit V: Flood Analysis **9 lecture hours**

Empirical methods – statistical methods – flood routing – routing through reservoir routing – through channels (Muskinggum method) – flood forecasting

1. COURSE NUMBER AND NAME:

PE13 - POLLUTION CONTROL AND MONITORING

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Rao C.S. (2006), Environmental Pollution Control Engineering, New Age International, ISBN: 9788122418354.

2. Arcadio P Sincero, Gregoria A Sincero (2009), Environmental Engineering : A Design Approach, PHI Learning, ISBN: 9788120314740.

3. George Tchobanoglous, Donald R. Rowe, Howard S. Peavy, Environmental Engineering, McGraw-Hill Publishing Co., ISBN: 9780071002318.

4. P. AarneVesilind, Susan M. Morga (2004), Introducing to Environmental Engineering, Nelson Engineering, ISBN: 9780534378127.

5. Gerard Kiley (1996), Environmental Engineering, McGraw-Hill, ISBN: 978-0077091279.

5. CATALOGUE DESCRIPTION

This course emphasizes pollutions in water, air, land. A brief discussion on water pollution due to industrial, agricultural and municipal wastes. Source of air pollution and effects of pollution on human health, vegetation and climate. Air quality monitoring and air pollution control legislation. Noise Pollution and Control, Solid Waste Management techniques and Environmental Sanitation system included in this course.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. Describe the principles of the biological and chemical treatment processes that are required to ensure adequate quality and quantities of potable water.
2. Implement the principle techniques currently in use for wastewater treatment and to review operational procedures for the plant involved.
3. Use advanced methods for monitoring and modeling spatial and temporal patterns of pollution.

8. COURSE CONTENT

Unit I: Water Pollution & Control **9 lecture hours**

Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.

Unit II: Air Pollution and Control **10 lecture hours**

Pollution and their sources-effects of pollution on human health, vegetation and climate-prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation.

Unit III: Noise Pollution and Control **8 lecture hours**

Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation etc; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation.

Unit IV: Solid Waste Management **8 lecture hours**

Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.

Unit V: Environmental Sanitation **10 lecture hours**

Relation of food to disease-principles of food sanitation-sanitation of kitchens, restaurants and other catering establishments-quality changes in milk-milk as carrier of infection-pasteurisation of milk-HTST and LTLT processes – cattle shed sanitation. Orientation of buildings with respect to the direction of prevailing winds and solar movement. Air movement inside the buildings for a healthy residential environment.

1. COURSE NUMBER AND NAME:
PE14 - INDUSTRIAL WASTE TREATMENT AND DISPOSAL

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Patwardhan A.D. (2008), Industrial Waste Water Treatment, PHI Learning Pvt Ltd. ISBN: 978-81-203-3350-5
2. Nelson, L. Nemerow (2007), Industrial Waste Treatment: contemporary practice and vision for future, Elsevier Butterworth-Heinemann Publication. ISBN: 9780123724939
3. Woodard & Curran Inc. (2006), Industrial Waste Treatment Handbook, Second Edition, Elsevier Butterworth-Heinemann Publication. ISBN: 9780750679633
4. Thomas T. Shen (1999), Industrial Pollution Prevention, Springer publications. ISBN: 3540652086
5. W .W. Eckenfelder Jr. (2000), "Industrial Water Pollution Control", McGraw-Hill Book Company, New Delhi. ISBN: 9780070393646

5. CATALOGUE DESCRIPTION

Disposal of waste water generated from the industries is the major concern because of the problems and diseases associated with it. Students learn about types of industries, industrial pollution, characteristics of industrial wastes, waste management approach, waste audit, equalization, neutralization, chemical oxidation and physico-chemical treatment. Upon completion, students should be able to know about the characteristics of the different industrial and design the effluent treatment system for the industry.

6. PREREQUISITE:

7. COURSE OUTCOMES

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

1. The solutions of physical, chemical and biological treatment and biosensors applied to biological process control
2. The uses of new techniques for collection, recycling and disposal and treatment of wastewater and solid wastes.
3. The design the wastewater supply and treatment technology.
4. The evaluation and monitoring of the treatment systems according to the different industries.

8. COURSE CONTENT

Unit I: Industrial Pollution **10 lecture hours**

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 – Hazardous Wastes – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes – Pollution Control Boards.

Unit II: Waste Management Approach **8 lecture hours**

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

Unit III: Liquid Waste Treatment Techniques **10 lecture hours**

Equalization – Neutralization – removal of suspended and dissolved organic solids - Chemical oxidation – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management.

Unit IV: Industrial Solid Waste Treatment **8 lecture hours**

Physico-chemical treatment – solidification – incineration – Secured landfills – Legal Provisions.

Unit V: Case Studies of Industrial Pollution Control **9 lecture hours**

Sources & their Characteristics, waste treatment flow sheets for selected industries such as textiles, tanneries, dairy, sugar, paper, distilleries, steel plants, refineries, fertilizer, and thermal power plants.

1. COURSE NUMBER AND NAME:

PE15 - AIR AND NOISE POLLUTION

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1.M N Rao& H V N Rao (2007), Air Pollution, Tata McGraw-Hill Publishing Company, 26th reprint, New Delhi. ISBN: 0074518718

2.Noel De Nevers (2010), Air Pollution Control Engineering, 2nd Edition, Waveland Press, Inc., Long Grove, Illinois. ISBN: 978-1577666745

3.Singal, S.P. (2000), Noise Pollution and Control, First Edition, Narosa Publishing House, New Delhi.ISBN: 8173193630

4.Rao C.S. (2006) Environmental Pollution Control Engineering, 2nd edition, New Age International,New Delhi. ISBN: 9788122418354

5.William L.Heumann (1997), Industrial Air Pollution Control Systems, McGraw Hill Professional, New York.ISBN: 9780070314306

5. CATALOGUE DESCRIPTION

Increased air and noise pollution is the common impact of industrialization lead to the several dangerous and untreatable impacts on human beings. Students learn about air pollutants, particulates and gaseous pollutants, effects of air pollution on human beings, elements of atmosphere and dispersion of pollutants, meteorological factors, principles and design of air pollution control measures, air quality monitoring, air pollution control measures, sources of noise pollution, environmental and industrial noise and effects of noise pollution.

6. PREREQUISITE: -

7. COURSE OUTCOMES

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

1. The main chemical components and reactions occur in the atmosphere and examine the factors responsible for perturbing this.

2. The Implementation of the methods for monitoring and modelling spatial and temporal patterns of pollution

3. The air pollution issues at a range spatial scales and how these are relaxed.

4. The environmental impacts of atmospheric pollutants and assess their concentration.

8. COURSE CONTENT

Unit I: Sources and Effects of Air Pollution **9 lecture hours**

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 II: Transport of Air Pollution **9 lecture hours**

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

Unit III: Control of Air Pollution **9 lecture hours**

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 IV: Air Quality Management **9 lecture hours**

Air quality standards – Air quality monitoring – Air pollution control efforts – Zoning – Town planning regulation of new indus-tries – Legislation and enforcement – Environmental Impact Assessment – Methods.

Unit V: Noise Pollution & Control **9 lecture hours**

Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution- fundamentals of sound generation - propagation, sound measurement - sound level meters – types, components, Noise prevention & control measures, environmental and industrial noise - noise control legislation.

UNUVERSITY CORES

1. COURSE NUMBER AND NAME:

UC1 – INTRODUCTION TO ENGINEERING

2. CREDITS AND CONTACT HOUR

L	T	P	C
0	0	2	1

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Dr. B. C. Punmia, Ashok K. Jain & Arun K. Jain (2005), Comprehensive Basic Civil Engineering, Laxmi Publications (P) Ltd.-New Delhi, ISBN: 978-81-700-8403-7.
2. M. S. Palanichami (2010), Basic Civil Engineering, Tata McGraw Hill Education India, ISBN: 978-00-707-0796-2.
3. Sateesh Gopi (2009), Basics of Civil Engineering, Pearson India, ISBN: 978-81-317-2988-5.
4. Er. Shrikrishna & Er. Shrikrishna A. Dhale (2013), S. Chand Publishing-New Delhi, ISBN: 978-81-219-4288-1.
5. S. S. Bhavikatti (2014), Basics of Civil Engineering, New Age International-New Delhi, ISBN: 978-81-224-3559-7.
6. K. Venugopal, Basic Civil And Mechanical Engineering, Anuradha Agencies Publications-Chennai, ISBN: 978-81-847-2079-2.

5. CATALOGUE DESCRIPTION

6. PREREQUISITE: - NIL

7. COURSE OUTCOMES

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

1. Know about different materials and their properties Demonstrate skills in performing measurement of distance, angles, leveling, and curve setting.
2. Know about engineering aspects related to buildings
3. Know about importance of surveying and the transportation
4. Get exposed to the rudiments of engineering related to dams, water supply, and sewage disposal

8. COURSE CONTENT

Unit I: Building Materials, Buildings and their components (8 hours)

Brief introduction to different types of building materials – cement, sand, stone chips, brick and concrete – Properties and their uses. (3 hours)
Buildings – Brief description of various components, e.g., slab, beam, lintel, column, foundation and their functions. (2 hours)
Soils – Brief description to classification of soils and bearing capacity – Improvement of bearing capacity of soil. (2 hours)
Roofs – Flat RCC roof – steel trusses – sloped roof – roof coverings. (1 hour)

Unit II: Utility and Services (8 hours)

Surveying – classification and principles – brief description of different surveying techniques and instruments. (2 hours)
Transportation – Types of roads – Water bound Macadam road – cement concrete road – Bituminous road - Brief introduction to railways (2 hours)
Dams – Purpose – Selection of site – Gravity and Earthen Dam. (2 hours)
Water Supply System – Sources – Surface and Ground water – Water Demand – Water treatment. (2 hours)

Unit III: Material Properties and Geometric Properties (8 Hours)

Material Properties – Stress – Strain – Modulus of Elasticity – Hooke's Law – Solution to simple problems. (4 Hours)
Geometric Properties: Centroid – Centre of Gravity – Moment of Inertia for rectangle, Angle, Tee section, I section, Channel section – Parallel Axis Theorem. (4 Hours)

1. COURSE NUMBER AND NAME:

UC14 - ENGINEERING MECHANICS

2. CREDITS AND CONTACT HOUR

L	T	P	C
3	0	0	3

3. INSTRUCTOR:

4. TEXT BOOKS/ REFERENCE BOOKS

1. Tayal.A.K. (2009), Engineering Mechanics – Statics and Dynamics, 12th Edition, Umesh Publications, ISBN: 9788188114016
2. Punamia B. C. (2010), Mechanics of Materials, 15th Edition, Laxmi publications (P) Ltd, ISBN: 9788131806463.
3. Shames I. H. (2006), Engineering Mechanics – Statics and Dynamics, 4th Edition, Prentice-Hall of India Private limited, ISBN- 9780133569247.

5. CATALOGUE DESCRIPTION

Engineering mechanics as a branch of applied mechanics that deals with behaviors of solid bodies subjected to various types of forces or loadings. All those who seek to understand natural phenomena involving stressing, deformation, flow and fracture of solids must be thoroughly familiar with Solid Mechanics. There are two broad categories of this subject: (1) Mechanics of rigid bodies that deals with how forces are transferred on to members of structures and trusses and is mainly concerned with the elastic and dynamic behavior of engineering components under external forces (2) Mechanics of materials or strength of materials (deformable solids) deals with internal stresses and strains in components resulting from external forces that can cause deformation and fracture of the component.

6. PREREQUISITE: MAT

7. COURSE OUTCOMES

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

1. Calculate the reaction forces of various supports of different structures.
2. Determine the centroid, centre of gravity and moment of inertia of various surfaces and solids.
3. Calculate the forces acting on the rigid body, structures using the principle of virtual work.
4. Determine the shear force and bending moment diagrams of statically determinate structures.

8. COURSE CONTENT

Unit I: Introduction to Mechanics & Equilibrium of Forces **9 lecture hours**

Fundamental Principles - Vectorial Representation of Forces and Moments - Coplanar forces - Resolution and Composition of forces and equilibrium of particles – introduction of Forces on a particle in space - Equivalent system of forces - Principle of transmissibility - Single equivalent force - Free body diagram - Equilibrium of rigid bodies in two dimensions and three dimensions and Introduction to Friction - Laws of Coulomb Friction - Equilibrium of Bodies involving Dry-friction. Application

Unit II: Properties of Surfaces and Solids **9 lecture hours**

Centroid - First moment of area - Theorems of Pappus and Guldinus - Second moment of area - moment and Product of inertia of plane areas - Transfer Theorems - Polar moment of inertia - Principle axes - Mass moment of inertia

Unit III: Engineering Dynamics **9 lecture hours**

Kinematics of particles - Newton's second law - D'Alembert principle - analysis of lift motion - linear and angular momentum - Work and Energy - work done by a force and spring - kinetic energy and work-energy principle - application of the work and energy principle - Impulse and Moment - Introduction to momentum principle - conservation of total momentum of particle - application of principle of impulse and momentum.

Unit IV: Analysis of plane truss **9 lecture hours**

Trusses - Introduction - Simple Truss and Solution of Simple truss - Method of Joints - Method of Sections - Method of Tension Coefficient.

Unit V: Stresses and Strains **9 lecture hours**

Simple Stress and Strain: Introduction - Normal and Shear stresses - Stress - Strain Diagrams, Solution of simple problems – Tapered Section - One Dimensional Loading of members of varying cross-section – Concepts of Elastic Constants.