DAV UNIVERSITY JALANDHAR

Course Scheme & Syllabus

Master of Technology

In

Structural Engineering

Session 2015 onwards

DAV UNIVERSITY, JALANDHAR

M Tech (Structural Engineering)

Semester	Course Code	Course Title	L	T	P	Cr	Nature of Course
1	MGT551	Research Methodology	4	0	0	4	Core
1	MTH551	Numerical Analysis	4	0	0	4	Core
1	CES 501	Dynamics of Structure	4	-	-	4	Core
1	CES 503	Analysis and Design of Foundations	4	-	-	4	Core
1	CES 505	Bridge Engineering	4	-	-	4	Core
1	CES 507	Structural Engineering Laboratory-I	-	-	4	2	Core (Lab)
			20	**0**	**4**	**22**	
Semester	**Course Code**	**Course Title**	**L**	**T**	**P**	**Cr**	**Nature of Course**
2	CES 502	Theory and Design of plates and Grids	4	-	-	4	Core
2	CES 5XX	Department Specific Elective-I	4	-	-	4	DSE-1
2	CES 5XX	Department Specific Elective-II	4	-	-	4	DSE-2
2	CES 5XX	Department Specific Elective-III	4	-	-	4	DSE-3
2	XXX	Generic Elective - 1	4	0	0	4	GE-1
2	CES 510	Structural Engineering Laboratory-II	-	-	4	2	Core (Lab)
2	CES 512	Seminar	0	0	4	2	Seminar
			20	**0**	**8**	**24**	
Semester	**Course Code**	**Course Title**	**L**	**T**	**P**	**Cr**	**Nature of Course**
3	CES 5XX	Department Elective-IV	4	-	-	4	DSE-4
3	XXX	Generic Elective -2	4	0	0	4	GE-2
3	CES 513	Dissertation Part-I	-	-	12	8	Dissertation Part - 1
			8	**0**	**12**	**16**	
Semester	**Course Code**	**Course Title**	**L**	**T**	**P**	**Cr**	**Nature of Course**
4	CES514	Dissertation Part - 2	0	0	0	12	Dissertation Part - 2
			0	0	0	**12**	

Discipline Specific Electives

DSE-1	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	CES521	Pre-stressed Concrete	4	0	0	4	Structures
	CES 523	Finite element analysis	4	0	0	4	Structures
	CES 525	Tall Structures	4	0	0	4	Structures
	CES 527	Ground Improvement	4	0	0	4	Structures
	CES 529	Soil Structure interaction	4	0	0	4	Structures

DSE-2	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	CES 522	Advanced Structural Design and Detailing	4	0	0	4	Structures
	CES 524	Advanced Solid Mechanics	4	0	0	4	Structures
	CES 526	Disaster Reduction and Management	4	0	0	4	Structures
	CES 528	Design of Steel and Steel-Concrete composites	4	0	0	4	Structures
	CES 530	Site investigations	4	0	0	4	Structures

DSE-3	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	CES531	Design of Industrial Structures	4	0	0	4	Structures
	CES 533	Earthquake resistant design of Masonry and RC Buildings	4	0	0	4	Structures
	CES 535	Hydraulic Structures	4	0	0	4	Structures
	CES 537	Advanced Concrete Technology	4	0	0	4	Structures
	CES 539	Building Services	4	0	0	4	Structures

DSE-4	Course Code	Course Title	L	T	P	Cr.	Area of Specialization
	CES 532	Construction Techniques And Management	4	0	0	4	Structures
	CES 534	Reliability Analysis Of Structure	4	0	0	4	Structures
	CES 536	Wind Effect on Structures	4	0	0	4	Structures
	CES 538	Infrastructure Planning And Management	4	0	0	4	Structures
	CES 540	Rehabilitation Of Structures	4	0	0	4	Structures

L: Lectures T: Tutorial P: Practical Cr: Credits

Generic Electives

S. No	Course Code	Course Title	L	T	P	Cr.
1	ELE901	Renewable Energy Sources	4	0	0	4
2	ELE902	Energy Audit and Management	4	0	0	4
3	CHL901	Analytical Techniques	4	0	0	4
4	CHL902	Pollution Abatrment and Control Equipment's	4	0	0	4
5	MEC901	Methods Engineering and Ergonomics	4	0	0	4
6	MEC902	Power Plant Engineering	4	0	0	4
7	CSE901	Soft Computing	4	0	0	4
8	CSE902	Mobile Communications	4	0	0	4
9	ECE901	Smart Sensors	4	0	0	4
10	ECE902	Silicon Chip Technology	4	0	0	4
11	CIV901	Transportation Engineering	4	0	0	4
12	CIV902	Water Resource Engineering	4	0	0	4
13	MGT051	Business Strategy	4	0	0	4
14	MGT052	Principles of Marketing	4	0	0	4

M Tech Course Structure							
CBCS	**Nature of Courses**	**Core**	**Elective Courses**			**Ability Enhancement Courses**	
Year	**Course Structure**	**Core**	**Dissertation/ Project**	**Generic Elective**	**Discipline Specific Elective**	**Ability Enhancement Compulsory Courses**	**Skill Enhancement Courses**
(2015)	**Structural Engineering**	28	22	8	16	0	0

Detailed Syllabus

SEMESTER -I

Course Tile: DYNAMICS OF STRUCTURE
Paper Code: CES501

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

• To understand the behaviour of structures under dynamic loads
• To familiarize with the dynamic analysis of structures subjected to time varying loads

Learning Outcomes

• Will be equipped with the analytical tools required to determine the dynamic response of structures
• will serve as a pre-requisite to study the subject "Analysis and design of earthquake resistant structures"

PART-A

Single Degree of Freedom Systems, Free and Forced vibration, Dynamic response, Transient and Steady state forcing functions. **8**

PART-B

Damping effects, Greens Function, Multi-degree of Freedom Systems Natural frequencies and mode shapes, Vanello Stodola and Matrix iteration methods **10**

PART-C

Energy methods, Lagrange's equation, Simple applications Continuous Systems, Approxin solutions, Rayleigh, Ritz Methods, Vibrations of building frames, Modal Analysis. **12**

PART-D

Base excited system, formulation of equations for SDOF & MDOF systems, concepts of spectral quantities and response spectrum, fundamental of earthquake engineering, Solution of eigen value problems mode superposition method and modal truncation errors-modal acceleration method, direct integration method, explicit and implicit methods **14**

Reference books

1. A.K. Chopra. Dynamics of Structures, 3rd Edition, Pearson, 2007.
2. Clough and Penzien. Dynamics of Structures, 5th Edition, McGraw Hill, 1975.
3. John M. Biggs. Introduction to Structural Dynamics, 1st Edition, McGraw Hill Book Co, 1964.
4. Mario Paz. Structural Dynamics Theory and Computation, 2nd Edition, CBS Publishers, 2010.
5. Clough and Penzien. Dynamics of Structures. New Delhi: McGraw-Hill Education (ISE Editions); International 2 Revised edition (1 August 1993)
6. Grover,G.K. Mechanical Vibrations. Roorkee: Nem Chand & Bros., 1972.
7. Walter C. Hurty & Moshe F. Rubinsten. Dynamics of Structures. USA: Prentice Hall, 1964

Course Title: ANALYSIS AND DESIGN OF FOUNDATIONS
Paper Code: CES 503

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:

- To determine the bearing capacity of soil and the probable settlement and also to select the type of depth of foundation for a project.
- To import empirical knowledge of soil behaviour required by the geotechnical engineer for the design of foundation and other soil related structures..

Learning Outcomes:

- A comprehensive and well defined knowledge on bearing capacity theories is expected. Also an exposure on grey areas like the design of laterally loaded piles and sheet piles will be obtained.
- Students are trained how to design the foundations of a particular project depending upon the properties of soil and type of projects.

PART-A

Functions and requisites of a foundation - Different types - Choice of foundation type – Types of deep foundation – Types of pile foundations- Factor governing choice of type of pile – Choice of pile materials, - Load carrying capacity of piles by static formulae: Introduction- Pile driving formulae selection of pile hammers- Determination of temporary elastic compression- Driving stresses in piles- Field measurement- Wave equation analysis 14

PART-B

Group action in piled foundations: Introduction- Minimum spacing of piles- group efficiency- Estimation of group bearing capacity- Effect on pile groups of installation methods- Settlement of pile group- Reduce differential settlement in pile group 14

PART-C

Bearing capacity of shallow foundations based on the classical earth pressure theory of Rankine. Prandtl's theory, Terzaghi's theory, Meyerhof's theory 14

PART-D

Retaining Walls-Types - Stability analysis of cantilever retaining walls against overturning and sliding-Bearing capacity considerations- Structural design of retaining walls Introduction to well foundations – Elements of well foundations – Types – Sinking stresses in wells – Design of well cap, Well staining, well curb, cutting edge and bottom plug 14

References Books:

1. J.E. Bowles. Foundation Analysis and Design. New Delhi: McGraw Hill, 1996.
2. M.J. Tomlinson. Foundation Design and Construction. USA: Addison Wesley, 2001.
3. M.J. Tomlinson. Pile Design and Construction Practice. UK: E & FN Spon, 1987.
4. Braja M. Das. Principles of Foundation Engineering. Singapore : Thomson Asia Pte , 1987, London Ltd., 2005, A viewpoint publication.
5. P.C. Varghese. Foundation Engineering. New Delhi: Prentice-Hall of India, 2005.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: BRIDGE ENGINEERING
Paper Code: CES505

Course Objectives

- To understand the theory and design methods of various forms of bridges.

Learning Outcomes

- Students should be able to select a particular form of bridge to suit the requirements and analyze, design the same.

PART-A

Introduction-definition and components of bridges. Layout and planning of bridges- classification, investigations for bridges, preliminary data collection, choice of type of the bridges, hydraulic design of bridges, traffic design of bridges. 10

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PART-B

Analysis and design of superstructure of straight and curved bridge decks- Loadings details, specification-reinforced concrete and steel decks. Decks of various types like slab, hollow and voided slab, beam and slam, box girder etc 10

PART-C

Design of substructure-piers and abutments of different types. Analysis and design of foundations- shallow foundations (open Foundations), deep foundations- well foundations and caisson. 12

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PART-D

Modern methods of construction of concrete and steel bridges- their impact on the analysis and the design. Introduction to analysis and design of long span bridges like suspension and cable stayed bridges. Special aspects in analysis and design, based on construction methodology. Inspection and maintenance and rehabilitation of bridges. 14

Reference books

1. Johnson Victor D. Essentials of Bridge Engineering. New Delhi: Oxford & IBH Pub.Co., 2007.
2.Vazirani V. N., Design of Concrete Bridges, Khanna publishers,2004.
3.Jagadeesh T.R and Jayaram M.A. Design of Bridge Structures. New Delhi: Prentice Hall,2004.
4. Krishnaraju, N. Design of Bridges. New Delhi: Oxford & IBH Pub. Co.,2010.
5. Krishnaraju, N. Prestressed Concrete bridges, New Delhi: CBS Publishers,2010.
6. IRC 6-2000,IRC 21-2000,IS 800-2007,IRC 18-1985,IRC 24-2001,IRC 83-1987

Course Title: STRUCTURAL ENGINEERING LABORATORY-1
Paper Code: CES507

L	T	P	Credits	Marks
0	0	4	2	50

Study of the effect of water/cement ratio on workability and strength of concrete - Effect of aggregate/cement ratio on strength of concrete - Effect of fine aggregate/coarse aggregate ratio on strength and permeability of concrete - Study of Mix design methods - study of stress-strain curve of concrete - correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture - effect of cyclic loading on steel - Non-Destructive testing of concrete - Study of behavior of Beams under flexure, Shear and Torsion.

References Books:

1. Nevilli, A. M.. Properties of Concrete. 5th Edition, USA: Prentice Hall, 2012
2. Shetty, M. S. Concrete Technology. Delhi: S. Chand & Co. 2006.

DAV UNIVERSITY, JALANDHAR

SEMESTER -II

Course Title: THEORY AND DESIGN OF PLATES AND GRIDS
Paper Code: CES502

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:
Thin walled structures in the form of plates and shells are encountered in many branches of technology. Such a widespread use of plate and shell structures arises from their intrinsic properties. So it is necessary to study the behavior of the plates and shells with different geometry under various types of loads.

Learning Outcomes:
Understand the behavior of plates and shells under different types of loads and come up with proper design methods.

PART-A

Introduction-Assumptions in the theory of thin plates-Bending of long rectangular plates to a cylindrical surface. Pure bending of plates-Slope and curvature - Relations between bending moments and curvature - Particular cases of pure bending. Symmetrical bending of circular plates-Differential equation-Uniformly loaded circular plates with simply supported and fixed boundary conditions- Annular plate with uniform moments and shear forces along the boundaries 14

PART-B

Small deflections of laterally loaded plates-Differential equation-Boundary conditions-Navier solution and Levy's solution for simply supported rectangular plates-Effect of transverse shear deformation-Anisotropic plates. Theory of folded plates-Design of reinforced concrete folded plates. 14

PART-C

Deformation of shells without bending-definitions and notation- Shells in the form of a surface of revolution, displacements-Membrane theory of cylindrical shells plates. General theory of cylindrical shells-A circular cylindrical shell loaded symmetrically with respect to its axis- stresses in cylindrical shell under dead and snow loads, symmetrical deformation. 14

PART-D

General case of deformation of cylindrical shell- cylindrical shells with supported edges- Shells having the form of surface of revolution and loaded symmetrically with respect to their axis. Detailed analysis and design of cylindrical shells- hyperbolic shells- Hyperbolic paraboloid shells-Detailing of reinforcement in shells, edge beams and transfer beams. 14

References Books:

1. Timoshenko S.P. and Krieger S. W. Theory of Plates and Shells. New Delhi: Tata Mc Graw Hill, 1959
2. Chandrashekhara K., Theory of Shells, Universities (India)Press Ltd., 2001
3. Ramaswamy G. S., Design and Construction of Concrete Shell Roofs, CBS Publishers, 2005.
4. Bairagi N. K., Plate Analysis. Delhi: Khanna Publishers, 1986
5. Kelkar V. S. and Sewell R.T., Fundamentals of the Analysis and Design of Shell Strutures. New Delhi: Prentice Hall Inc., 1987
6. T.K.Varadan & K. Bhaskar, Anályses of plates – Theory and problems. Bangalore: Narosha Publishing Co.,1999.
7. Reddy J N. Theory and Analysis of Plates and Shells. Taylor and Francis, 2006

DEPARTMENTAL ELECTIVE-I

Course Title: **PRESTRESSED CONCRETE**
Paper Code: **CES521**

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives
To impart to students the knowledge of methods of prestressing, analysis and design of various prestressed concrete elements under relevant codal provisions.

Learning Outcomes
Understand and use suitably the different concepts of prestressing. Comprehend the design of various prestressed concrete members used in practice.

Unit – A

Reinforced and prestressed concrete construction - Prefabricated structures - Production of ready mixed concrete - Productivity analysis 12

Unit – B

Pre-stressing systems and end anchorages, losses of pre-stress. Composite construction: Types, analysis and design. Concept of partial prestressing. Circular prestressing: Analysis and design of pipes and water tanks, 12

Unit – C

Analysis and design of members for flexure, shear, bond and bearings. Cable layouts. Design of circular systems, domes and slabs. 12

Unit – D

Design of Pre-stressed Bridges, (Super-structure only). Design of Continuous beams. 10

References Books:

1. Krishna Raju N. Prestressed concrete. New Delhi :Tata McGraw Hill Company, 1998.
2. Mallick S.K., Gupta A.P., Prestressed concrete, Delhi: Oxford and IBH publishing Co. Pvt. Ltd. 1997.
3. Rajagopalan, N. Prestressed Concrete. Delhi: Alpha Science, 2002.
4. Ramaswamy G.S. Modern prestressed concrete design. New Delhi: Arnold Heinimen, 1990.
5. Lin T.Y. Design of prestressed concrete structures. Bombay: Asia Publishing House, 1995.
6. IS 1343: 1980 Indian Standard Code of Practice for Prestressed Concrete
7. IS 456: 2000 Indian Standard Code of Practice for Plain and Reinforced Concrete

DAV UNIVERSITY, JALANDHAR

Course Title: FINITE ELEMENT ANALYSIS

L	T	P	Credits	Marks
4	0	0	4	100

Paper Code: CES523

Course Objectives

• To provide an understanding of fundamental knowledge and technique of FEM

• To develop tools to analyze engineering problems using FEM and typical commercial FEA package.

Learning Outcomes

• Will be able to analyze and build FEA model for various engineering problems.

• Can be extended to the dynamic analysis of structures

PART-A

Basic equations of solid mechanics-review of equilibrium conditions, strain – displacement relations, stress – strain relations, principles of virtual work and stationary potential energy and various formulations. 14

Approximate methods Rayleigh, Ritz weighted residual (Galerkin) and finite difference methods.

PART-B

Finite element method: displacement model-shape functions Lagrange and Serendipity elements. Element properties-isoperimetric elements-numerical integration technique assemblage of elements and solution technique for static analysis. 14

Analysis of framed structures-2D & 3D truss and beam element and applications.

PART-C

Analysis of plan stress/strain and ax symmetric solids-triangular, quadrilateral and isoperimetric elements, incompatible modes. Three dimensional stress analysis, isoperimetric 8 and 20 nodded elements. 14

PART-D

Analysis of plate bending-basic equations of thin plate theory Reissinner-Mindlin theory-plate elements and applications. Analysis of shells-degenerated shell elements. Finite element programming and FEA software. 14

References Books:

1. Cook R D et al. Concepts and Applications of Finite Element Analysis. Singapore: John Wiley & Sons. .
2. Krishnamoorthy C S. Finite Element Analysis- Theory and Programming. New Delhi: Tata McGraw Hill.
3. Bathe K J. Finite Element Procedures in Engineering Analysis. New Delhi: Prentice Hall.
4. Zienkiewicz, O.C. and Taylor, R.W. Finite Element Method. UK: Elsevier Butterworth-Heinemann.
5. Rajasekharan S. Finite Element Analysis in Engineering Design, New Delhi: Wheeler.
6. Chandrupatla T R and Belegundu A D. Introduction to Finite Elements in Engineering, New Delhi: Pearson Education.
7. Hutton D V. Fundamentals of Finite Element Analysis, New Delhi: Tata McGraw Hill Education Private Ltd. .

DAV UNIVERSITY, JALANDHAR

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: TALL STRUCTURES
Paper Code: CES 525

Course Objectives

• The ability to identify the structural systems for various combinations of gravity and horizontal loading considering their functional use and heights.
• Should be able to analyze the behavior and drift capacities of various high rise structural forms

Learning Outcomes

• Understand behavior of common high rise structures under gravity and lateral loading
• Understand the drift capabilities of different structural forms

PART-A

Definition of tall building-need for constructing tall building-Historic background-factors affecting growth. Design Criteria, Design Philosophy of High Rise structures, Materials, Loading gravity loading- Dead and live load, live load reduction techniques-sequential loading, Impact loading, Wind Loading, Wind Characteristics, Static and Dynamic wind Effects. 14

PART-B

Analytical and wind tunnel experimental method, Earthquake loading-equivalent lateral force method, modal analysis, Introduction to Performance based seismic design. Structural form, Floor systems, Rigid frame Structures- rigid frame behaviour –approximate determination of member forces by gravity loading- two cycle moment distribution, approximate determination of member forces by lateral loading- Portal method, Cantilever method, approximate analysis of drift. 14

PART-C

Structural design of tall concrete and masonry buildings: commentary structure a standards, plastic analysis-strength of members and correction, non-linear analysis and limit design, stability, stiffness and crack control creep shrinkage and temperature effects. Limit state design, masonry structures. 14

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PART-D

Frame-shear wall systems: Twist of frame. Analysis of shear wall, frame wall interaction, analysis of coupled shear wall, computation of earthquake load dynamic analysis of tall building. 14

References Books:

1. Smith Bryan Stafford, Coull Alex. Tall Building structures: Analysis and Design, New York Wiley-Interscience, , 1991.
2. Taranath Bungale S. Structural Analysis and Design of Tall Buildings. New Delhi: Tata Mc Graw Hill,1988.
3. Kolousek V, Pimer M, Fischer O and Naprstek J, Wind effects on Civil Engineering Structures. Elsevier Publications.1984.
4. Robert L Wiegel. Earthquake Engineering. USA: Prentice Hall, 1970.
5. ATC40- Seismic evaluation and retrofitting of concrete buildings, Seismic safety commission, California 1996.
6. Wolfgang Schuller. High Rise Building structures. UK: JohnWiley and sons,1977.
7. Mark Fintel. Hand book of concrete engineering. Van Nostrand Reinhold, 1985.
8. FEMA 445, Next generation Performance based seismic design guidelines, FEMA, 2006.

Course Title: GROUND IMPROVEMENT
Paper Code: CES527

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

• To demonstrate how theoretical knowledge and observation of engineering performance assist in rational application of ground modification procedure.
• To give a thorough understanding of the various techniques used in ground improvement.

Learning Outcomes

• A study of the many different approaches to ground modification broadens the minds and inspires creativity and innovation in geotechnical construction and related fields.
• Equips to make an informed decision on which technique to be used in a particular situation.

PART-A

Role of ground improvement – Drainage and groundwater lowering – Well point systems – 14
Thermal and freezing methods – Insitu densification – Deep compaction– Dynamic compaction – Blasting – Sand piles – Preloading with sand drains – Stone columns- Lime piles.

PART-B

Earth reinforcement – Rock bolts – Cables and guniting – Geotextiles as reinforcement – 14
Filtration. Drainage and Erosion control – Soil Nailing – Micro piles.

PART-C

Grouting – Types – Rheology – Applications – Electro chemical stabilization – 14
Physical andchemical aspects of stabilization – Stabilization with cement, lime etc..

PART-D

Soil Stabilization: Lime stabilization-Base exchange mechanism, Pozzolanic reaction, lime-soil interaction, lime columns, Design of Foundation on lime columns. Cement stabilization. Mechanism, amount, age and curing. Fly-ash – Lime Stabilization, Soil Bitumen Stabilization. 14

References

1. Manfred Hausmann, Ground modification (1990) – McGraw Hill, New York.
2. Purushothama Raj, Ground Improvement Techniques Laxmi Publications, New Delhi, India, 1999.
3. F.G. Bell, Foundation Engineering in Difficult Ground (1978), Butterworth – Heinmann, 1978.
4. Frank Harris, Ground Engineering Equipments and Methods, McGraw hill Book company Ltd,
New York, 1983.

Course Title: SOIL STRUCTURE INTERACTION
Paper Code: CES529

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

• To demonstrate how theoretical knowledge and observation of engineering performance assist in rational application of soil structural behaviour.

• To give a thorough understanding of the various techniques used in ground improvement.

Learning Outcomes

• A study of the many different approaches to ground modification broadens the minds and inspires creativity and innovation in geotechnical construction and related fields.

PART-A

Soil foundation Interaction: 14

Introduction to soil foundation interaction problems, soil behaviour, foundation behaviour, interface behaviour, scope of soil foundation interaction analysis, soil response models,

PART-B

Beam on Elastic foundation-soil models: 14

Infinite beam, two parameters, Isotropic elastic half space, analysis of beams of finite length, classification of finite beams in relation to their stiffness.

PART-C

Plate on Elastic medium: 14

Infinite plate, Winkler, two parameters, isotropic elastic medium, thin and thick plates, analysis of finite plates: rectangular and circular plates, Numerical analysis of finite plates, simple solutions.

PART-D

Elastic analysis of piles: 14

Elastic analysis of single pile, theoretical solutions for settlement and load distributions, analysis of pile group, interaction analysis, load distribution in groups with rigid cap.

References

1. Elastic analysis of soil foundation interaction by Selva durai, A.P.S.
2. Pile Foundation Analysis and Design by Poulos, H.G. & Davis E.H.
3. Foundation Analysis by Scott, R.F.
4. Structure Soil Interaction- State of Art Report, Institution of Structural Engineers, 1978
5. Geotechnical Earthquake Engineering By Kramer, S.L

DEPARTMENTAL ELECTIVE-II

Course Title: ADVANCED STRUCTURAL DESIGN AND DETAILING
Paper Code: CES522

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:

• The ability to identify the structural systems for various combinations of gravity and horizontal loading considering their functional use and heights.
• Should be able to analyse the behaviour and drift capacities of various high rise structural forms.

Learning Outcomes:

• Understand behaviour of common structures under gravity and lateral loading
• Understand the drift capabilities of different structural forms

PART-A

Introduction to limit state method of design, provisions in the Indian standard codes for loading wind loads and seismic loads, design and detailing of concrete structures. 14

PART-B

BIS Handbook for design, Examples of design using handbook. 14
Design of Structures as per I.S. 1893 for Earthquake Resistant Design Construction.

PART-C

Design and Detailing Requirements as per 4326-1993. 14
Design and Detailing of Earthen Buildings as per 13827-1993.

PART-D

Design and Detailing of Masonry Structures as per I.S. 13828-1993 14
Design and Ductile Detailing of R.C.C. Structures as per I.S. 13920-1993
Repair and Seismic Strengthening of Buildings as per I.S. 13935-1993.

References Books:

1. Dayaratnam, P. Reinforced Concrete Structure 2007
2. Jain, A.K. Reinforced Concrete, Limit State Method of Design, 2007
3. Punmia, B.C. Reinforced Concrete Structures, Vol II 2007
4. Jain and jaikrishna Plain and Reinforced Concrete Vol II 2003
5. P.Dayaratnam :Design of Steel Structures: 2005
6. B.I.S. Codes 1893, 4326, 13827, 13828, 13920, 13935

DAV UNIVERSITY, JALANDHAR

Course Title: ADVANCED SOLID MECHANICS
Paper Code: CES524

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:
Introduce Fracture Mechanics and its applications to Structural Engineering students
Learning Outcomes:
Understand fracture mechanics which has wide applications in Structural Engineering.

PART-A

Theory of stress, state of stress in a body, Differential equations of equilibrium. Analysis of state of stress at a given point in a body 14

PART-B

Geometrical theory of strains, displacement components and strain components and relation between them, generalized hooks law 14

PART-C

Strains expressed in terms of stresses, stresses expressed in terms of strains, torsion of prismatic bars and bending 14

PART-D

Saint- Venant method, three dimensional stress systems , tensors, unsymmetrical bending. 14

References Books:

1. S.Timoshenko. Theory of elasticity. New Delhi: McGraw-Hill Publishing Company; 3rd edition (October 1, 1970), 2003.
2. M.Filonenko. Theory of elasticity. New Delhi: John Wiley & Sons, 2001.

DAV UNIVERSITY, JALANDHAR

Course Title: DISASTER REDUCTION AND MANAGEMENT

Paper Code: CES526

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:

• To impart awareness about the effect of earthquakes on structures.

• To study IS code provisions for the analysis, design and detailing of earthquake resistant Structures

Learning Outcomes:

• Understand various aspects of earthquake engineering

• Capable of design and detailing of earthquake resistant structures

• Awareness about disaster management due to earthquakes.

PART-A

Elements of earthquake engineering- characteristics of ground motion – earthquake intensity and magnitude- recording instruments -seismic zoning- earthquake effects on different types of structures- Effect of architectural features and structural irregularities- review of damages during past earthquakes 14

PART-B

IS Code provision for design and detailing for earthquake resistance- reinforcement detailing for members and joints- design examples. Repair and rehabilitation of damaged structures- case studies- methods for disaster mitigation- Vulnerability assessment and seismic evaluation of structures– vulnerability reduction 14

PART-C

Management cell, Central crisis management core group, damage reconnaissance, Management of relief and rehabilitation (Infrasture rehabilitation, Housing rehabilitation, Social rehabilitation), Role of volunteers, Emergency operation centers, Information system, Danger zone restrictions, Cooperation with local authority, Coordination for international relief, Role of government, NGO's, Business and donors, Role of remote sensing in relief operations, Information management and related technologies in engineering and disaster management. 14

PART-D

Principles and guidelines for earthquake resistant design of structures- Design lateral forces- Static analysis – Dynamic analysis- Shear walls 14

References Books:

1. IS: 1893-2002, Indian Standard criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi
2. IS: 4326-1993, Indian Standard code for practice for Earthquake Resistant Design and Construction of Buildings, Bureau of Indian Standards, New Delhi.
3. IS: 13920-1993, Indian Standard Ductile Detailing of RCC Structures subjected to seismic forces-Code of practice, Bureau of Indian Standards, New Delhi
4. SP: 22-1982, Explanatory Handbook on codes of Earthquake Engineering, Bureau of Indian Standards, New Delhi
5. Pankaj Agarwal and Manish Shrikhande, Earthquake Resistant Design of Structures. New Delhi : Prentice- Hall of India.
6. Anil K Chopra, Dynamics of Structures. Prentice- New Delhi: Hall of India.
7. S. K. Duggal-Earthquake Resistant Design of Structures-Oxford University Press-2007

DAV UNIVERSITY, JALANDHAR

Course Title: DESIGN OF STEEL AND STEEL-CONCRETE COMPOSITE STRUCTURES
Paper Code: CES 528

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

• The ability to DESIGN and analysis the steel structures like gantry girders framed connections, compression and tension members.

• Should be able to analyse the behaviour of composite sections like slabs, columns, deck panels etc.

Learning Outcomes

• Understand the principles and design concepts of framed structures and composite sections.

PART-A

Design of members subjected to lateral loads and axial loads - Principles of analysis and design of Industrial buildings and bents - Crane gantry girders and crane columns – Analysis and design of steel towers - Design of industrial stacks – Self-supporting and guyed stacks lined and unlined. 14

PART-B

Types of connections, Design of framed beam connections, Seated beam connection, Unstiffened, Stiffened Seat connections, Continuous beam – to - beam connections and continuous beam–to–column connection both welded and bolted. Cold formed Steel Sections - Types of cross sections - Local buckling and post buckling - Design of compression and Tension members - Beams - Deflection of beams – Combined stresses and connections. 14

PART-C

Introduction to composite design – shear connectors – types of shear connectors – degrees of shear connections – partial and full shear connections – composite sections under positive bending – negative bending – propped conditions – un-propped conditions – deflection of composite beams. 14

PART-D

Introduction – Composite slabs – profiled sheeting – sheeting parallel to span – sheeting perpendicular to span - Types of Composite columns – design of encased columns – design of in-filled columns – axial, uni-axial and bi-axially loaded columns. Composite shear wall – double skinned composite deck panels – composite trusses – composite frames – composite plate girders. 14

References Books:

1. Arya, A.S. Design of Steel Structures. New Delhi: New Chand & Brothers, 1982.
2. R.P. Johnson. Composite Structures of Steel & Concrete. UK: Blackwell Scientific publications, 1994.

DAV UNIVERSITY, JALANDHAR

Course Title: SITE INVESTIGATION

L	T	P	Credits	Marks
4	0	0	4	100

Paper Code: CES530

Course Objectives: The course is intended for geotechnical engineers/engineering geologists to gain a practical understanding of the planning and design of site investigations, the spectrum of investigation techniques available, laboratory test scheduling, and interpretation of results

Learning Outcomes:

- Plan and define the scope of a Site Investigation
- Understanding the application of various in situ testing techniques
- Identify different soil types and basic classification
- Compile a specification for Site Investigation

PART-A

Introduction: Soil formation Processes – Characteristics of major soil deposits of India. Necessity and Importance of soil exploration Method of sub surface exploration Test pits , Trenches, Caissons, Tunnels and drifts, Wash boring , Percussion drilling , Rotary drilling, Factors affecting the selection of a suitable method of boring. Extent of boring, Factors controlling spacing and depth of bore holes, Spacing and depth for various Civil engineering structures. [12]

PART-B

Indirect method of exploration, Seismic method, Electrical resistivity, Resistivity sounding and profiling, Qualitative and quantitative interpretation of test results, Comparison of resistivity and seismic surveys, Shortcomings. [6]

Ground water Observation: Different method of ground water observation: Time lag in observation, Sampling of ground water. [8]

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PART-C

Sampling: Source of disturbance and their influence, Type of sampler, Principle of design of sampler, Representative and undisturbed sampling in various types of soils, Surface sampling, Amount of sampling, Boring and sampling record, Preservation and shipment of sample preparation of bore log. Standard penetration test, Dynamic cone penetration tests with and without bentonite mud slurry. Static cone penetration test, Surface sampling. Cyclic plate load test, Large shear box test, Vane shear test, Pile load, In situ Permeability. Pumping in test and pumping out test [14]

PART-D

Investigation below sea/river bed – methods and equipment's – interpretation of offshore exploration, Instrumentation in soil engineering - strain gauges - resistance and inductance type - load cells, earth pressure cells - settlement and heave gauges - piezometers and slope indicators - inclinometer, Field visit, data and report preparation. [10]

References Books:

1. Hvorsler M. "Subsurface exploration and sampling of soil for Civil Engg. Purposes
2. Simon and Cayton " Site investigation"

DEPARTMENTAL ELECTIVE-III

Course Title: DESIGN OF INDUSTRIAL STRUCTURES
Paper Code: CES531

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

- It provides the ability in analysis and design of basic reinforced concrete and Steel components.
- To study of advanced topics including theory and design of reinforced concrete structures

Learning Outcomes

- Understand the theory and design of the main elements in reinforced concrete and Steel structures
- Understand the behaviour of reinforced concrete structures
- Carry out calculations on safety verification of various members
- Understand the design of special steel and RCC components

PART-A

ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS: Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular c truss, Truss for a railway platform. 14

PART-B

Planning of Industrial Structures, Steel Gantry Girders - Portal Frames - Gable Structures - Light weight Structures 14

PART-C

Steel Bunkers- Silos, RC Bunkers and Silos- Water Tanks 14

PART-D

Design of Steel Chimneys, Towers, Hyperbolic Cooling Towers. 14

Reference books

1. N. Krishna Raju. Advanced Reinforced Concrete Design. New Delhi: CBS Publishers & Distributors.
2. Chandra, Ram. Design of Steel Structures. Jodhpur: Scientific Publishers, 2007.
3. Duggal. Design of Steel Structures. New Delhi: McGraw-Hill Education (India) Pvt Limited, 2009.
4. P. Dayaratnam. Design of Steel Structures. Delhi: S. Chand & Company Ltd., 2010
5. Vazirani and Ratwani. Design of steel structures. New Delhi: Khanna Publishers.

DAV UNIVERSITY, JALANDHAR

Course Title: EARTHQUAKE RESISTANT DESIGN OF MASONRY AND RC BUILDINGS
Paper Code: CES533

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

- To impart awareness about the effect of earthquakes on structures.
- To study IS code provisions for the analysis, design and detailing of earthquake resistant structures

Learning Outcomes

Understand various aspects of earthquake engineering
Capable of design and detailing of earthquake resistant structures
Awareness about disaster management due to earthquakes

PART-A

Introduction to Seismicity, Earthquake Motion and Response, Response Spectra, Philosophy of Capacity Design. 12

PART-B

Concepts of seismic design: Earthquake resistant design of R.C.C Structures and IS:1893. Earthquake resistant construction of R.C.C. Elements: Detailing aspects and IS:13920. 12

PART-C

Earthquake resistant design of Brick Masonry Structures and IS: 4326 12

PART-D

Introduction to Indian Standards, related to Earthquake Engineering. 12
Earthquake resistant design of Bridges.

Reference books

1. Fundamentals of earthquake engineering Newmark N.M. and Rosenblueth E.
2. Earthquake Design practice for Buildings Key, D
3. Dynamics of Structures Anil K. Chopra
4. Dynamics of Structures Clough and Penzien
5. Seismic design of R.C.C & Masonry Structures Pauley, T. and Priestley
6. Bridge Engineering: Seismic Design W.F. Chen & Lian Duan.

DAV UNIVERSITY, JALANDHAR

Course Title: HYDRAULIC STRUCTURES

Paper Code: CES535

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

- To impart awareness about the effect of hydraulics structures.
- To study IS code provisions for the analysis, design and detailing of hydraulics structures

Learning Outcomes

Understand various aspects of hydraulics engineering
Capable of design and detailing of hydraulic structures
Awareness about disaster management due to hydraulics

PART-A

Design procedure for irrigation channels, Irrigation outlets, Canal masonary Works. 12

PART-B

Principles of design, use of flow net, Khosla's theory , Regulation works - Falls, distributary head regulators, Cross regulators. 12

PART-C

Cross drainage works, Canal head Works, Earth Dams, Gravity Dams, Spillways and Energy dissipaters 12

PART-D

Escapes, Trench weirs, Supply channel and head regulator. 12

Reference books

1. R.S. Varshney, S.C. Gupta and R.L. Gupta; Theory and Design of Irrigation Structures, Nemchand & Brothers ,Roorkee, 1992.
2. R.k. Sharma; Irrigation Engineering and Hydraulic Structures, Oxford and IBH Publishing Co., New Delhi, 1984.
3. Arora, K.R. " Irrigation water power and Water Resources Engineering", Standard Publishers Distributors, Delhi,2002..

DAV UNIVERSITY, JALANDHAR

Course Title: ADVANCED CONCRETE TECHNOLOGY
Course Code: CES537

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

This course is designed to

- Provide the ability in analysis and design of basic reinforced concrete components
- Study of advanced topics including theory and design of reinforced concrete structures

Learning Outcomes

- Understand the theory and design of the main elements in reinforced concrete structures
- Understand the behaviour of reinforced concrete structures
- Carry out calculations on safety verification of reinforced concrete members
- Understand the design of special reinforced concrete members and components

PART – A

Aggregates classification- Testing Aggregates, fibres. Cement, grade of Cement, chemical composition, Hydration of Cement, Structure of hydrated Cement, Special Cement, Water, Chemical and Mineral Admixtures. 12

PART – B

Principles of Concrete mix design, methods of Concrete mix design, Design of high strength and high performance concrete. 10

PART – C

Rheological behaviour of fresh Concrete- Properties of fresh and hardened concrete- Strength, Elastic properties, Creep and Shrinkage, Variability of concrete strength. Non destructive testing and quality control, Durability, corrosion protection and fire resistance. 12

PART – D

Modern trends in concrete manufacture and placement techniques, Methods of transportation, Placing and curing-extreme whether concreting, Special concreting methods, Vacuum dewatering of concrete-Under water concreting. 10

Light weight Concrete, Fly-ash Concrete- Fibre reinforced Concrete, Polymer Concrete, Epoxy resins and screeds for rehabilitation- properties and application.

Reference Books:

1. Krishnaraju, N. Advanced Concrete Technology. New Delhi: CBS Publishers, 1985.
2. Nevile, A.M. Concrete Technology. New York: Prentice Hall, , 1985.
3. Santhakumar, A.R.. Concrete Technology. New Delhi: Oxford University Press, 2006.

DAV UNIVERSITY, JALANDHAR

Course Title: BUILDING SERVICES

L	T	P	Credits	Marks
4	0	0	4	100

Paper Code: CES539

Course Objectives

- This course introduces students to various methods of record keeping, preparation of checklists, identification of defects and selecting suitable repair techniques.

Learning Outcomes

- Students will be equipped to identify the defects in buildings and propose suitable repair and rehabilitation techniques.

PART-A

Orientation and Planning - Grouping and circulation - lighting and ventilation - Termite proofing of buildings- Lightning protection of buildings 12

PART-B

Fire protection of buildings - Vertical transportation – Prefabrication systems in residential buildings: Planning and modules and sizes of components in prefabrication 12

PART-C

Shell structures - Domes - Folded plate structures - Skeletal and space frame structures - Grain storage structures - Earthquake resistant structures - Air-conditioning and heating - Acoustics and Sound insulation – Plumbing services. 10

PART-D

Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking Maintenance, repair and rehabilitation, Facets of and importance of Maintenance Preventive measures on various aspects Inspection 10

References Books:

1. Arora, Bindra, Building Construction. New Delhi: Dhanpat Rai, 2012.
2. Hand Book of Housing Statistics, NBO, 2003.
3. National Building Code of India, Bureau of Indian Standards, 2005.
4. Raikar, R.N., Learning from failures – Deficiencies in Design, Construction and Service – R&D Centre (SDCPL). Bombay: Raikar Bhavan, 1987.
5. Allen R.T., Edwards S.C. Repairs of Concrete Structures.UK: Blaike and Sons,1987.

DEPARTMENTAL ELECTIVE-IV

Course Title: CONSTRUCTION TECHNIQUES AND MANAGEMENT
Paper Code: CES532

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:
• The ability to identify the structural systems for various combinations of gravity and horizontal loading considering their functional use and heights.
• Should be able to analyze the behavior and drift capacities of various high rise structural forms.

Learning Outcomes:
• Understand behavior of common structures under gravity and lateral loading
• Understand the drift capabilities of different structural forms

PART-A
Reinforced and prestressed concrete construction, Prefabricated structures, Production of ready mixed concrete, Productivity analysis, Economics of form work, Design of Formwork and their reusability, [10]

PART-B
Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts. Modular coordination, Standardization, system building, Lamination and Advantages of modular construction [12]

PART-C
Construction Law - public law; Government Departments and Local Authorities; Private Law, Contracts, Torts, property law and building law. Construction Contracts - Contract Specifications - types of contract documents used for construction [12]

PART-D
Contract Procurement - selecting a contractor. Contract procedure Disputes, Arbitration and litigation procedure- preparation, settlement, evidence. Price Adjustment: need for the formulae, comparison with previous system, Civil Engineering and building formulae, practical implications. [10]

References Books:
1. Allen E, Iano, J, Fundamentals of Building Construction Material and Method, John Wiley & Sons, 2011.
2. Cameron K. Andres, Ronald C. Smith, Principles and Practices of Commercial Construction, 8th Edition, Prentice Hall, 2009.
3.Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M. Tripathi Private Ltd.,
Bombay, 1982.
4. Jimmie Hinze, Construction Contracts, 2nd Ed., McGraw Hill, 2001.
5. Joseph T. Bockrath, ontracts and the Legal Environment for Engineers and Architects, 6th Edition,
McGraw Hill, 2000.

Course Title: RELIABILITY ANALYSIS OF STRUCTURE
Paper Code: CES534

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:
• Understand use of general concepts of statistics for probabilistic analysis.
• Understand the basic concepts related to reliability analysis of structures.
• Design the structures for various reliability indices
• The ability to identify the structural systems for various combinations of gravity and horizontal loading considering their functional use and heights. To analyze the behavior and drift capacities of various high rise structural forms.
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Learning Outcomes:
• Understand behavior of common structures under gravity and lateral loading
• Understand the drift capabilities of different structural forms

PART-A
Concepts of Structural Safety: General, Design methods. [2]
Basic Statistics: Introduction, Data reduction, Histograms, Sample correlation. [4]
Probability Theory: Introduction, Random events, Random variables, Functions of random variables, Moments and expectation, Common probability distribution, External distribution. [4]

PART-B
Resistance Distributions and Parameters: Introduction, Statistics of properties of concrete, Statistics of properties of steel, Statistics of strength of bricks and mortar, Dimensional variations, Characterization of variables, Allowable stresses based on specified reliability. [6]
Probabilistic Analysis of Loads: Gravity loads, Wind load. [6]
PART-C
Basic Structural Reliability: Introduction, Computation of structural reliability. Monte Carlo Study of Structural Safety: General, Monte Carlo method, Applications. [6]
Level 2 Reliability Methods: Introduction, Basic variables and failure surface, First-order second moment methods (FOSM). [4]

PART-D
Reliability Based Design: Introduction, Determination of partial safety factors, Safety checking formats, Development of reliability based design criteria, Optimal safety factors, Summary of results of study for Indian standard – RCC design. [6]
Reliability of Structural Systems: Preliminary concepts as applied to simple structures. [4]

References Books:
1. Ranganatham, R. "Structural Reliability Analysis and Design"
2. Melchers, R.E. "Structural Reliability"
3. Ditlevsen, O. and Madsen, H.O. , Structural Reliability methods, John Wiley & Sons (2007).
4. Madsen, H.O., Krenk, S. and Lind, N.C, Methods of structural safety, John Wiley & Sons (1999).

Course Title: WIND EFFECT ON STRUCTURES
Paper Code: CES536

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:

- To study the effect of wind loads, pressure variance on low and high rising structure
- To study the design consideration for different civil engineering structure in relationship with aerodynamic modifications

Learning Outcomes:

- To Understand wind effects on low as well as tall buildings ·
- Evaluation of wind forces for various structures using relevant Indian standards · Design of structures for wind resistance ·
- To Understand the role of wind tunnel testing for structural safety

PART-A

Introduction: Nature of wind storm, Design wind speed, Atmospheric boundary coyer and Wind turbulence. [6]

Basic Bluff body aerodynamics: Flow around bluff bodies, Pressure & force coefficients flow around flat plates, Walls, Prismatic shapes. [4]

PART-B

Wind effects on Low Buildings: Low buildings with different roof shapes and multi-span buildings. [6]

Wind effects on Tall Buildings: Along wind effects, across wind effects and vortex shedding. [4]

PART-C

Wind effects on Bridges: Basic force coefficients for bridges, Nature of dynamic response of long span bridges, Flutter instability, Buffeting of long span bridges. [8]

PART-D

Role of Wind Tunnel: Flow simulation, Modelling, Flow measurement, Pressure measurement, Deformation measurement. [8]

References Books:

1. Simiu, E., Scanlan, Robert H., Effects on Structures, Dover Publications, (1996).
2. Sachs, P.**,** Wind Forces in Engineering, Pergamon Press (1972).
3. Holmes, J.D., Wind Loading of Structures, Taylor & Francis (2007).

Course Title: INFRASTRUCTURE PLANNING AND MANAGEMENT

L	T	P	Credits	Marks
4	0	0	4	100

Paper Code: CES538

Course Objectives:

• The students are equipped with knowledge of basic theories, techniques, and design concepts to assume their assigned professional roles as members of multi-disciplinary teams which involve survey, analysis and plan making for an urban/regional areas

Learning Outcomes:

• Helps students to develop basic skills to serve various planning, development and management agencies in different professional capacities in the public sector as well as in private consultancy organizations later in their careers.

PART-A

Introduction: An overview of Basic Concepts Related to Infrastructure: Introduction to Infrastructure., An Overview of the Power Sector in India., An Overview of the Water Supply and Sanitation Sector in India., An overview of the Road, Rail, Air and Port Transportation Sectors in India. , An overview of the Telecommunications Sector in India. , An overview of the Urban Infrastructure in India. , An overview of the Rural Infrastructure in India. An Introduction to Special Economic Zones, Organizations and Players in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle., an Overview of Infrastructure Project Finance [10]

PART-B

Private Involvement in Infrastructure: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study. Privatization of Infrastructure in India : Case Study, Privatization of Road Transportation Infrastructure in India. [12]

PART-C

Challenges to Successful Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks : The Case study, Political Risks : The case study,: Socio-Environmental Risks : Case study, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure. [10]

PART-D

Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects, Sustainable Development of Infrastructure, Information Technology and Systems for Successful Infrastructure Management, Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions. [12]

References Books:

1. Grigg, Neil, Infrastructure engineering and management, Wiley, (1988).
2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, (1994).
3. Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).
4. Munnell, Alicia, Editor, Is There a Shortfall in Public Capital Investment? Proceedings of a Conference Held in June (1990).
5. World Development Report 1994: Infrastructure for Development (1994).
6. Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1st European Pavement Management Systems Conference, Budapest, September (2000).

Course Title: REHABILITATION OF STRUCTURES
Paper Code: CES540

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:
Recognise the mechanisms of degradation of concrete structures and conduct preliminary forensic assessment of deteriorated concrete structures;
Learn how to conduct field monitoring and non-destructive evaluation of concrete structures;

Learning Outcomes:
To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

PART-A

Maintenance and repair strategies: Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of distress and deterioration of concrete- Evaluation of existing buildings through field investigations, Seismic evaluation of existing buildings. **Serviceability and durability of concrete:** Quality assurance for concrete construction concrete properties – strength, permeability, thermal properties and cracking. – Effects due to climate, temperature, chemicals, corrosion – design and construction errors – Effects of cover thickness and cracking. [12]

PART-B

Materials and techniques for repair: Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning - Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating and cathodic protection. [10]

PART-C

Repairs, rehabilitation and retrofitting of structures: Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure - Special techniques for structural Retrofitting (Bracing, Shear walls, Base isolation etc) [8]

PART-D

Demolition techniques: Engineered demolition techniques for Dilapidated structures – case studies - Case Studies on Restoration of fire damaged buildings, Case study on repairs and strengthening corrosion damaged buildings; Case study on use of composite fibre wraps for strengthening of building components. [10]

References Books:

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, (1991).
2. R.T. Allen and S.C. Edwards, Repair of Concrete structures, Blakie and Sons, UK, (1987)
3. M. S. Shetty, Concrete Technology – Theory and Practice, S. Chand and Company, New Delhi, (1992).
4. Santhakumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, "RHDC – NBO" Anna University, July (1992).
5. Raikar, R.., Learning from failures – Deficiencies in Design, Construction and Service – R & D centre (SDCPL), Raikar Bhavan, Bombay, (1987).
6. N. Palaniappan, Estate Management, Anna Institute of Management, Chennai, (1992).

Generic Electives

DAV UNIVERSITY, JALANDHAR

Course Title: TRANSPORTATION ENGINEERING
Course Code: CIV901

L	T	P	Cr
4	0	0	4

Course Objective: Aim of this paper is to familiarize the students with highway planning and its maintenance.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of highway geometric design and various materials used in highway construction.

Part-A

Introduction: Importance and role of transportation systems; different modes of transportation, historical development of road construction, Highway Economics. [6]

Highway Planning & Project Preparation: Planning surveys, Highway alignment, Highway Location surveys, soil and material surveys, Highway Projects: drawing and report. [6]

Part-B

Highway materials and construction: Desirable properties of soil, Road aggregates, bitumen, cement & cement concrete as highway materials. Various types of roads & their construction-earth roads, gravel roads, W.B.M., bituminous, surface treatment, bituminous concrete, sheet asphalt and quality control during construction. [6]

Part-C

Highway Drainage and Maintenance: Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures. [6]

Part-D

Elementary Traffic Engineering-Traffic Engineering studies, traffic signs, traffic signals, road markings, road intersection, highway lighting. [8]

REFERENCE:

1. Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee, 1998.
2. Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. “Principles, Practice& Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.
5. Mannering, “Principles of Highway Engineering & Traffic Analysis”, Wiley Publishers, New Delhi, 2007.

DAV UNIVERSITY, JALANDHAR

Course Title: WATER RESOURCE ENGINEERING

L	T	P	Credits
4	0	0	4

Course Code: CIV902

Course Objective: This course offers a good understanding of the various water supply techniques used in modern life, various types of distribution systems.

Learning Outcomes: After the completion of this course the participants would gain the knowledge of various water supply systems as well as about the quality tests for water.

Part-A

Public Water Supply: Beneficial uses of water, water demand, per capita demand, variation in demand, causes detection and prevention of wastage of water, population forecasting, and water demand for fire fighting, population forecasting and water demand estimation. [8]

Water sources and development: Surface and ground water sources; Selection and development of sources [4]

Part-B

Water resource management: Spatial and temporal characteristics of water resources, Characteristics and functions of reservoir [6]

Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques. [6]

Part-C

Groundwater wells: Types and features of each type of wells; Well development, River Training Techniques and Water Quality: Drinking water quality parameters [8]

Part-D

Quality and testing of Water: Impurities in water, sampling of water, physical, water quality parameters, drinking water quality standards and criteria. [4]

REFERENCE:

1. Khanna S.K., and Justo, C.E.G. “Highway Engineering”, Nem Chand and Brothers, Roorkee, 1998.

2. Kadiyali, L.R. “Principles and Practice of Highway Engineering”, Khanna Publishers, New Delhi, 1997.

3. Flaherty, C.A.O. “Highway Engineering”, Volume 2, Edward Arnold, London, 1986.

4. Sharma, S.K. “Principles, Practice& Design of Highway Engineering”, S. Chand & Company Ltd., New Delhi, 1985.

5. Mannering, “Principles of Highway Engineering & Traffic Analysis”, Wiley Publishers, New Delhi, 2007.