

# **Dr. Mahalingam College of Engineering and Technology**

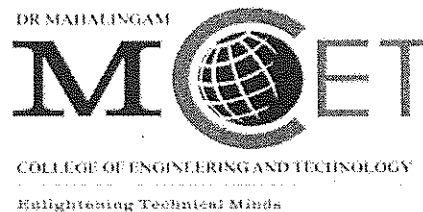
**(An Autonomous Institution)**

**Pollachi - 642 003**

## **Curriculum and Syllabus B.E. CIVIL ENGINEERING**

**SEMESTER I to VIII**

**REGULATIONS 2014**





**DEPARTMENT OF CIVIL ENGINEERING**

**2014 REGULATION**

**Curriculum & Syllabi for B.E Civil Engineering  
SEMESTER I**

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
141CE0101	Communication Skills - I	2	0	2	3	100
141CE0102	Engineering Mathematics - I	3	1	0	4	100
141CE0103	Applied Physics	3	0	0	3	100
141CE0104	C Programming	3	0	0	3	100
141CE0105	Introduction to Civil Engineering	3	0	0	3	100
141CE0106	Engineering Graphics	2	0	3	3	100
<b>PRACTICAL</b>						
141CE0107	Engineering Practices Laboratory	0	0	2	1	100
141CE0108	C Programming Laboratory	0	0	2	1	100
141CE0109	Promotion of Students Wellness	0	0	2	1	100
<b>TOTAL</b>		<b>16</b>	<b>1</b>	<b>11</b>	<b>22</b>	<b>900</b>

**SEMESTER II**

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
141CE0201	Communication Skills - II	2	0	2	3	100
141CE0202	Engineering Mathematics - II	3	1	0	4	100
141CE0203	Materials Science	3	0	0	3	100
141CE0204	Engineering Chemistry	3	0	0	3	100
141CE0205	Engineering Mechanics	3	1	0	4	100
141CE0206	Basics of Mechanical and Electrical	4	0	0	3	100
<b>PRACTICAL</b>						
141CE0207	Engineering Physics and Chemistry Laboratory	0	0	2	1	100
141CE0208	Computer Aided Building Drawing Laboratory	0	0	2	1	100
141CE0209	Sports for Wellness	0	0	2	1	100
<b>TOTAL</b>		<b>18</b>	<b>2</b>	<b>8</b>	<b>23</b>	<b>900</b>

  
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### SEMESTER III

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
141CE0301	Transforms and Partial Differential Equations	3	1	0	4	100
141CE0302	Mechanics of Solids - I	3	1	0	4	100
141CE0303	Fluid Mechanics	3	1	0	4	100
141CE0304	Construction Materials and Methods - I	3	0	2	4	100
141CE0305	Environmental Science and Engineering	3	0	0	3	100
141CE0306	Surveying	3	0	0	3	100
<b>PRACTICAL</b>						
141CE0307	Strength of Materials Laboratory	0	0	4	2	100
141CE0308	Surveying Practice Laboratory - I	0	0	4	2	100
141CE0309	Personal Effectiveness	0	0	2	1	100
	One Credit Course	0	0	2	1	100
<b>TOTAL</b>		<b>18</b>	<b>3</b>	<b>14</b>	<b>28</b>	<b>1000</b>

### SEMESTER IV

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
141CE0401	Numerical Methods	3	1	0	4	100
141CE0402	Mechanics of Solids - II	3	1	0	4	100
141CE0403	Soil Mechanics	3	1	0	4	100
141CE0404	Construction Materials and Methods - II	3	0	0	3	100
141CE0405	Applied Hydraulic Engineering	3	1	0	4	100
141CE0406	Basic structural design	3	1	0	4	100
<b>PRACTICAL</b>						
141CE0407	Hydraulic Engineering Laboratory	0	0	4	2	100
141CE0408	Surveying Practice Laboratory - II	0	0	4	2	100
141CE0409	Ethical and Moral Responsibility	0	0	2	1	100
	One Credit Course	0	0	2	1	100
<b>TOTAL</b>		<b>18</b>	<b>5</b>	<b>12</b>	<b>29</b>	<b>1000</b>

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### SEMESTER V

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
141CE0501	Water Resources and Irrigation Engineering	3	0	0	3	100
141CE0502	Structural Analysis - I	3	1	0	4	100
141CE0503	Foundation Engineering	3	1	0	4	100
141CE0504	Design of Steel Structures	3	1	0	4	100
141CE0505	Highway Engineering	3	0	0	3	100
XXX	Professional Elective-I	3	0	0	3	100
<b>PRACTICAL</b>						
141CE0507	Concrete and Highway Laboratory	0	0	4	2	100
141CE0508	Geo-technical Engineering Laboratory	0	0	4	2	100
141CE0509	Teamness and Inter-Personal Skills	0	0	2	1	100
	One Credit Course	0	0	2	1	100
<b>TOTAL</b>		<b>18</b>	<b>3</b>	<b>11</b>	<b>27</b>	<b>1000</b>

### SEMESTER VI

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
141CE0601	Water Supply and treatment Engineering	3	0	0	3	100
141CE0602	Structural Analysis - II	3	1	0	4	100
141CE0603	Design of RC Elements	3	1	0	4	100
141CE0604	Construction Project Management	3	0	0	3	100
XXX	Professional Elective-II	3	0	0	3	100
<b>PRACTICAL</b>						
141CE0607	Computer Aided Design and Drafting Laboratory	0	0	4	2	100
141CE0608	Structural Mechanics laboratory	0	0	4	2	100
141CE0609	Campus to Corporate	0	0	2	1	100
	One Credit Course	0	0	2	1	100
<b>Total</b>		<b>15</b>	<b>2</b>	<b>12</b>	<b>23</b>	<b>900</b>

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### SEMESTER VII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
141CE0701	Waste Water Engineering	3	0	0	3	100
141CE0702	Structural Dynamics and Earthquake Engineering	3	1	0	4	100
XXX	Professional Elective-III	3	0	0	3	100
XXX	Open Elective-I	3	0	0	3	100
<b>PRACTICAL</b>						
141CE0707	Environmental Engineering Laboratory	0	0	4	2	100
141CE0708	Quantity Surveying and Estimation Laboratory	0	0	4	2	100
141CE0710	Innovative and Creative Project	0	0	8	4	100
<b>TOTAL</b>		<b>12</b>	<b>1</b>	<b>16</b>	<b>21</b>	<b>700</b>

### SEMESTER VIII

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
<b>THEORY</b>						
XXX	Professional Elective-IV	3	0	0	3	100
XXX	Professional Elective-V	3	0	0	3	100
XXX	Professional Elective-VI	3	0	0	3	100
<b>PRACTICAL</b>						
141CE0810	Project	0	0	20	10	200
<b>TOTAL</b>		<b>9</b>	<b>0</b>	<b>20</b>	<b>19</b>	<b>500</b>

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### ELECTIVES

S.No	Course code	Course title	L	T	P	C
1	141CE9111	Professional Ethics and Human Values	3	0	0	3
<b>Environmental Engineering Stream</b>						
2	141CE9112	Air Pollution Management	3	0	0	3
3	141CE9113	Ecological Engineering	3	0	0	3
4	141CE9114	Industrial Waste Management	3	0	0	3
5	141CE9115	Municipal Solid Waste Management	3	0	0	3
<b>Structural Engineering Stream</b>						
6	141CE9116	Concrete Technology	3	0	0	3
7	141CE9117	Design of RC Structures	4	0	0	4
8	141CE9118	Bridge Structures	3	0	0	3
9	141CE9119	Computer Aided Design of Structures	3	0	0	3
10	141CE9120	Design of Plate and Shell Structures	3	0	0	3
11	141CE9121	Industrial Structures	3	0	0	3
12	141CE9122	Maintenance And Rehabilitation of Structures	3	0	0	3
13	141CE9123	Prefabricated Structures	3	0	0	3
14	141CE9124	Storage Structures	3	0	0	3
15	141CE9125	Tall Building	3	0	0	3
16	141CE9126	Pre stressed Concrete	3	0	0	3
<b>Remote Sensing Stream</b>						
17	141CE9127	Electronic Surveying	3	0	0	3
18	141CE9128	Remote Sensing and GIS	3	0	0	3
19	141CE9129	Cartography	3	0	0	3
<b>Transportation Engineering Stream</b>						
20	141CE9130	Railways, Airports and Harbour Engineering	3	0	0	3
21	141CE9131	Traffic Engineering and Management	3	0	0	3
22	141CE9132	Urban and Regional Planning	3	0	0	3
23	141CE9133	Transportation Planning	3	0	0	3
<b>Water Resources &amp; Irrigation Stream</b>						
24	141CE9134	Design and Management of Irrigation Systems	3	0	0	3
25	141CE9135	Ground Water Engineering	3	0	0	3
26	141CE9136	Hydrology	3	0	0	3
<b>Geotechnical Engineering Stream</b>						
27	141CE9137	Engineering Geology	3	0	0	3
28	141CE9138	Ground Improvement Techniques	3	0	0	3
29	141CE9139	Pavement Engineering	3	0	0	3
30	141CE9140	Soil Dynamics And Machine Foundations	3	0	0	3
<b>Construction Management Stream</b>						
31	141CE9141	Advanced Construction Techniques	3	0	0	3
32	141CE9142	Building Services	3	0	0	3
33	141CE9143	Safety in Construction	3	0	0	3
34	141CE9144	Quality Control And Assurance	3	0	0	3
35	141CE9145	Smart Structures And Smart Materials	3	0	0	3
36	141CE9146	Infrastructure Engineering	3	0	0	3
37	141CE9147	Project Formulation And Appraisal	3	0	0	3
38	141CE9148	Contract Laws and Regulations	3	0	0	3
<b>GENERAL ELECTIVES</b>						
39	141CE9149	Indian Constitution And Society	3	0	0	3
40	141CE9150	Intellectual Property Rights	3	0	0	3

S.No	Course code	Course title	L	T	P	C
41	141CE9151	Probability and Statistics	3	0	0	3
42	141CE9152	Architecture	3	0	0	3

Open Electives						
S.No	Course code	Course title	L	T	P	C
43	141OE0907	Safety Engineering	3	0	0	3
44	141OE0908	Environmental Impact Assessment	3	0	0	3

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<b>Course Code :141CE0101</b>	<b>Course title : COMMUNICATION SKILLS I</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>2 : 0 : 2 : 3</b>
<b>Type : Theory / Practical</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

**COURSE OBJECTIVES**

The course is intended to:

1. Write grammatically correct sentences in English.
2. Listen to conversations comprehend, make notes and answer questions.
3. Speak about a process, things, about oneself and others.
4. Read passages, infer and respond to the question.
5. Write short pieces of business correspondence such as emails, letters and reports.

**Unit I - GRAMMAR**

**12**

Parts of speech - Kinds of sentences – statement, interrogative, imperative and exclamatory – action word and its importance in a sentence –kinds of verbs& forms of verbs - auxiliary verbs and its importance, modal auxiliaries and its usage - Tenses and impersonal passive voices – Spelling - prepositions

**Unit II - LISTENING**

**12**

Listening for specific information – short conversation and monologues, Telephone conversation, extended monologues, listening for gist – conversation, interview and discussion, multiple choice, gap filling, note-taking

**Unit III - SPEAKING**

**12**

Elements of effective speech – exchange of basic personal information –narration –talk on general topics– describing events, pictures and people – Working Mechanism of a machine.

**Unit IV - READING**

**12**

Business articles -Advertisements – company websites – Interpreting visual information – skimming and scanning -data from email, articles, books and report- Newspaper articles – short Messages- pamphlets, brochures, flyers, leaflets and real-world notices – Error spotting – Cloze Test- extracting relevant information – identifying main and subordinate ideas–comprehension – making inferences – reading critically – determining fact versus opinion

**Unit V –WRITING**

**12**

Formal & informal emails- letter writing- leave letter, permission seeking letter- format, content, set phrases and etiquettes of e-mails and letters- fax –memo - note- reports.

**COURSE OUTCOMES**

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

- CO.1 Write grammatically correct sentences in English.
- CO.2 Listen to conversations comprehend, make notes and answer questions.
- CO.3 Speak about a process, things, about oneself and others.
- CO.4 Read passages, infer and respond to the question.

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- CO 3. Compute the extremum for two variable functions.  
CO 4. Apply multiple integrals to find area of the plane curves and volume of solids.  
CO 5. Solve first order ordinary differential equations.

**TEXT BOOKS:**

1. Kreyszig.E, "Advanced Engineering Mathematics", 10th edition, Wiley Publications. 2015.
2. Veerarajan.T, "Engineering Mathematics", Updated 2nd Edition, Tata McGraw Hill, New Delhi, 2010.

**REFERENCE BOOKS:**

1. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.
2. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.
3. Narayanan S., Manicavachagom Pillay T.K., Ramanaiah G., "Advanced Mathematics for Engineering students", Volume I, 2nd edition, S.Viswanathan Printers and Publishers, 1992.
4. Venkataraman M.K., "Engineering Mathematics - First Year", 2nd edition, National Publishing Co., Chennai, 2000.
5. Rukmangadachari E., "Engineering Mathematics", Volume I, PEARSON Publishing, 2012.

**WEB REFERENCES:**

1. <https://www.edx.org/>
2. [www.iitk.ac.in/gate/gate2012/pdf/files/xea.pdf](http://www.iitk.ac.in/gate/gate2012/pdf/files/xea.pdf)

<b>Course Code :141CE0103</b>	<b>Course title : APPLIED PHYSICS</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

## COURSE OBJECTIVES

The course is intended to:

1. Discuss the principles of waves and oscillations
2. Explain the properties of acoustic and ultrasonic waves and their applications
3. Analyze the component of force and relate with motion
4. Calculate the work done and energies in 1D & 2D related problems
5. Describe the elastic properties of materials

### Unit I - WAVES AND OSCILLATIONS

9

Longitudinal and transverse waves, wave motion, speed of wave motion, displacement relation for progressive wave; principle of superposition of waves, reflections of waves, standing waves in strings and pipes, fundamental mode and harmonics, beats, Doppler effect. Seismic Waves (Qualitative). Periodic motion – period, frequency, displacement as a function of time and periodic functions, Simple Harmonic motion and its equation; Phase, uniform circular motion and simple harmonic motion; oscillations of a spring-restoring force and force constant

### Unit II - ACOUSTICS AND ULTRASONICS

9

Classification of Sound- decibel- Weber–Fechner law – Sabine"s formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Properties of Ultrasonic waves - acoustic grating, Industrial applications: Welding & Cavitation, - Non Destructive Testing (NDT) – pulse echo system, through transmission and reflection, modes - A,B and C – scan displays.

### Unit III - FORCES AND MOTION IN 2D

9

Concept of force and net force, inertia and Newton's laws of motion, free body diagrams and translational equilibrium. *Friction*: Frictional forces and coefficients of friction, Air resistance. *Motion in 2D*: Components of motion, Kinematic equation for components of motion, vector addition and subtraction. Projectile motion: Horizontal, Projections at arbitrary angles, relative velocity: 1D, 2D

### Unit IV - ENERGY AND WORK

9

Work and energy, Work and Kinetic energy: Expression for work, Work done by: gravitational force, spring force, general variable force (1D, 3D analysis), Work-kinetic energy theorem with a variable force. Potential energy, Path Independence of conservative forces, determining potential energy values: Gravitational Potential energy, Elastic Potential energy, Conservation of mechanical energy, reading a potential energy curve, work done on a system by an external force, conservation of energy.

### Unit V - PROPERTIES OF MATTER

9

Stress strain curve - *Elasticity*: Hooke's law, Elastic moduli – Poisson's ratio – relation between them - Factors affecting elasticity – Expression for bending moment, I-shaped girders - determination of Young's modulus by cantilever depression method – Static Tension - Expression for couple per unit twist – Torsional oscillation.

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## **COURSE OUTCOMES**

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

- CO.1 Discuss the principles of waves and oscillations
- CO.2 Explain the properties of acoustic and ultrasonic waves and their applications
- CO.3 Analyze the component of force and relate with motion
- CO.4 Calculate the work done and energies in 1D & 2D related problems
- CO.5 Describe the elastic properties of materials

## **TEXT BOOKS:**

- 1. BrijLal& Subramanian. Properties of Matter. N, Eurasia publishing Co., New Delhi, 1989.
- 2. Halliday, Resnic and Walker, Fundamentals of Physics, 6th Ed., John Wiley, 2011.
- 3. Wilson, Buffa, Lou. College Physics. 6<sup>th</sup> Ed., Pearson Prentice Hall, 2007
- 4. BrijLal&Subramaniam. Waves and oscillations. Vikas publishing house, New Delhi.

## **REFERENCE BOOKS:**

- 1. Beiser A, Concepts of Modern Physics, 5<sup>th</sup> Ed., McGraw Hill International, 2003.
- 2. Yakov Perelman, Physics for Entertainment, Create Space Independent Publishing Platform, 2010.

## **WEB REFERENCES:**

- 1. <https://physics.stanford.edu/undergraduate-program/bs-engineering-physics>
- 2. <http://ocw.mit.edu/courses/physics/>
- 3. [http://provost.illinois.edu/programsofstudy/2013/fall/programs/undergrad/engin/engin\\_physics.html](http://provost.illinois.edu/programsofstudy/2013/fall/programs/undergrad/engin/engin_physics.html)

<b>Course Code :141CE0104</b>	<b>Course title : C PROGRAMMING</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

- CO.1 Comprehend the knowledge on computer systems and problem solving techniques
- CO.2 Identify and construct program using appropriate programming paradigm
- CO.3 Develop programs using arrays and strings
- CO.4 Interpret the significance of code reusability and attain memory access through pointers
- CO.5 Illustrate the perceptions of structures, union and Files

### **Unit I - INTRODUCTION**

**8**

Generation and Classification of Computers- Computer Systems –Peripherals – SMPS- RAM-ROM-HDD-CPU- Graphics card -Basic Organization of a Computer –Computer languages. Need for logical analysis and thinking– Algorithm – Pseudo code – Flow Chart.

### **Unit II - C PROGRAMMING BASICS**

**11**

Introduction to C programming –structure of a C program – compilation and linking processes –Preprocessor directives-Identifier- Keywords - Data Types- Variables — Constant-Operators and Expressions – Managing Input and Output operations –Decision Making and Branching – Looping statements-Nested looping-Type Casting-Storage Classes. Solving Problems.

### **Unit III - ARRAYS AND STRINGS**

**8**

Arrays — Declaration - Initialization – One dimensional and two dimensional arrays- Advantages and Limitations of Arrays. String - String operations – Arrays of Strings. Array Applications - sorting- searching – matrix operations.

### **Unit IV - FUNCTIONS AND POINTERS**

**9**

Function –Built in function-User defined function— Declaration of function – definition of function -Pass by value – Pass by reference– Recursion. Pointers - Definition – Initialization – Pointers arithmetic -Example Problems.

### **Unit V - STRUCTURES, UNIONS AND FILES**

**9**

Need for structure data type – structure definition – Structure declaration –Accessing structure elements- Array of structures –Pointer to Structure - Union - Programs using structures and Unions .Files-Introduction-Using Files in C-Working with Text Files.

### **COURSE OUTCOMES**

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

- CO.1 Comprehend the knowledge on computer systems and problem solving techniques
- CO.2 Identify and construct program using appropriate programming paradigm
- CO.3 Develop programs using arrays and strings
- CO.4 Interpret the significance of code reusability and attain memory access through pointers

  
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CO.5 Illustrate the perceptions of structures, union and Files

**TEXT BOOKS:**

1. PradipDey, ManasGhosh, Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009
2. Behrouz A. Forouzan and Richard F. Gilberg, *Computer Science: A Structure program approach using C*, Cengage learning, 2008
3. Yashavant P. Kanetkar. Let Us C, BPB Publications, 2011.

**REFERENCE BOOKS:**

1. Kernighan, B.W and Ritchie, D. M, The C Programming language, Second Edition, Pearson Education, 2006
2. Byron S Gottfried, Programming with C, Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, How to Solve it by Computer, Pearson Education, Fourth Reprint, 2007

**WEB REFERENCES:**

1. Introduction to programming in C. URL: <http://nptel.ac.in/courses/106104128/>
2. Practical Programming in C URL: <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/lecture-notes/>

  
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<b>Course Code :141CE0105</b>	<b>Course title : INTRODUCTION TO CIVIL ENGINEERING</b>	
<b>Core / Elective: General</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Explain importance of infrastructural development in building a nation.
2. List out and explain various fields of civil engineering
3. Demonstrate the need of higher order thinking skills.
4. Explain the functional, strength durability requirements of various infrastructures
5. Demonstrate the phases of a construction project.
6. List out elements of a building and describe them

### **Unit I - ROLE OF ENGINEERING IN SOCIETY**

**9**

Basic human needs – Benefits derived from engineering - Historical development of Structures - Importance of infrastructural development -Scope and branches of Civil Engineering – Role of civil engineers — Government funding plans for construction - Opportunities for civil engineers.

### **Unit II - ENGINEERING EDUCATION**

**9**

Expectations and aspirations of engineering students, Graduate engineering attributes, outcome based engineering curriculum, engineering skills –concepts and theories of learning – Higher order thinking skills, multiple intelligences, learning styles inventory, teaching/ learning process and methodologies.

### **Unit III - FEATURES OF INFRASTRUCTURES**

**9**

Types of Infrastructure - Aspects considered in creating infrastructures – Functions, Importance of safety , stability, Durability, comfort and convenience – types of Materials used - buildings , Bridges, Roads, Railways , Airport, Harbour and Dams - Drainage and water supply system.

### **Unit IV - CIVIL ENGINEERING PROCESS**

**9**

Feasibility studies, preliminary investigations, client requirements; develop concept, planning, design, preparation of drawings, approval from statutory authorities, construction, operation, monitoring, maintenance, repair and rehabilitation.

### **Unit V - ELEMENT OF BUILDINGS**

**9**

Types of buildings – Planning considerations in buildings (light, climate, safety) - Elements of a residential building - units of measurements - foundation, walls, laying of bricks, doors/windows, timber joints, gates, grills, plumbing lines, electrical wiring, air condition ducts, making model of a house.

### **COURSE OUTCOMES**

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

- CO.1 Explain importance of infrastructural development in building a nation.
- CO.2 List out and explain various fields of civil engineering
- CO.3 Demonstrate the need of higher order thinking skills.
- CO.4 Explain the functional, strength durability requirements of various infrastructures

  
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CO.5 Demonstrate the phases of a construction project.

CO.6 List out elements of a building and describe them

**TEXT BOOKS:**

1. M.S. Palanichamy, "Basic Civil Engineering", 4<sup>th</sup> Edition, McGraw Hill Education (India) Private Limited, 2010.
2. L.S. Jayagopal and R. Rudramoorthy, "Elements of Civil And Mechanical Engineering", Vikas Publishing House Pvt Ltd, 2003

**REFERENCE BOOKS:**

1. S.P. Arora and S.P. Bindra, "A Text book of Building Construction", DhanpatRai Publications (p) Ltd, 2010.
2. B. C. Punmia, "Building Construction", 10<sup>th</sup> Edition, Laxmi Publication, 2008
3. William C. Oakes and Les L. Leone, "Engineering Your Future: A Comprehensive Introduction to Engineering", Oxford University Press, 2014

**WEB REFERENCES:**

1. [http://epltt.coe.uga.edu/index.php?title=Multiple\\_Intelligences\\_and\\_Learning\\_Styles](http://epltt.coe.uga.edu/index.php?title=Multiple_Intelligences_and_Learning_Styles) (updated 27-Mar-2016)
2. Clark, D.R. (2012). "Bloom's Taxonomy of Learning Domains", Retrieved from [http://nwlink.com/~donclark/design/design\\_models.html](http://nwlink.com/~donclark/design/design_models.html), (updated on 12-Jan-2015)
3. Robert M. Arens, Joseph P. Hanus and Edmond Saliklis, "Teaching Architects and Engineers: Up and Down Bloom's Taxonomy" retrived from [http://content-calpoly-edu.s3.amazonaws.com/architecture/1/documents/arens\\_1\\_0809.pdf](http://content-calpoly-edu.s3.amazonaws.com/architecture/1/documents/arens_1_0809.pdf)
4. Peter Goodhew, "Teaching Engineering" retrived from <http://teachingengineering.liv.ac.uk/book/> (2015).

<b>Course Code :141CE0106</b>	<b>Course title : ENGINEERING GRAPHICS</b>	
<b>Core / Elective: General</b>	<b>L: T : P : C</b>	<b>2 : 0 : 3 : 3</b>
<b>Type : Theory / Practical</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Sketch different engineering curves and explain its application.
2. Prepare orthographic & isometric drawings of simple solids
3. Prepare simple building plan & elevation
4. Prepare development of lateral surfaces of simple objects.
5. Prepare perspective drawings of regular solids

### **Unit I - CURVES USED IN ENGINEERING PRACTICES**

**12**

Importance of graphics in engineering applications – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning- Methods of Dimensioning. Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid and involutes of square and circle – Drawing of tangents and normal to the above curves. Mathematical representation of these curves and their applications

### **Unit II - ORTHOGRAPHIC AND ISOMETRIC PROJECTION, SIMPLE BUILDING PLAN**

**12**

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout of views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects. Orthographic projection of solids – Practices on three view projection of solids. Isometric Projection of solids – practices on simple solids - Simple and working plan. Front, Elevation and Section of 2-roomed, single storied residential building.

### **Unit III - PROJECTION OF LINES AND PLANE SURFACES**

**12**

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

### **Unit IV - PROJECTION OF SOLIDS AND ITS SECTION**

**12**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane. Need for sectioning of solids – Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other – Orthographic views of sections of simple solids.

### **Unit V - DEVELOPMENT OF SURFACES, PERSPECTIVE PROJECTIONS**

**12**

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones. Concepts of Perspective projection of prisms, pyramids and cylinders by visual ray method.

### **COURSE OUTCOMES**

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

- CO.1 Sketch different engineering curves and explain its application.

  
**BoS Chairman**

- CO.2 Prepare orthographic & isometric drawings of simple solids
- CO.3 Prepare simple building plan & elevation
- CO.4 Prepare development of lateral surfaces of simple objects.
- CO.5 Prepare perspective drawings of regular solids

**TEXT BOOKS:**

- 1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2013).

**REFERENCE BOOKS:**

- 1. B. P. Verma "Civil Engineering Drawing & House Planning", Khanna publishers, 2014.

**WEB REFERENCES:**

- 1. <http://www.engineeringdrawing.org>
- 2. <http://nptel.ac.in>
- 3. <http://iitd.ac.in>

<b>Course Code :141CE0107</b>	<b>Course title : ENGINEERING PRACTICES LABORATORY</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>30 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Lay the joints in bricks and timber connections
2. Assemble a pipeline and a sanitary line for kitchen.
3. Make the electrical wiring connections.
4. Make two way connection for a lamp
5. Do the simple welding mechanism.

### **LIST OF EXERCISES**

1. Laying of the bricks for walls.
2. Making Lap, butt, Tee joints in timber frames
3. Making a wooden window frame to the required dimensions.
4. Assembling a pipeline from overhead tank to kitchen sink and dining wash basin.
5. Assembling of a sanitary line from kitchen sink to outlet.
6. Making of a domestic wiring circuit to connect a light, a fan with a regulator and a socket.
7. Making of internal wiring of tube light and checking connection.
8. Making of two way staircase wiring for lamp.
9. Making lap and butt joints using arc welding
10. Making a winnowing basket in a sheet metal to the required dimensions.

### **COURSE OUTCOMES**

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

- CO.1 Lay the joints in bricks and timber connections
- CO.2 Assemble a pipeline and a sanitary line for kitchen.
- CO.3 Make the electrical wiring connections.
- CO.4 Make two way connection for a lamp
- CO.5 Do the simple welding mechanism.

### **REFERENCE BOOKS:**

1. Jeyachandran. K, Natarajan. S. &Balasubramanian.S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Rajendra Prasad. A &Sarma. P.M.M.S, "Workshop Practice", SreeSai Publication, 2002.
3. Kannaiah. P &Narayana. K. L, "Manual on Workshop Practice", Scitech Publications, 1999.
4. Electrical practices laboratory manual for civil engineers - MCET
5. B. C. Punmia, "Building Construction", 10<sup>th</sup> Edition, Laxmi Publication, 2008

  
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<b>Course Code :141CE0108</b>	<b>Course title : C PROGRAMMING LABORATORY</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>30 Hours</b>

### COURSE OBJECTIVES

The course is intended to:

1. Explain about computer systems and problem solving techniques.
2. Write programs using appropriate programming constructs.
3. Write programs using Arrays and Functions.
4. Write programs using Pointers and Structures.
5. Write programs using Files and Pre-Processor Directives.

### List of Exercises

1. Text formatting ,table ,Mathematical equations and insertion of objects in MS Word
2. To include mathematical Functions , statistical Functions and charts in MS Exce
3. Program using operators and decision making statements (Any 2)
  - a. To find the area of a rectangle/circle/square
  - b. To find the simple interest and compound interest
  - c. To find the roots of a quadratic equation
  - d. Calculation of electricity bill
  - e. To identify the grade of the student
  - f. To find the maximum number among 3 numbers
4. Program using loops (Any 2)
  - a. To display the total and average of N students
  - b. To display the floyd's triangle
  - c. To display the Fibonacci series
  - d. To display the sum of first N prime numbers
  - e. To calculate the following series  $1^2 + 2^2 + 3^2 + \dots + N^2$
5. Program using Arrays (Any 2, 1 from 1D array and another from 2D array)
  - a. To sort N Numbers in ascending/descending order
  - b. To find the greatest number among N numbers
  - c. To search for a particular number among N Numbers
  - d. To compute the Matrix addition / subtraction
  - e. To calculate Matrix Multiplication / Transpose
6. Program using Strings (Any 2)
  - a. To manipulate strings using string functions.
  - b. To calculate the length of the String without using builtin functions.
  - c. To check whether the string is Palindrome or not.
  - d. To sort a given set of strings in alphabetical order.
7. Program using functions (Any 1)
  - a. To find the square and cube of a number.
  - b. To find the factorial of a number.
  - c. To swap two numbers.
8. Program using Pointers (Any 1)
  - a. To display the address of each element in an array
  - b. To pass an entire array to the function.
  - c. To perform arithmetic operations using pointers
9. Program using structures (Any 1)
  - a. To display the employee details using .(dot) operator

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- b. To display the book details using ->(reference) operator
  - c. To display the information of N Students
10. Program using Files (Any 1)
- a. To write a string into a text file
  - b. To read the contents of a text file
  - c. To copy the contents from one file into another

### **COURSE OUTCOMES**

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

- CO.1 Explain about computer systems and problem solving techniques.
- CO.2 Write programs using appropriate programming constructs.
- CO.3 Write programs using Arrays and Functions.
- CO.4 Write programs using Pointers and Structures.
- CO.5 Write programs using Files and Pre-Processor Directives.

### **REFERENCE BOOKS:**

- 1. McGrath Mike C, C- Programming in easy steps, fourth edition, Tata McGraw-Hill, 2013.

### **WEB REFERENCES:**

- 1. <http://www.cprogramming.com/tutorial/c-tutorial.html>
- 2. <http://www.programiz.com/c-programming>
- 3. <http://www.w3schools.in/c/>

<b>Course Code :141CE0109</b>	<b>Course title : PROMOTION OF STUDENTS' WELLNES (Common to CSE, IT, EEE, ECE, EEE, Civil and E &amp; I)</b>	
<b>Core / Elective: General</b>	<b>L: T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type :Practical</b>	<b>Total Contact hours:</b>	<b>30 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Maintain physical wellbeing - grooming, BMI, flexibility, muscle strength, body compositions (vatha, pitha, kapa)
2. Maintain mental wellbeing - perceptions, attention/concentration, memory, gunas
3. Maintain social wellbeing - etiquettes, emotional and psychological aspects, stress management, morality and values

### **Unit I - PHYSICAL HEALTH**

Physical structure and functions of human body – simplified physical exercises (hand exercises, Leg exercises, breathing exercises, eye exercises – kapalapathi – Maharasanas 1-2 – Massages – Acupuncture – relaxation – importance and benefits. Suryanamaskar.

### **Unit II - MENTAL HEALTH**

Maintenance of youthfulness and life force – kayakalpa yoga – anti ageing process – benefits. Mind and its functions – mind wave frequency – meditation process – Agna, shanthi, thuriam – benefits

### **Unit III - PERSONALITY DEVELOPMENT – I**

Purpose of life and analysis of thought – philosophy of life – introspection – practice. Moralization of desires and neutralization of anger - practices

### **Unit IV - PERSONALITY DEVELOPMENT – II**

Eradication of worries and benefits of blessings – wave theory –practices. Genetic centre – purification – cause and effect theory

### **Unit V - SOCIAL HEALTH**

Greatness of guru – cultural education – love and compassion – fivefold culture. Greatness of friendship and social welfare – individual, family and world peace.

### **COURSE OUTCOMES**

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

- CO.1 Maintain physical wellbeing - grooming, BMI, flexibility, muscle strength, body compositions (vatha, pitha, kapa)
- CO.2 Maintain mental wellbeing - perceptions, attention/concentration, memory, gunas
- CO.3 Maintain social wellbeing - etiquettes, emotional and psychological aspects, stress management, morality and values

### **TEXT BOOKS:**

1. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar ,“Value education for harmonious life (Manavalakalai Yoga)”, Vethathiri Publications, Erode, I Ed. (2010)

### **REFERENCE BOOKS:**

1. Dr.R.Nagarathna, Dr.H.R.Nagendra, “Integrated approach of yoga therapy for positive health”, Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.
2. Dr.R.Nagarathna, Dr.H.R.Nagendra , “New perspectives in stress management”, Swami Vivekananda Yoga Prakashana, Bangalore, I Ed June 1986.

**END OF SEMESTER I**

  
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<b>Course Code :141CE0201</b>	<b>Course title : COMMUNICATION SKILLS II</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>2 : 0 : 2 : 3</b>
<b>Type : Theory / Practical</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Write concisely and ensure accuracy through proof reading.
2. Listen to lectures and presentations, comprehend and respond
3. Use appropriate non-verbal skills to present ideas and participate in discussions.
4. Use various reading techniques, make notes and respond.
5. Write effectively for various professional situations.

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

**12**

Types of sentences – simple, compound and complex, Concord – One word substitutions, word formation, commonly confused words, idioms and phrases –Editing-punctuation, spelling - correct use of articles-usage of question tags.

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

**12**

Listening to fill up gapped texts -Listening to identify context and Speaker's opinion-Note Taking-Listening to Conversation, to business lecturers, presentation, interviews, ted talk, pep talk, documentaries and cricket commentaries.

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

**12**

Non-verbal skills – importance & types - conversational practices, debate Narration, mock interview, GD - impromptu talks, story-telling, likes and dislikes, role plays & presentations on business themes.

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

**12**

Exposure to different reading techniques-Intensive & Extensive reading-Reading Comprehension - speed reading-obstacles in reading- eye fixation, regression and sub-vocalization - Note Making– Jumbled Sentences – short stories and Newspaper articles.

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

**12**

Free writing on any given topic, Letter of application - content, format & Resume writing-Writing Business Letters- calling for quotations, placing orders, a letter of complaint regarding manufacturing defects, Writing Instructions-Proof Reading.

### **COURSE OUTCOMES**

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

- CO.1 Write concisely and ensure accuracy through proof reading.
- CO.2 Listen to lectures and presentations, comprehend and respond
- CO.3 Use appropriate non-verbal skills to present ideas and participate in discussions.
- CO.4 Use various reading techniques, make notes and respond.
- CO.5 Write effectively for various professional situations.

### **TEXT BOOKS:**

1. Meenakshi Raman &Sangeetha Sharma, Technical Communication Principles and Practice, Second edition, Oxford Higher Education, New Delhi, 2011.
2. Cambridge BEC Vantage- Practice Tests, Self-study Edition, Cambridge University

  
**BoS Chairman**



Press, 2002

**REFERENCE BOOKS:**

1. R C. Sharma, Krishna Mohan, Business Correspondence and Report Writing, Tata McGraw Hill Publishing Co., Ltd., New Delhi 2002
2. Shalini Verma, Verbal, Ability and Reading Comprehension, Pearson publications, 2013
3. Edgar Thorpe, Showick Thorpe, Objective English, fifth edition, Pearson publications, 2014.
4. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill Education Pvt. Ltd., New Delhi 2005.

**WEB REFERENCES:**

1. [http://www.examenglish.com/BEC/BEC\\_Vantage.html](http://www.examenglish.com/BEC/BEC_Vantage.html)
2. [www.splendid-speaking.com/exams/bec\\_speaking.html](http://www.splendid-speaking.com/exams/bec_speaking.html)

  
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<b>Course Code :141CE0202</b>	<b>Course title : ENGINEERING MATHEMATICS – II</b>	
<b>Core / Elective : General</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

**PREREQUISITE: 141CE0102 – ENGINEERING MATHEMATICS I**

### **COURSE OBJECTIVES**

The course is intended to:

1. Solve the second and higher order ordinary differential equations.
2. Apply the concepts of gradient, divergence and curl to solve engineering problems.
3. Apply the Laplace transform techniques to solve differential equations.
4. Use the functions of a complex variable and construct analytic functions.
5. Apply the concept of complex integration to evaluate real integrals.

### **Unit I - DIFFERENTIAL EQUATIONS OF SECOND AND HIGHER ORDER 9+3**

Second and higher order linear differential equations with constant coefficients-Solution by variation of parameters- First order simultaneous differential equations

### **Unit II - VECTOR CALCULUS 9+3**

Gradient, divergence and curl - Directional derivative - Irrotational and solenoidal vector fields - Vector integration - Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem(excluding proofs) -Evaluation of integrals using Green's ,Gauss's and Stoke's theorem.

### **Unit III - LAPLACE TRANSFORM 9+3**

Laplace transform - Sufficient condition for existence - Transform of elementary functions – Basic properties - Transforms of derivatives - Transforms of unit step function and impulse functions - Transform of periodic functions - Inverse Laplace transforms -Statement of Convolution theorem -Solution of linear ODE of second order.

### **Unit IV - ANALYTIC FUNCTIONS 9+3**

Functions of a complex variable - Analytic functions: Necessary conditions - Cauchy-Riemann equations and sufficient conditions (excluding proofs) -Properties of analytic functions - Harmonic conjugate - Construction of analytic functions.

### **Unit V - COMPLEX INTEGRATION 9+3**

Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Types of Singularities– Residues – Cauchy's residue theorem.

### **COURSE OUTCOMES**

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

- CO.1 Solve the second and higher order ordinary differential equations.
- CO.2 Apply the concepts of gradient, divergence and curl to solve engineering problems.
- CO.3 Apply the Laplace transform techniques to solve differential equations.
- CO.4 Use the functions of a complex variable and construct analytic functions.

CO.5 Apply the concept of complex integration to evaluate real integrals.

**TEXT BOOKS:**

1. Kreyszig. E, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons. Singapore, 2012.

**REFERENCE BOOKS:**

1. Grewal B.S "Higher Engineering Mathematics, 42ndEdition", 2012.
2. Rukmangadachari E., "Engineering Mathematics", Volume I, PEARSON Publishing, 2012.
3. Venkataraman M.K., "Engineering Mathematics – First Year" (2ndedition), National Publishing Co., Chennai, 2000.
4. Narayanan S., ManicavachagomPillay T.K., RamanaiahG., "Advanced Mathematics for Engineering students", Volume I (2ndedition), S.Viswanathan Printers and Publishers, 1992.
5. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd.,
6. Veerarajan. T, "Engineering Mathematics", Updated 2nd Edition, Tata McGraw Hill, New Delhi, 2010.

**WEB REFERENCES:**

1. <http://learnerstv.com/Free-Maths-video-lecture-courses.htm>
2. <http://nptel.ac.in/video.php?subjectId=122107036>

<b>Course Code :141CE0203</b>	<b>Course title : MATERIALS SCIENCE</b>	
<b>Core / Elective : General</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

## COURSE OBJECTIVES

The course is intended to:

1. Calculate crystal parameters and analyze different crystal structures
2. Explain the mechanical properties and failure in bulk materials
3. Choose appropriate mechanical testing technique for analyzing materials
4. Discuss the properties and strengthening mechanism of steel
5. Identify the types of composite materials

### Unit I - CRYSTALLOGRAPHY

9

Crystalline and Non crystalline Materials: Single crystals, polycrystalline materials, Anisotropy *Crystal Parameters*: Atomic radius, Number of atoms per unit cell, Co-ordination number, Atomic Packing factor for SC, BCC, FCC and HCP – Influence of grain structure on material behavior. *Crystal Planes*: Miller indices, Bragg's law, Debye Scherrer method, Interplanar distance – Polymorphism and allotropy. *Crystal imperfections*: Point, line surface and Volume defects and its role in mechanical properties

### Unit II - MECHANICAL PROPERTIES

9

Elasticity and plasticity of bulk material, Ductility, malleability and brittleness, Stress and strain behavior, Hooke's law, Yield strength, Impact strength, Tensile strength, Resilience, Hardness, *Failure of Metals*: Fracture behavior, Ductile and Brittle fracture, Toughness, Fatigue, Endurance limit, SN curve, Creep, Stages of creep.

### Unit III - TESTING OF MATERIALS

9

Introduction, Tensile testing, compression testing, hardness tests-Vickers, Rockwell, Brinell, Poldi, Micro Hardness Test, impact testing, bend test, torsion test, fatigue testing, creep testing, *Ductility test*: Erichsen Cupping Test.

### Unit IV - STEEL AND ITS STRENGTHENING MECHANISM

9

Substitutional solid solution: Disordered & ordered, interstitial solid solution, cooling curves. Solidification of metals and alloys- nucleation and crystal growth from the liquid phase Ingot structure dendrite freezing. Iron - allotropy, polymorphism *Classification of steels*, micro-constitutions of iron and steel, effect of carbon and other alloying elements (Mn, Si, Cr, Va, Mo, Ti & W) on properties of steels. *Strengthening Mechanism of steel*: Solid solution hardening, precipitation hardening, dispersion hardening and work hardening.

### Unit V –COMPOSITES

9

Introduction, properties, functions of matrix and reinforcement in composites – Law of mixtures. *Classification of composites*: Particle-reinforced, Fiber-reinforced and Structural composites (Laminar and Sandwich) *Types of composite materials*: Polymer-matrix composites, Metal-matrix composites, Ceramic-matrix composites, Carbon-carbon composites and Hybrid composite – Applications

## **COURSE OUTCOMES**

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

- CO.1 Calculate crystal parameters and analyze different crystal structures
- CO.2 Explain the mechanical properties and failure in bulk materials
- CO.3 Choose appropriate mechanical testing technique for analyzing materials
- CO.4 Discuss the properties and strengthening mechanism of steel
- CO.5 Identify the types of composite materials

## **TEXT BOOKS:**

- 1. W.D. Callister, Materials Science and Engineering: An Introduction, 7<sup>th</sup> edition Wiley, (2006)
- 2. V. Raghavan, Materials Science and Engineering, 4<sup>th</sup> edition, Prentice Hall (1998)
- 3. Khanna. O.P.A text book of Materials Science and Metallurgy, Khanna Publishers, 2003.

## **REFERENCE BOOKS:**

- 1. Elements of Materials Science & Engineering: L. H. Van Vlack.
- 2. Solid State Physics: Properties of Materials: M.A. Wahab
- 3. Fundamentals of Materials Science & Engineering: William F Smith
- 4. Materials Science by G.K. Narula; K.S. Narula; V.K. Gupta, Tata McGraw-Hill

## **WEB REFERENCES:**

- 1. [www.nptel.ac.in](http://www.nptel.ac.in)
- 2. [www.ocw.mit.edu](http://www.ocw.mit.edu)

  
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<b>Course Code :141CE0204</b>	<b>Course title : ENGINEERING CHEMISTRY</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Explain the chemistry of water and specify the water conditioning processes.
2. Determine the rate of corrosion of a given metal in a given environment and identify appropriate control techniques to avoid corrosion.
3. Comprehend the role of adsorption in waste water treatment.
4. Identify a suitable plastic for a specific engineering application.
5. Describe the chemistry of cement in modern construction

### **Unit I - WATER TECHNOLOGY**

**9**

Water quality parameters – Physical, Chemical and Biological characteristics of potable water-Water Quality Standards (BIS, WHO) - Hardness of water – types, expression, units of hardness, calcium carbonate equivalents, problems, disadvantages. Water conditioning methods – Internal conditioning- Carbonate, Phosphate and Calgon Conditioning. External conditioning – Demineralization, Reverse osmosis.

### **Unit II - CORROSION AND ITS CONTROL**

**9**

Corrosion – Dry and Wet corrosion, Galvanic corrosion and differential aeration corrosion – Factors influencing corrosion (metallic and environmental factors).Corrosion Control methods – Cathodic protection method – Sacrificial anodic protection and impressed current cathodic protection method – Organic coating – Paints – constituents and its functions.

### **Unit III - CHEMICAL THERMODYNAMICS & SURFACE CHEMISTRY**

**9**

Thermodynamic process - Isothermic, Isobaric, Isochoric and Adiabatic processes – First & Second law of thermodynamics – Derivation (Thermodynamic relations – Maxwells Relations) & Significance - Enthalpy, Entropy, Free energy & Internal energy - terms of thermodynamics. Adsorption – Classification, Adsorption Isotherm – Freundlich Adsorption Isotherm and Langmuir Adsorption Isotherm – Derivation and Limitations – Applications of Activated carbon in waste water treatment.

### **Unit IV - ENGINEERING PLASTICS**

**9**

Polymers and polymerization process (Addition and condensation only)– Plastics – Classification – Engineering plastics - Preparation, properties and uses of Nylon 6,6, PET and Teflon. Commodity plastics- Preparation, properties and uses of PVC, Polyethylene, polystyrene. Compounding of plastics – Constituents and functions – Extrusion moulding technique.

### **Unit V - CHEMISTRY OF CEMENT**

**9**

Chemistry of Lime & Gypsum - Cement – Chemical composition - Classification - Manufacture by wet and dry process – Setting and Hardening of cement – Chemical reactions during the hydration of cement – Hydration products of cement – Physical and chemical properties - Applications.

### **COURSE OUTCOMES**

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

- CO.1 Explain the chemistry of water and specify the water conditioning processes.
- CO.2 Determine the rate of corrosion of a given metal in a given environment and identify appropriate control techniques to avoid corrosion.
- CO.3 Comprehend the role of adsorption in waste water treatment.
- CO.4 Identify a suitable plastic for a specific engineering application.
- CO.5 Describe the chemistry of cement in modern construction

**TEXT BOOKS:**

- 1. Wiley Engineering Chemistry, Second Edition, Wiley India Pvt. Ltd. New Delhi (2011).
- 2. P. C. Jain and Monica Jain, "Engineering Chemistry", 16<sup>th</sup> Ed., Dhanpat Rai Pub, Co., New Delhi (2004).

**REFERENCE BOOKS:**

- 1. L. Brown and T. Holme, Chemistry for Engineering Students, 3<sup>rd</sup> Edition, Cengage Learning (2010).
- 2. P.W. Atkins and de Paula Julio, "Physical Chemistry", Oxford University Press, 9th Ed. (Indian Student Edition) (2011).
- 3. O. G. Palanna, Engineering Chemistry, Fourth Reprint. Tata McGraw Hill Education Pvt. Ltd. New Delhi (2009).
- 4. S. S. Dara "A text book of Engineering Chemistry" S. Chand & Co. Ltd., New Delhi (2006).

**WEB REFERENCES:**

- 1. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=104101001>
- 2. <http://nptel.ac.in/courses/104105039/>
- 3. <http://nptel.ac.in/courses/122101001/>



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<b>Course Code :141CE0205</b>	<b>Course title : ENGINEERING MECHANICS</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Calculate various geometric properties such as centroids and moment of inertia
2. Estimate the forces in Concurrent systems by applying law of mechanics for rigid bodies
3. Analyze the effect of dry friction in contact surfaces (Ladder, wedge, screw and belt ) and resultant for coplanar non concurrent system
4. Write equilibrium equations for Coplanar non concurrent systems and evaluate forces acting on various members (Beams , Trusses )
5. Apply the law of dynamics and calculate the various dynamic parameters

### **Unit I - PROPERTIES OF SURFACES AND SOLIDS**

**9+3**

Units and Dimensions – Determination of Areas and Volumes – First moment of area and the Centroid of simple sections using integration – Centroid of the composite sections – second moment of simple sections using integration – Parallel axis theorem – Moment of Inertia of the composite sections – perpendicular axis theorem – Polar moment of inertia – Product of Inertia – Principal moments of inertia of plane areas – Center of Gravity – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle.

### **Unit II - CONCURRENT SYSTEM OF FORCES**

**9+3**

Introduction – Laws of Mechanics – Lamé's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Types of forces – Concurrent Forces – Free body diagram – Coplanar Concurrent Forces Resultant of forces – Equilibrium of a rigid bodies – Non Coplanar Concurrent Forces– Resultant of forces –Equilibrium of a rigid bodies in space – Principle of transmissibility

### **Unit III - NON CONCURRENT SYSTEM OF FORCES**

**9+3**

Non concurrent Forces – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Varignon's theorem – Single Equivalent system – Resultant of forces – Equilibrium Equations of a systems – Frictional force – Laws of Coulombs friction – Coplanar systems with friction (Ladder, Wedges ) – Belt friction

### **Unit IV - TRUSSES**

**9+3**

Types of supports and their reactions – Equilibrium of Rigid bodies in two dimensions and three dimensions –Static Indeterminacy of beams and trusses – Types of beams and its reactions from supports – Types of trusses – analysis for member forces by method of joints and method of sections

### **Unit V –DYNAMICS**

**9+3**

Kinematics of particles - Displacements, Velocity and acceleration, their relationship – Rectilinear and curvilinear motion with uniform and non-uniform accelerations – Relative motion – Kinetics of rigid bodies – Newton's law – D'Alemberts principle - Work, Energy



Equation of particles – Impulse and Momentum – Impact of elastic bodies.

### **COURSE OUTCOMES**

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

- CO.1 Calculate various geometric properties such as centroids and moment of inertia
- CO.2 Estimate the forces in Concurrent systems by applying law of mechanics for rigid bodies
- CO.3 Analyze the effect of dry friction in contact surfaces (Ladder, wedge, screw and belt ) and resultant for coplanar non concurrent system
- CO.4 Write equilibrium equations for Coplanar non concurrent systems and evaluate forces acting on various members (Beams, Trusses )
- CO.5 Apply the law of dynamics and calculate the various dynamic parameters

### **TEXT BOOKS:**

- 1. Nelson. A, "Engineering Mechanics: Statics and Dynamics, Tata-McGraw Hill Education private Limited, New Delhi, 2010.
- 2. Beer. F.P et al., "Vector Mechanics for Engineers: Statics and Dynamics", ninth edition, Tata McGraw-Hill education pvt Ltd, New Delhi, 2011.

### **REFERENCE BOOKS:**

- 1. Rajasekaran. S, Sankarasubramanian. G, "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., New Delhi, 2009.
- 2. Hibbeler.R.C. and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11<sup>th</sup> Edition, Pearson Education India pvt Ltd, New Delhi, 2013.  
K.L.Kumar, Veenu Kumar, "Engineering Mechanics" , 4<sup>th</sup> Edition , Tata-McGraw Hill Education private Limited, New Delhi, 2011

### **WEB REFERENCES:**

- 1. <http://nptel.ac.in/courses/112103109/>
- 2. <http://www.iitg.ac.in/ssg/me101.html>
- 3. <https://www.coursera.org/learn/engineering-mechanics-statics>
- 4. [http://www.vssut.ac.in/lecture\\_notes/lecture1423904717.pdf](http://www.vssut.ac.in/lecture_notes/lecture1423904717.pdf)



**BoS Chairman**

<b>Course Code :141CE0206</b>	<b>Course title : BASICS OF MECHANICAL AND ELECTRICAL</b>	
<b>Core / Elective : General</b>	<b>L : T : P : C</b>	<b>4 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Comprehend the different manufacturing process
2. Explain different combustion systems, refrigeration and Air conditioning systems
3. Explain the various stages in Electric Power System
4. Understand the behavior of DC and AC circuits
5. Explain the various Electrical measurement techniques

### **Unit I - MANUFACTURING PROCESSES**

**9**

Metal Forming - Forging, Rolling, Extrusion processes. Metal Casting – Foundry – Moulding and Casting Processes, Welding, Metal Machining – Turning, Milling, Drilling, Shaping.

### **Unit II - INTERNAL AND EXTERNAL COMBUSTION SYSTEMS**

**9**

Working principles of IC engines – Classification – Diesel and petrol engines: two stroke and four stroke engines. Steam generators (Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories.

### **Unit III - ELECTRICAL POWER SYSTEM**

**9**

Introduction – Components of power system – Single line diagram of power system – Overview of Generation, transmission, sub-transmission and distribution systems – Grounding and earthing - Types of cables – Domestic wiring.

### **Unit IV - ELECTRIC CIRCUITS**

**9**

Characterization of electrical power: nature of electric power (AC/DC), charge, voltage, current, active power, reactive power and apparent power – Electric circuit elements (R,L& C) – Voltage and current relationship – Ohm's law and Kirchoff's laws – Voltage and current division rules – Series and parallel connections- AC fundamentals: average and RMS values of sinusoidal waveform – Power factor – R,L & C connected to AC source – Phasor diagram.

### **Unit V - MEASUREMENT SYSTEM**

**9**

Classification of instruments - ammeter, voltmeter, multimeter - Measurement of power by wattmeter - Measurement of energy by energy meter – Measurement of insulation resistance by megger- Tachometer - Strain gauge, Bourdon tube, Thermistor - Introduction to Data acquisition system.

### **COURSE OUTCOMES**

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

- CO.1 Comprehend the different manufacturing process
- CO.2 Explain different combustion systems, refrigeration and Air conditioning systems
- CO.3 Explain the various stages in Electric Power System
- CO.4 Understand the behavior of DC and AC circuits
- CO.5 Explain the various Electrical measurement techniques

  
BoS Chairman

### TEXT BOOKS:

1. Jayagopal. L.S & Rudramoorthy. R, "Basic Civil and Mechanical Engineering", Vikas Publishing House, New Delhi, 2001.
2. M.S. Sukhija and T.K. Nagsarkar, 'Basic Electrical and Electronics Engineering', Oxford University press, 2012.
3. Vincent Del Toro, 'Electrical Engineering Fundamentals', Prentice hall of India, New Delhi, 1999.
4. Alan S. Morris, 'Measurement and Instrumentation principles', Reed Educational and Professional Publishing Ltd, 3<sup>rd</sup> edition.

### REFERENCE BOOKS:

1. Shanmugam. G and Palanichamy. M.S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, 1996.
2. Ananthanarayanan.P, "Basic Refrigeration and Air Conditioning", Tata McGraw Hill Publishing Co., New Delhi, 2003.
3. Srinivasan. S, "Automotive engineering" Tata McGraw Hill Publishing Co., New Delhi, 2003

### WEB REFERENCES:

1. <http://nptel.ac.in/courses/112105128/>
2. [http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/New\\_index1.html](http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/New_index1.html)
3. <http://www.engineeringcivil.com/>
4. <http://www.bmtpc.org/>
5. <http://www.aboutcivil.org/engineering-materials.html>



BoS Chairman

Course Code :141CE0207	Course title : ENGINEERING PHYSICS AND CHEMISTRY LABORATORY	
Core / Elective : General	L: T : P : C	0 : 0 : 2 : 1
Type : Practical	Total Contact hours:	30 Hours

### COURSE OBJECTIVES

The course is intended to:

1. Measure velocity of ultrasound of a liquid.
2. Determination of Young's Modulus.
3. Estimate the total hardness of water.
4. Measure corrosion rate of a mild metal.
5. Determine concentration of a solution through electrical method

### PHYSICS LABORATORY

#### LIST OF EXERCISES

1. Ultrasonic interferometer-Determination of Velocity of ultrasound in a Liquid and compressibility of liquid.
2. Torsional Pendulum – Determination of Rigidity modulus
3. Viscosity of Less viscous Liquid – Poiseuille's Method
4. Cantilever Bending – Determination of Young's modulus
5. Torque and angular acceleration of a fly wheel

### CHEMISTRY LABORATORY

#### LIST OF EXERCISES

1. Estimation of Hardness of water by EDTA Method
2. Determination of corrosion rate of mild steel by weight loss method.
3. Determination of corrosion inhibition efficiency of organic compounds on mild steel by weight loss method.
4. Estimation of iron in water by Spectrophotometry.
5. Determination of Molecular weight of polymer by viscometric method
6. Constructing of a pH titration curve and estimation of strength of an acid by pH meter.

### COURSE OUTCOMES

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

- CO.1 Measure velocity of ultrasound of a liquid.  
 CO.2 Determination of Young's Modulus.  
 CO.3 Estimate the total hardness of water.  
 CO.4 Measure corrosion rate of a mild metal.  
 CO.5 Determine concentration of a solution through electrical method

### TEXT BOOKS:

1. Engineering Physics Laboratory Manual, Dr. R. Jayaraman, V. Umadevi, S.Maruthamuthu and B. Saravanakumar, Pearson Publication, New Delhi.
2. Engineering Chemistry Laboratory Manual by Faculty, Chemistry Department, MCET.

<b>Course Code : 141CE0208</b>	<b>Course title : COMPUTER AIDED BUILDING DRAWING LABORATORY</b>	
<b>Core / Elective : General</b>	<b>L: T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>30 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Use various commands in CAD Software to draw building drawings.
2. Draw the components of buildings
3. Draw the king post and north light roof trusses.
4. Draw plan, elevation and sectional view of various types of residential and commercial buildings with proper orientation.
5. Draw the perspective view of buildings.

### **LIST OF EXERCISES**

1. Introduction to CAD commands – A Study.
2. Components of buildings, types of buildings and its orientation – A Study.
3. Introduction to Foundation and its Types - drawing various types of foundations.
4. Drawing of Doors and windows.
5. Introduction to Roofing elements and its types – drawing of north light and king post trusses.
6. Drawing of Simple buildings – load bearing structure
7. Drawing of Simple buildings – framed structure
8. Planning & drawing of One BHK – Single storied
9. Planning & drawing of One BHK – Double storied
10. Planning & drawing of Two BHK– Double storied
11. Drawing of Commercial buildings
12. Perspective view of buildings - Hand drawing

### **COURSE OUTCOMES**

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

- CO.1 Use various commands in CAD Software to draw building drawings.  
CO.2 Draw the components of buildings  
CO.3 Draw the king post and north light roof trusses.  
CO.4 Draw plan, elevation and sectional view of various types of residential and commercial buildings with proper orientation.  
CO.5 Draw the perspective view of buildings.

### **TEXT BOOKS:**

1. Civil Engg. Drawing & House Planning – Varma B.P., Khanna publishers, Delhi, 2010
2. Building planning & Drawing – Kumaraswamy N., KameswaraRao A., Charotar Publishing, 7<sup>th</sup> Revised & Enlarged Edition : 2013

### **REFERENCE BOOKS:**

1. Building drawing – Shah. M.G., Tata McGraw-Hill, 5<sup>th</sup> Edition, 2013.

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**BoS Chairman**

<b>Course Code : 141CE0209</b>	<b>Course title : SPORTS FOR WELLNESS (Common to Auto, Mech, Civil, EEE &amp; EIE)</b>	
<b>Core / Elective : General</b>	<b>L : T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type : Theory &amp; Practical</b>	<b>Total Contact hours:</b>	<b>30 Hours</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Explain the significance of physical fitness for healthy living
2. Maintain physical fitness through exercises
3. Exhibit mental agility

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

Meaning of health - Components of health - physical, mental, social, emotional, spiritual - importance of health - Personal hygiene - Heredity and environment –Adopting healthy habits

#### **Unit II - FITNESS & WELLNESS**

Fitness and wellness – what is physical fitness - categories - components of health related physical fitness- components of skill related physical fitness-values of physical fitness – Physical fitness development.

What is wellness - importance of wellness for engineers –factors promoting wellness – Physiology and health: cardio-respiratory, muscular and nervous systems – ageing.

#### **Unit III - FOOD & HEALTH**

Energy balance and body composition – nutrients- problems of surplus and deficiency - balanced diet - good food habits for better health – hazards of junk food - food and the gunas.

#### **Unit IV - FITNESS & DEVELOPMENT I**

Exercises related ailment and injuries - safety and precautions - first aid.

Muscular strength – exercises (calisthenics): pull-up, sit-up, push-up and weight training.

Explosive power – exercises: vertical jump, long jump,

Cardio respiratory endurance– exercises: walking, jogging, treadmill, stair climbing, bicycling, skipping.Flexibility –exercises: stretching

#### **Unit V - FITNESS & DEVELOPMENT II**

Speed, agility, balance and coordination – exercises: sprint, cone drill, ladder drill, hurdle drill, ball throw - mental agility tests.

Dexterity - 12 minutes cooper test – long run – adventure games, Team games.

### **COURSE OUTCOMES**

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

- CO.1 Explain the significance of physical fitness for healthy living
- CO.2 Maintain physical fitness through exercises
- CO.3 Exhibit mental agility

### **REFERENCE BOOKS:**

1. Tony Buzan, Harper Collins, The Power of Physical Intelligence (English)
2. PadmakshanPadmanabhan, Handbook of Health & Fitness, Indus Source Books, First Edition, 2014

**END OF SEMESTER II**

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BoS Chairman

### SEMESTER III

Course Code : 141CE0301	Course title : TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	
Core/Elective: General	L: T : P : C	3 : 1 : 0 : 4
Type : Theory	Total Contact hours:	60

**PREREQUISITE:141CE0202 – ENGINEERING MATHEMATICS II**

#### COURSE OBJECTIVES

**The course is intended to:**

1. Determine the solution of first and second order partial differential equations.
2. Compute the Fourier series expansion for given periodic function.
3. Solve one dimensional wave equation.
4. Solve one dimensional and two dimensional heat flow equation.
5. Calculate the Fourier transformation for a periodic function.

#### UNIT I - PARTIAL DIFFERENTIAL EQUATIONS

9+3

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations – Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

#### UNIT II - FOURIER SERIES

9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

#### UNIT III - SOLUTION OF ONE DIMENSIONAL WAVE EQUATION

9+3

Method of separation of variables - Classification of second order linear partial differential equations, Solutions of one dimensional wave equation by Fourier series method.

#### UNIT IV - SOLUTION OF ONE AND TWO DIMENSIONAL HEAT FLOW EQUATION

9+3

One dimensional equation of heat conduction - Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded), Solution by Fourier series method.

#### UNIT V - FOURIER TRANSFORMS

9+3

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

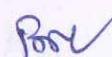
#### COURSE OUTCOMES

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

- CO.1 Determine the solution of first and second order partial differential equations.
- CO.2 Compute the Fourier series expansion for given periodic function.
- CO.3 Solve one dimensional wave equation.
- CO.4 Solve one dimensional and two dimensional heat flow equation.
- CO.5 Calculate the Fourier transformation for a periodic function.

#### TEXT BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", First Edition, Oxford University Press, New Delhi, 2015
2. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt.Ltd., New Delhi, Second reprint, 2012.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley Publications, 2015.

  
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**REFERENCE BOOKS:**

1. Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012
2. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 8<sup>th</sup> Edition, Laxmi Publications Pvt Ltd, 2011.
3. Ramana. B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/122107037/19>
2. <http://nptel.ac.in/video.php?subjectId=108106075>

**BoS Chairman**



<b>Course Code : 141CE0302</b>	<b>Course title : MECHANICS OF SOLIDS – I</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE: 141CE0205 ENGINEERING MECHANICS**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Determine stresses and strains in compound bars, bars of varying section and determine the relation between elastic constants.
2. Determine the principle stresses, normal and tangential stresses in oblique planes in an element subjected to two dimensional stress systems.
3. Draw shear forces and bending moment diagram for determinate beams and determine the shear stress, bending stress distribution in them
4. Determine deflection in determinate beams
5. Design shafts to transmit required power.

### **UNIT I - STRESS-STRAIN AND DEFORMATION OF SOLIDS, STATES OF STRESS 9+3**

Rigid bodies and deformable solids – Stability, strength, stiffness – Tension, compression and shear stresses – strain, Hooke's law, ultimate strength, yield stress, factor of safety, stress-strain curve for mild steel, TMT bars and concrete, poisson's ratio, lateral strain, temperature stresses. Deformation of simple bars- Compound bars and bars of varying section – Shear modulus, bulk modulus, relationship between elastic constants.

### **UNIT II - ANALYSIS OF THIN CYLINDERS AND PRINCIPAL STRESSES 9+3**

Thin cylinders - Circumferential stress, longitudinal stress, volumetric strain under internal pressure, – Stresses in thin compound cylinders – Shrink fit. Biaxial state of stress – Stress at a point – Stress on inclined plane – Principal stresses and principal planes – Mohr's circle of stresses.

### **UNIT III - SHEAR AND BENDING IN BEAMS 9+3**

Beams – Types of supports – Simple and fixed, types of load – Concentrated, uniformly distributed, – Bending moment and shear force diagram for simply supported, cantilever and overhanging beams – Relationship between load, bending moment and shear force. Theory of simple bending, Analysis of Beams for Stresses – Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions - Flitched Beams.

### **UNIT IV - DEFLECTION 9+3**

Deflection and slope of cantilever, simply supported and overhanging beams – Double integration method – Macaulay's method – Moment area method – Conjugate beam method.

### **UNIT V - TORSION OF SHAFTS AND SPRINGS 9+3**

Elastic theory of torsion - Stresses and deformation in circular solid and hollow shafts - Combined bending moment and torsion of shafts - Strain energy due to torsion - Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel - Design of shafts - Closed coiled and open coiled helical springs subjected to axial load, leaf springs, deflection of springs.

### **COURSE OUTCOMES**

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

- CO.1 Determine stresses and strains in compound bars, bars of varying section and determine the relation between elastic constants.
- CO.2 Determine the principle stresses, normal and tangential stresses in oblique planes in an element subjected to two dimensional stress systems.
- CO.3 Draw shear forces and bending moment diagram for determinate beams and

determine the shear stress, bending stress distribution in them  
CO.4 Determine deflection in determinate beams  
CO.5 Design shafts to transmit required power.

**TEXT BOOKS:**

1. Bansal R.K., A text book of Strength of materials, Fourth Edition, Laxmi Publications (P) Ltd, New Delhi, 2007.
2. Egor P Popov, Engineering Mechanics of Solids, Second Edition, Prentice Hall of India, New Delhi, 2005.
3. Rajput.R.K., Strength of Materials, Fifth edition, Eurasia Publishing House, Ram Nagar, New Delhi.

**REFERENCE BOOKS:**

1. Timoshenko S.P. and Young D.H., Elements of Strength of Materials, East West Press Private Limited, New Delhi, 1978.
2. Hibbeler R.C., Mechanics of materials, Sixth Edition, Pearson-Prentice Hall, New Delhi, 2007.
3. Subramanian R., Strength of materials, Second Edition, Oxford university press, New Delhi, 2010.
4. William A. Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, Fourth Edition, Tata McGraw-Hill publishing co., New Delhi, 2007

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105106116/>
2. <http://web.mit.edu/emech/dontindex-build/>
3. <http://www.aboutcivil.org/solid-mechanics.html>
4. <http://web.aeromech.usyd.edu.au/AMME2301/Documents/>



**BoS Chairman**

<b>Course Code : 141CE0303</b>	<b>Course title : FLUID MECHANICS</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Determine the static pressure, buoyant force and meta centric height.
2. Explain the flow properties through velocity potential function and stream function
3. Measure the discharge of the flow through pipes flow
4. Determine the loss of head in flow through pipes
5. Describe the dimensionless analysis, model analysis, and predict effects on the prototype.

### **UNIT I - FLUID PROPERTIES AND FLUID STATICS**

**9+3**

Fluid - Definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - Density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension - Fluid statics: Concept of fluid static pressure, absolute and gauge pressures - Pressure measurements by manometers and pressure gauges - Forces on planes - Centre of pressure - Buoyancy - Meta centric height- Flootation.

### **UNIT II - FLUID KINEMATICS**

**9+3**

Fluid Kinematics - Flow visualization - Lines of flow - Types of flow - Velocity field and acceleration - Velocity measurement- Continuity equation (one and three dimensional differential forms) - Equation of streamline - Stream function - Velocity potential function - circulation - Vortex flow - Flow net.

### **UNIT III - FLUID DYNAMICS**

**9+3**

Equations of motion - Euler's equation along a streamline - Bernoulli's equation - Applications- Venturimeter, Orifice meter and Pitot tube. Linear momentum equation and its application. Boundary layer - Definition - Boundary layer on a flat plate - Thickness and classification - Displacement, energy and momentum thickness.

### **UNIT IV - FLOW THROUGH PIPES**

**9+3**

Viscous flow - Shear stress, pressure gradient relationship - Laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseuille's) - Hydraulic and energy gradient - flow through pipes - Darcy - Weisbach's equation - pipe roughness - Friction factor- Moody's diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

### **UNIT V - DIMENSIONAL ANALYSIS AND MODEL STUDIES**

**9+3**

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi -Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models.

### **COURSE OUTCOMES**

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

- CO.1 Determine the static pressure, buoyant force and meta centric height.
- CO.2 Explain the flow properties through velocity potential function and stream function
- CO.3 Measure the discharge of the flow through pipes flow
- CO.4 Determine the loss of head in flow through pipes
- CO.5 Describe the dimensionless analysis, model analysis, and predict effects on the prototype.

### **TEXT BOOKS:**

1. Bansal R.K., "Fluid Mechanics And Hydraulic Machines", Laxmi Publications, New Delhi

(2010)

2. Som S., BiswasGowdham, Chakraborty S., "Introduction to Fluid Mechanics & Fluid Machines" Tata McGraw Hill Education Private Ltd, New Delhi, (2011).

**REFERENCE BOOKS:**

1. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, (2000).
2. Frank M White, "Fluid Mechanics", Tata McGraw Hill Publications, New Delhi, (2008).
3. James A Fay, "Introduction to Fluid Mechanics", Prentice Hall of India Private Limited, New Delhi, (2007).
4. John F. Douglas, Janusz M. Gasiorek, and John A. Swaffield, "Fluid Mechanics", Fourth Edition, Pearson Education Ltd, New Delhi, (2001).

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105103095/>
2. <http://www.et.byu.edu/~dol4/che374/lectureNotes/lectureNotes.html>
3. <http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-01-unified-engineering-i-ii-iii-iv-fall-2005-spring-2006/fluid-mechanics/>
4. [https://www.vidyarthiplus.com/vp/Thread-ME2204-Fluid-Mechanics-and-Machinery-Lecture-Notes-2013-Edition#.VxG4X\\_I97IU](https://www.vidyarthiplus.com/vp/Thread-ME2204-Fluid-Mechanics-and-Machinery-Lecture-Notes-2013-Edition#.VxG4X_I97IU)



**BoS Chairman**

<b>Course Code : 141CE0304</b>	<b>Course title : CONSTRUCTION MATERIALS AND METHODS – I</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 0 : 2 : 4</b>
<b>Type : Theory &amp; Practical</b>	<b>Total Contact hours:</b>	<b>60</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Identify the construction materials, list their properties, Identify and compare the various methods of construction.
2. Describe the functional requirements of a building and its components.
3. Apply the correct principles of the construction process.
4. Demonstrate the use of modern construction materials and engineering practice.
5. Explain substructure and superstructure construction methods.
6. Describe the importance of experimental verification of material properties.

### **UNIT I - SITE SELECTION and FUNCTIONAL PLANNING**

**12**

Building components and their basic requirements - Various steps in construction of a building - General principles of site selection - Site plan - Regulations and by laws - Principles of planning - orientation of buildings - site layout - Plumbing services and electrical services.

### **UNIT II - CONSTRUCTION OF FOUNDATION**

**12**

Foundation - Purpose - Bearing capacity of soil - Types of foundations - Setting out of foundation trenches - Excavation - Dewatering - Timbering of trenches - Setting out for brickwork - Plinth beam - Filling in foundation trenches - Anti-termite treatment - Damp-proofing and Waterproofing - Sand filling in basement.

### **UNIT III - CEMENT, AGGREGATE, MORTAR AND CONCRETE**

**12**

Cement: Manufacture of cement - Types of cement - Characteristics - Tests for cement - laboratory tests. Aggregates - Basic Characteristics - Types of aggregates - Testing of aggregates - laboratory tests - Water - Qualities of water for construction - Mortar: Classification of mortar - Preparation - Selection of mortar - Tests for mortars - Concrete - Mix Proportioning - Types of Concrete - Properties of fresh concrete - Properties of hardened concrete - Slump Test - Vee-bee test - Flow test - Compacting factor test.

### **UNIT IV - WALL CONSTRUCTION**

**12**

**STONE MASONRY:** Application of stones in buildings - Qualities of a good building stone - Deterioration and Prevention of stones - Artificial stones - Classification of stone masonry - Stone veneer works for facing of walls.

**BRICK MASONRY :** Composition of brick earth - Manufacture of bricks - Qualities of good brick - Tests for bricks - laboratory tests - Compressive strength and Water absorption tests - Terms used in brick work - Mortars to be used - Method of laying of bricks - Classification of brick masonry - Inspection of brickwork - Curing - Construction of cavity walls.

**BLOCK MASONRY:** Concrete blocks - Dimensions and Tolerances - Types - Autoclaved aerated concrete blocks - Joist and Filler blocks - Considerations for use of hollow concrete blocks - Laying of blocks - Compound walls in block work.

**FORMWORK:** Definition - Types - Formwork for column and wall - Scaffolding - Shoring - Underpinning - Construction of wall - Lintels - Definition - Purpose - Types - Sunshade Construction.

### **UNITV - ROOF CONSTRUCTION**

**12**

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Flat Roof Construction - Reinforced concrete roof construction - Formwork for beam and slab - Surface treatment of shuttering - Provisions for expansion joints - Water-proofing - Weather proof course - Reduction of heat transmission through roofs - Sloped roof construction - slopes of roofs – types- Flashings - Laying of tiled roofs - Laying of AC sheets - False ceiling - Drainage of flat and sloped roofs.

### **COURSE OUTCOMES**

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

- CO.1 Identify the construction materials, list their properties, Identify and compare the various methods of construction.
- CO.2 Describe the functional requirements of a building and its components.
- CO.3 Apply the correct principles of the construction process.
- CO.4 Demonstrate the use of modern construction materials and engineering practice.
- CO.5 Explain substructure and superstructure construction methods.
- CO.6 Describe the importance of experimental verification of material properties.

### **TEXT BOOKS:**

1. Rangwala, "Engineering Materials (Material Science)", Charotar Publishing House Private Limited, Gujarat, Thirty Eighth Edition, 2011.
2. P.C.Varghese, "Building Construction", PHI Learning Private Limited, New Delhi, 2010.
3. S.P.Arora and S.P. Bindra "Building Construction", DhanpatRai Publications, New Delhi, 2012.
4. IS Code of Practices -Relevant Parts and Construction Materials Laboratory manual of Civil Engineering Department, MCET, Pollachi, 2016.

### **REFERENCE BOOKS:**

1. P.C.Varghese, "Building Materials", PHI Learning Private Limited, New Delhi, 2011.
2. S.K.Duggal, "Building Materials", New Age International Publishers, 2008.
3. Roy Chudley, Roger Greeno, Advanced Construction Technology, Pearson Prentice Hall, 2006.
4. M.S.Shetty, "Concrete Technology Theory and Practice", S. Chand and Company Ltd., 2008.

### **WEB REFERENCES:**

1. [www.understandconstruction.com](http://www.understandconstruction.com)
2. [www.engineeringcivil.com](http://www.engineeringcivil.com)
3. [www.aboutcivil.com](http://www.aboutcivil.com)
4. [www.lmtpc.org](http://www.lmtpc.org)



**BoS Chairman**

<b>Course Code : 141CE0305</b>	<b>Course title : ENVIRONMENTAL SCIENCE AND ENGINEERING</b>	
<b>Core/Elective: General</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the inter relationship between living organism and environment
2. Describe the cause effects and control measures of environmental pollution
3. Explain the effects on environment due to the over exploitation of natural resources
4. Describe social issues and possible solutions for environment protection
5. Interpret the impacts between population growth on environment and apply technology to manage it

### **UNIT I - ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**

**9**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem –food chains, food webs and ecological pyramids –Introduction to biodiversity definition: genetic, species and ecosystem diversity – bio geographical classification of India – value of biodiversity – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

### **UNIT II - ENVIRONMENTAL POLLUTION**

**9**

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

### **UNIT III - NATURAL RESOURCES**

**9**

Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies– Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Equitable use of resources for sustainable lifestyles.

### **UNIT IV - SOCIAL ISSUES AND THE ENVIRONMENT**

**9**

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

Population growth, variation among nations – population explosion – Theories of population explosion – Malthus theory, Marx's theory and Demographic transition theory – Family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – Role of information technology in environment and human health – Public awareness – Eco labeling – Role of NGO's in environmental management – Case studies.

**COURSE OUTCOMES**

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

- CO.1 Explain the inter relationship between living organism and environment
- CO.2 Describe the cause effects and control measures of environmental pollution
- CO.3 Explain the effects on environment due to the over exploitation of natural resources
- CO.4 Describe social issues and possible solutions for environment protection
- CO.5 Interpret the impacts between population growth on environment and apply technology to manage it

**TEXT BOOKS:**

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education 2004.
2. KaushikAnubha&Kaushik C.P. "Environmental Science and Engineering", 3<sup>rd</sup> edition – New age International publishers, New Delhi, 2010.

**REFERENCE BOOKS:**

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press 2005.

**WEB REFERENCES:**

1. nptel.ac.in
2. www.cseindia.org
3. ocw.mit.edu
4. evs2013sec3.weebly.com





<b>Course Code : 141CE0306</b>	<b>Course title : SURVEYING</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Calculate areas and included angles by Chain, Compass and Plane table surveying
2. Classify and differentiate various methods of surveying to determine the levels of earth surface and draw contours.
3. Measure and calculate the position of different objects in space using Theodolite.
4. Differentiate Theodolite surveying and Tacheometric surveying and their characteristics.
5. Set out plan for all types of structures, dams, curves for road, railway tracks and bridges constructions using modern equipments.

### **UNIT I - BASICS OF SURVEYING**

**9**

Definition - Principles – Classification. Introduction to Chain – Errors and corrections, Compass – bearing, meridian – Open and closed traverse – Closing errors and Introduction to Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing.

### **UNIT II - LEVELLING**

**9**

Principles and theory of levelling - Datum, bench mark and reduced level - Level surface and horizontal plane - Mean sea level - Types of levels, levelling staff and their types - Effect of curvature and refraction - Balancing back sight and foresight distance - Longitudinal, cross-sectional and reciprocal levelling - Reducing levels by rise and fall and height of collimation methods and check.

### **UNIT III - THEODOLITE SURVEYING**

**9**

Theodolite - types, features and fundamental axes - Adjustments; horizontal angles - Vertical angles - Heights and distances of inaccessible points - Methods of traversing - Problems on omitted measurements – Gale's Traversing method for closing error correction.

### **UNIT IV - TACHEOMETRIC SURVEYING**

**9**

Methods - Determination of constants of the tacheometer - Use of anallactic lens - Distance and elevation formulae for inclined sights with vertical and normal holding staff - Movable hair method - principles of tangential tacheometry - Problems in tacheometry - Subtense bar method.

### **UNIT V - CONTOURING, CURVES AND MODERN SURVEYING**

**9**

Definition - Contour interval and horizontal equivalent - Characteristics - Uses of contour maps - Drawing of contours using computers. Computation of area and volume of earthwork or reservoir capacity from contour map. Elements of simple curve - Location of tangent points - Setting out of simple curve by offset and Rankine's methods. Vertical curves – Types – grades. Total Station – Electronic Theodolite – Laser alignment instrument – Global Positioning System.

### **COURSE OUTCOMES**

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

- CO.1 Calculate areas and included angles by Chain, Compass and Plane table surveying
- CO.2 Classify and differentiate various methods of surveying to determine the levels of earth surface and draw contours.
- CO.3 Measure and calculate the position of different objects in space using Theodolite.
- CO.4 Differentiate Theodolite surveying and Tacheometric surveying and their characteristics.

CO.5 Set out plan for all types of structures, dams, curves for road, railway tracks and bridges constructions using modern equipments.

**TEXT BOOKS:**

1. Punmia B C, "Surveying" - vol. 1, vol. 2 and vol 3, Laxmi Publications (P) Ltd., New Delhi, 2005.
2. Agor. R, "A Text Book of Surveying and Levelling", Khanna Publishers, 2009.
3. Duggal R K, "Surveying", Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2013.

**REFERENCE BOOKS:**

1. Kanetkar T P, "Surveying and Levelling, Part I and II, Pune VidyarthiGrihaPrakashan, 1993.
2. Bannister A and Raymond S, "Surveying, Addison Wesley Longman Ltd, England, 1996.
3. Gopi.S, Sathikumar.R, Madhu.N, "Advanced Surveying, Dorling Kindersley (India) Pvt. Ltd., 2008.
4. Chandra. A.M. "Surveying, New Age International Private Ltd Publishers, 2006.

**WEB REFERENCES:**

1. <http://www.aboutcivil.org/surveying-levelling%20II.html>
2. <http://civil.engineering.webservices.utoronto.ca/Assets/Civil+Engineering+Digital+Assets/programs/courses/Survey+Camp+Class+Notes.pdf?method=1>
3. <http://www.nptel.ac.in/courses/105107122/>
4. [http://www.vssut.ac.in/lecture\\_notes/lecture1428642587.pdf](http://www.vssut.ac.in/lecture_notes/lecture1428642587.pdf)
5. [www.scribd.com/doc/63716977/Surveying-1-Lecture-Notes](http://www.scribd.com/doc/63716977/Surveying-1-Lecture-Notes)

**BoS Chairman**

<b>Course Code : 141CE0307</b>	<b>Course Title : STRENGTH OF MATERIALS LABORATORY</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 4 : 2</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Conduct the test to determine strength and moduli of steel and concrete.
2. Determine Impact Strength of mild steel by various metals.
3. Determine hardness of ferrous and non ferrous metal using hardness test.
4. Conduct Test to find out flexural rigidity of a given model beam.
5. Verify various theorems applicable for beams and columns by conducting test and validate theorems.

### **LIST OF EXPERIMENTS**

1. Determination of strength and modulus of elasticity of mild steel and study stress-strain curve for mild steel and TMT bars using both tension and compression test.
2. Determination of strength and modulus of elasticity of concrete and study stress-strain curve using compression test.
3. Determination of Torsional strength and modulus of rigidity of mild steel.
4. Determination of impact strength of mild steel by a) Izod test b) charpy test and c) impact tension test.
5. Determination of hardness of metals using Brinell, Vicker's and Rockwell hardness tests.
6. Determination of the flexural rigidity (EI) of a given beam.
7. Determination of shear stress distribution and bending stress distribution in metal beam.
8. To verify moment area theorems for slope and deflections of a beam.
9. Determination of strain in the cantilever beam using strain gauge.
10. Determination of shear strength of metals (Double shear test).
11. Determination of stiffness of the helical spring.
12. Determination of shear centre for D, Angle and Channel section.

### **COURSE OUTCOMES**

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

- CO.1 Conduct the test to determine strength and moduli of steel and concrete.
- CO.2 Determine Impact Strength of mild steel by various metals.
- CO.3 Determine hardness of ferrous and non ferrous metal using hardness test.
- CO.4 Conduct Test to find out flexural rigidity of a given model beam.
- CO.5 Verify various theorems applicable for beams and columns by conducting test and validate theorems.

### **REFERENCE**

1. Kukreja C.B. and V.V. Shastry, Experimental methods in structural mechanics, Standard Publishers Distributors, New Delhi, 2009.
2. Strength of materials Laboratory Manual of Civil Engineering department, MCET, Pollachi.

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<b>Course Code : 141CE0308</b>	<b>Course Title : SURVEYING PRACTICE LABORATORY– I</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>0 : 0 : 4 : 2</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Handle various survey instruments and to obtain accurate results in measurements.
2. Determine areas using various survey instruments
3. Determine the elevations and their differences between various points and boundaries.
4. Draw the profile of the given terrain using leveling instruments.
5. Measure vertical and horizontal angles

### **LIST OF EXPERIMENTS**

1. Study of Instruments – chains, compass, plane table and dumpy levels.
2. To determine the area of a given boundary using Chain and its accessories
3. To find and fix the unknown point with reference to three known points using Plane table Surveying - Bessel's method
4. Determination of the area of a closed traverse after eliminating the closing error using Compass Surveying
5. Determination of RL of different points on the earth surface using dumpy level
6. Determination of RL of various points including inverted readings using fly levelling.
7. Verifying the accuracy of levelling using method of Check Levelling
8. To plot the LS & CS of a given length of road using Profile levelling.
9. To Study the various parts, components and adjustments of a Theodolite.
10. Determination of horizontal angles by Method of repetition and reiteration.
11. Determination of elevation of an object whose base is inaccessible by Single Plane method
12. Determination of elevation of an object whose base is inaccessible by Double Plane method

### **COURSE OUTCOMES**

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

- CO.1 Handle various survey instruments and to obtain accurate results in measurements.  
CO.2 Determine areas using various survey instruments  
CO.3 Determine the elevations and their differences between various points and boundaries.  
CO.4 Draw the profile of the given terrain using leveling instruments.  
CO.5 Measure vertical and horizontal angles

### **REFERENCE**

1. Surveying Practice Laboratory I manual of Civil Engineering Department, MCET, Pollachi, 2012.

<b>Course Code : 141CE0309</b>	<b>Course title : PERSONAL EFFECTIVENESS</b>	
<b>Core/Elective: General</b>	<b>L : T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>30</b>

**PREREQUISITE: 141CE0209 – SPORTS FOR WELLNESS**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Identify the strengths, weaknesses and opportunities.
2. Set well-articulated goals for academics, career, and personal aspirations.
3. Establish the road map to realize the goals.
4. Apply time management techniques to complete planned tasks on time.
5. Create time and pursue activities of self-interest that add value.

### **UNIT I - THE IMPORTANCE OF ENVISIONING**

**6**

Importance of positive self-perception – Principle of dual creation (Everything gets created twice – Envisioning) - Understanding vision and mission statements - Writing personal mission statements – ‘Focus’ as a way of life of most successful people – Importance of goal setting –Importance of planning and working to time

### **UNIT II - FUNDAMENTAL PRINCIPLES OF GOAL SETTING AND WORKING TO TIME**

**6**

Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume

### **UNIT III - GOAL SETTING AND ACTION ORIENTATION**

**6**

Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment – Importance of action orientation - Converting goals to actionable tasks – Establishing road map – Using Gantt chart for planning and progress

### **UNIT IV - TIME MANAGEMENT - TOOLS AND TECHNIQUES**

**6**

Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying ‘NO’ – Managing procrastination

### **UNITV - PUTTING INTO PRACTICE**

**6**

Practicals using the weekly journal – Executing and achieving short term goals – Periodic reviews

### **COURSE OUTCOMES**

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

- CO.1 Identify the strengths, weaknesses and opportunities.
- CO.2 Set well-articulated goals for academics, career, and personal aspirations.
- CO.3 Establish the road map to realize the goals.
- CO.4 Apply time management techniques to complete planned tasks on time.
- CO.5 Create time and pursue activities of self-interest that add value.

### **COURSE HANDOUTS (Compiled by PS team, MCET)**

1. Learner’s workbook

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2. Personal efficiency Journal
3. Reading material for Personal Effectiveness

**FURTHER READING:**

1. Stephen R Covey, "First things first", Simon & Schuster Uk, Aug 1997.
2. Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster Uk, 2004.
3. College student's guide to time management (e-book)

**Operational modality:**

Enablement through learning workshops	Conducted by external experts	3 days 7 hours each	21 hours
Progress monitoring (face to face interaction with student and checking workbook/Journal)	Internal faculty	1 hour per week	12 hours
Mid semester reinforcement-workshop	External expert	1 day	7 hours
Total			40 hours
No: of credits			2

**Assessments:**

Assessment	Details	Weightage	Administration	By Whom	When
Knowledge Test*	Multiple choice questions (20)	20%	Pen and paper	Internal team	Immediately after the initial workshop
Final comprehensive Knowledge test*	Multiple choice questions (40)	30%		Internal team	End of semester
Scenario based knowledge test*	Multiple choice scenario responses (15)	30%	Pen and paper	Internal team	Immediately after mid-semester reinforcement
Review of student journal	Student held journal with enough pages for the whole semester	10%	Student journals to be reviewed	Trained Internal faculty	Once in a week.
Review of student journal by external expert		10%	Student journal comprehensive review	External expert and Internal reviewer	End of semester

\*Prepared by external expert team.

**END OF SEMESTER III**

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## SEMESTER IV

<b>Course Code : 141CE0401</b>	<b>Course title : NUMERICAL METHODS</b>	
<b>Core/Elective: General</b>	<b>L: T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

### PREREQUISITE:

141CE0301–TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

### COURSE OBJECTIVES

#### The course is intended to:

1. Solve the non-linear equations and system of linear equations and calculate the dominant Eigen value.
2. Predict the unknown values for the given set of data.
3. Apply numerical techniques to find derivatives and to evaluate integrals.
4. Solve first order differential equation using numerical techniques
5. Solve partial differential equations using numerical techniques.

### UNIT I - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations – RegulaFalsi method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method - Gauss Jordan method – Cholesky Method - Iterative methods of Gauss Jacobi and Gauss Seidel - Dominant Eigen values of a matrix by Power method.

### UNIT II - INTERPOLATION AND APPROXIMATION 9+3

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

### UNIT III - NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

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

### UNIT IV - INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

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

### UNITV - BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

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

### COURSE OUTCOMES

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

- CO.1 Solve the non-linear equations and system of linear equations and calculate the dominant Eigen value.
- CO.2 Predict the unknown values for the given set of data.
- CO.3 Apply numerical techniques to find derivatives and to evaluate integrals.

  
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CO.4 Solve first order differential equation using numerical techniques

CO.5 Solve partial differential equations using numerical techniques.

**TEXT BOOKS:**

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", First Edition, Oxford University Press, New Delhi, 2015
2. Grewal, B.S. and Grewal, J. S., Numerical methods in Engineering and Science, 9th Edition, Khanna Publishers, New Delhi, 2007

**REFERENCE BOOKS:**

1. Chapra. S.C. and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5th Edition, New Delhi, 2007.
2. Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi, 2007.
3. Sankara Rao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105105043>



<b>Course Code : 141CE0402</b>	<b>Course title : MECHANICS OF SOLIDS – II</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE: 141CE0302 MECHANICS OF SOLIDS – I**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Apply Energy theorem for computing deflection.
2. Determine the bending moment and shear force in propped, fixed and continuous beams.
3. Examine the behaviour of columns at critical load condition.
4. Design the member based on various theories of failure.
5. Determine the bending stresses, shear stresses and deflection due to unsymmetrical bending and to locate the shear centre.

### **UNIT I - ENERGY PRINCIPLES**

**9+3**

Strain energy and Strain energy density - Strain energy in axial load, flexure, Shear and Torsion - Strain energy and complimentary energy - Castigliano's and Engesser's Energy theorems - Principle of virtual work - Application of Energy theorem for computing deflection – Simple beams, plane trusses and simple rigid plane frames - Maxwell's reciprocal theorem.

### **UNIT II - STATICALLY INDETERMINATE BEAMS**

**9+3**

Static and Kinematic indeterminacy. Fixed end moments, reactions, BM and S.F. diagrams for propped and fixed beams for point loads, UDL, UVL - Theorem of three Moments – Analysis of continuous beam (up to two span)-Shear force and B.M diagrams for continuous beams

### **UNIT III - COLUMNS**

**9+3**

Type of columns, eccentrically loaded short columns, combined bending and direct stresses, crushing load, – middle third rule – Euler's theory of long columns – Limitations of Euler's theory - critical loads for prismatic columns with different end conditions; Rankine formula.

### **UNIT IV - STATE OF STRESS IN THREE DIMENSIONS**

**9+3**

Determination of Principal stresses and Principal planes - Volumetric strains - Dilatation and Distortion. Theories of failure - Maximum Principal Stress theory - Maximum shear stress theory - Strain energy theory - Distortion energy theory - Principal strain energy theory - Application of above theories in determining load carrying capacity - Design of members.

### **UNIT V - ADVANCED TOPICS IN BENDING OF BEAMS**

**9+3**

Properties of beam cross section - Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - Determination of shear centre for I and channel sections - Bending of curved beams, Winkler Bach formula - Position of neutral axis for rectangular and trapezoidal sections- Stress concentration - fatigue.

### **COURSE OUTCOMES**

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

CO.1 Apply Energy theorem for computing deflection.

CO.2 Determine the bending moment and shear force in propped, fixed and continuous beams.

CO.3 Examine the behaviour of columns at critical load condition.

CO.4 Design the member based on various theories of failure.

CO.5 Determine the bending stresses, shear stresses and deflection due to unsymmetrical bending and to locate the shear centre.

  
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**TEXT BOOKS:**

1. Bansal R.K. A text book of Strength of materials, Fourth Edition, Laxmi Publications (P) Ltd, New Delhi, 2007.
2. Punmia B.C. Theory of Structures (SMTS) Vol 1, Laxmi publishing Pvt Ltd, New Delhi, 2004.
3. R.K.Rajput, Strength of Materials, Fifth edition, Eurasia Publishing House, Ram Nagar, New Delhi.

**REFERENCE BOOKS:**

1. Subramanian R., Strength of materials, Second Edition, Oxford university press, New Delhi, 2010.
2. William A.Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, Fourth Edition, Tata McGraw-Hill publishing co., New Delhi, 2007.
3. Lehri. R. S. and Lehri. A. S., Strength of materials, S.K. Kataria& Sons, New Delhi, 2010.
4. Egor P Popov, Engineering Mechanics of Solids, Second Edition, Prentice Hall of India, New Delhi, 2005.

**WEB REFERENCES:**

1. [http://nptel.ac.in/courses/112106141/Pdfs/2\\_1.pdf](http://nptel.ac.in/courses/112106141/Pdfs/2_1.pdf)
2. [http://physics.fe.uni-lj.si/students/literatura/20131029085254762\\_1.pdf/](http://physics.fe.uni-lj.si/students/literatura/20131029085254762_1.pdf/)
3. <http://www2.hcmuaf.edu.vn/data/phamducdung/thamkhao/MachineryHandbook/MH26/yc.pdf>
4. <http://scribeindia.com/anna-university/strength-of-materials-notes-anna-university-ce2252-some-lecture-notes/>

**BoS Chairman**

<b>Course Code : 141CE0403</b>	<b>Course title : SOIL MECHANICS</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Calculate the Engineering properties, identification and classification of soil mass with reference to their characteristics.
2. Describe the behaviour and effect of water in the soil mass.
3. Explain the principles of settlement and stress distribution in soil mass.
4. Calculate and plot the soil strength parameters.
5. Analyze the stability of slopes.

### **UNIT I - INDEX PROPERTIES**

**9+3**

Formation of soil – Types of soil – Civil Engineering problems with soil – Three phase system – Index properties of soils – Specific Gravity, Field Density, Grain size analysis – Atterberg's limits - Classification of soils for engineering purposes - BIS classification system – Soil compaction - Factors affecting compaction – Field compaction methods and monitoring.

### **UNIT II - SOIL WATER, PERMEABILITY AND SEEPAGE**

**9+3**

Soil water – Various forms – Capillary rise – Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Permeability – Darcy's Law- Permeability measurement in the laboratory – Liquefaction - Seepage – Laplace Equation - Introduction to flow nets –properties and uses - Application to simple problems.

### **UNIT III - STRESS DISTRIBUTION AND SETTLEMENT BEHAVIOUR OF SOIL**

**9+3**

Stress distribution in soil media – Boussinesq's theory – Approximate methods - Use of Newmark influence charts – Westergaard's equation for point load - Terzaghi's one dimensional consolidation theory – Laboratory consolidation test – Field consolidation curve for NC and OC clays - Components of settlement - Immediate and consolidation settlement - problems on final and time rate of consolidation.

### **UNIT IV - SHEAR STRENGTH BEHAVIOUR OF SOIL**

**9+3**

Shear strength of cohesive and cohesion less soils - Mohr-Coulomb failure theory – shear strength parameters and their measurements - Direct shear, Triaxial compression, Unconfined Compression and Vane shear tests – Types of shear tests based on drainage and their applicability – Factors influencing shear strength behaviour of clay and sand – pore pressure parameters.

### **UNIT V - SLOPE STABILITY**

**9+3**

Slope failure – types, causes and mechanisms - Modes - Infinite slopes - Finite slopes – Total and effective stress analysis - stability analysis for purely cohesive and c-φ soils - Method of slices – Friction circle method - Stability number – Slope protection measures.

### **COURSE OUTCOMES**

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

- CO.1 Calculate the Engineering properties, identification and classification of soil mass with reference to their characteristics.
- CO.2 Describe the behaviour and effect of water in the soil mass.
- CO.3 Explain the principles of settlement and stress distribution in soil mass.
- CO.4 Calculate and plot the soil strength parameters.
- CO.5 Analyze the stability of slopes.

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**BoS Chairman**

**TEXT BOOKS:**

1. Murthy V.N.S., "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", Marcel Dekker, Inc., New York, 2009.
2. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2012.
3. Arora.K.R "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, 2010.

**REFERENCE BOOKS:**

1. Coduto, D.P., "Geotechnical Engineering Principles and Practices", 2nd edition, Prentice Hall of India Private Limited, New Delhi, 2010.
2. GopalRanjan and Rao A.S.R., "Basic and Applied soil mechanics", New Age International Publishers, New Delhi, 2007.
3. Varghese P.C., "Foundation Engineering", PHI Learning Private Limited, New Delhi, 2005.

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105103097/>
2. <http://home.iitk.ac.in/~pkbd/A%20Preview%20of%20Soil%20Behavior.pdf>
3. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/lecture-notes/>
4. <http://www.aboutcivil.org/soil-mechanics.html>

**BoS Chairman**

<b>Course Code : 141CE0404</b>	<b>Course title : CONSTRUCTION MATERIALS AND METHODS – II</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0304 - CONSTRUCTION MATERIALS AND METHODS – I**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the usage and applications of timber, ferrous, glass, and aluminum materials.
2. Describe about standards and specifications of doors, windows and stairs.
3. Identify various methods used in construction and recognize requirements in construction projects.
4. Explain the properties of fire proofing and green building materials.
5. Describe the latest construction techniques.

### **UNIT I - DOORS, WINDOWS AND VENTILATORS**

**9**

Timber – Types of timber – Defects in timber – Seasoning of timber – Timber products. Steel– Structural steel – Rebar - Rusting and corrosion - Tensile strength. Aluminium – Properties – Applications in construction. Glass – Types – Selection of glass for various applications – Engineering properties of glass. Doors, Windows and Ventilators - Types – Standard sizes – Method of fixing doors and windows frames – Fittings for doors and windows – Fixing grills to windows and ventilators – Methods of Glazing.

### **UNIT II - STAIRS AND FLOORING**

**9**

Terminology – Types of staircases – Layout requirements of RC stairs – Construction of simple concrete stairs – Brick stair construction – Finishes to concrete steps – Flooring – Ground floor construction – Details of construction of sub-base and base – Consolidation - Suspended floors– Laying of toppings – Choice of floor finishes- Planning for the layout of tiles floors – Concrete flooring construction – Damp-proofing of floors – Waterproofing of basement.

### **UNIT III - PLASTERING, POINTING AND PAINTING**

**9**

Plastering – Definition – Specifications for plastering with cement – Plastering methods – Pointing – Types – Plastering between concrete beam and brick masonry – Painting – Preparation of newly plastered walls for painting – Types of paints to be used – Process of painting - Defects in paintwork – Distempers – Properties – Distempering – Important considerations in distempering.

### **UNIT IV - CONSTRUCTION EQUIPMENTS**

**9**

Selection of equipments - Earth moving operations - Types of earthwork equipment - Tractors, motor graders, scrapers, front end loaders, earth movers – Equipment for foundation and pile driving. Equipment for concrete construction - Equipment for materials handling and erection of structures - Equipment for dredging, trenching, tunnelling.

### **UNIT V - CONSTRUCTION OF OTHER STRUCTURES**

**9**

Launching girders, bridge decks, off shore platforms – Techniques for heavy decks – In-situ pre-stressing in high rise structures, Material handling - Erecting light weight components on tall structures - Construction sequences in cooling towers, sky scrapers - Support structure for heavy Equipment and conveyors -Erection of articulated structures.

### **COURSE OUTCOMES**

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

CO.1 Explain the usage and applications of timber, ferrous, glass, and aluminum materials.

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- CO.2 Describe about standards and specifications of doors, windows and stairs.
- CO.3 Identify various methods used in construction and recognize requirements in construction projects.
- CO.4 Explain the properties of fire proofing and green building materials.
- CO.5 Describe the latest construction techniques.

**TEXT BOOKS:**

1. S.P.Arora and S.P. Bindra "Building Construction", Dhanpatrai Publications, New Delhi, 2012.
2. Rangwala, "Engineering Materials (Material Science)", Charotar Publishing House Private Limited, Gujarat, Thirty Eighth Edition, 2011.
3. P.C.Varghese, "Building Construction", PHI Learning Private Limited, New Delhi, 2010.
4. M.S.Shetty, "Concrete Technology Theory and Practice", S. Chand and Company Ltd., 2008.

**REFERENCE BOOKS:**

1. S.P.Arora and S.P. Bindra "Building Construction", Dhanpatrai Publications, New Delhi, 2012.
2. Rangwala, "Engineering Materials (Material Science)", Charotar Publishing House Private Limited, Gujarat, Thirty Eighth Edition, 2011.
3. P.C.Varghese, "Building Construction", PHI Learning Private Limited, New Delhi, 2010.

**WEB REFERENCES:**

1. [www.understandconstruction.com](http://www.understandconstruction.com)
2. [www.engineeringcivil.com](http://www.engineeringcivil.com)
3. [www.aboutcivil.com](http://www.aboutcivil.com)
4. [www.lmtpc.org](http://www.lmtpc.org)



**BoS Chairman**

<b>Course Code : 141CE0405</b>	<b>Course title : APPLIED HYDRAULIC ENGINEERING</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE: 141CE0303 FLUID MECHANICS**

**COURSE OBJECTIVES**

**The course is intended to:**

1. Compute the critical flow and alternate depth of the channel flow.
2. Design the efficient section of channel with uniform flow.
3. Explain gradually varied flow and its computations by various methods.
4. Describe the behavior of hydraulic jump and its use in energy dissipation structures.
5. Describe the components, function, and use of different types of pumps and turbines.

**UNIT I - OPEN CHANNEL FLOW & CRITICAL FLOW**

**9+3**

Open channel flow – Types - Difference between open channel and pipe flow – Properties of Open channel-Types of channel -Fundamental equations, conservation of mass, conservation of energy and conservation of momentum-Velocity distribution in open channel flow – Mean velocity - Specific energy – Specific energy equation-Critical flow and its computation – Critical depth and Alternate depths.

**UNIT II - UNIFORM FLOW**

**9+3**

Uniform flow – Manning's and Chezy's formula –Equivalent roughness-Determination of normal depth and velocity - Efficient hydraulic sections for open channel- Rectangular, trapezoidal and circular sections-Derivation – Applications- channel transition- Measurement of flow- Measurement using area of flow and Mean velocity of flow-Notches and weirs

**UNIT III - GRADUALLY VARIED FLOW**

**9+3**

Dynamic equation of gradually varied flow – Assumptions – Characteristics of flow profiles - Water surface flow profile classifications - Profile determination by direct step method, standard step method and graphical method – Drawdown and backwater curves – Profile determination

**UNIT IV - RAPIDLY VARIED FLOW**

**9+3**

Hydraulic jump – Types of hydraulic jump –Expression of depth of Hydraulic jump- Expression for loss of energy due to hydraulic jump- Length of hydraulic jump- Energy dissipation - Surges and surge through channel transitions.

**UNIT V - PUMPS & TURBINES**

**9+3**

Centrifugal pump –Components-Working principle- Priming of centrifugal pump-Specific speed - Reciprocating pump – Components-working principle- Single and Double acting reciprocating pump- Discharge through a pump- Work done-Pump efficiency- Negative slip - Turbines - Classification – Impulse and Reaction turbines - Head and Efficiencies of Hydraulic turbines -Components and functions of Pelton Wheel turbine, Francis turbine and Kaplan turbine-Velocity Triangle-Specific speed - Physical and Technical basics of hydropower.

**COURSE OUTCOMES**

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

- CO.1 Compute the critical flow and alternate depth of the channel flow.

  
BoS Chairman

- CO.2 Design the efficient section of channel with uniform flow.  
CO.3 Explain gradually varied flow and its computations by various methods.  
CO.4 Describe the behavior of hydraulic jump and its use in energy dissipation structures.  
CO.5 Describe the components, function, and use of different types of pumps and turbines.

**TEXT BOOKS:**

1. Subramanya. K, "Flow in Open Channels", Tata McGraw Hill Publishing Company Ltd, New Delhi (2009).
2. Bansal. R.K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publishing Pvt Ltd, New Delhi, (2007).

**REFERENCE BOOKS:**

1. Chow VenTe, "Open Channel. Hydraulics", Tata McGraw Hill Book Company Ltd, New Delhi (1996).
2. Modi, P.N. and Seth, S.M., "Hydraulic and Fluid Mechanics", Standard Book House, New Delhi (2000).
3. Srivastava. R., "Flow through open channels", Oxford University Press, New Delhi, (2008).

**WEB REFERENCES:**

1. <http://www.annaunivupdates.com/2015/01/ce6403-applied-hydraulic-engineering-ahe-lecture-notes-question-bank-2-mark-with-answers.html>
2. <http://nptel.ac.in/courses/105106114/>
3. [http://web.itu.edu.tr/~bulu/hydraulics\\_files/lecture\\_notes\\_05.pdf](http://web.itu.edu.tr/~bulu/hydraulics_files/lecture_notes_05.pdf)



<b>Course Code : 141CE0406</b>	<b>Course title : BASIC STRUCTURAL DESIGN</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE: 141CE0205 ENGINEERING MECHANICS  
141CE0302 MECHANICS OF SOLIDS - I**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Classify structures requirements and steps involved in design methods.
2. Design bolted and welded connections.
3. Design masonry walls and columns.
4. Explain grading and properties of timber and design timbers subjected to bending and axial forces.
5. Calculate loads on truss and design truss members.

### **UNIT I - STRUCTURE AND DESIGN CONCEPTS**

**9+3**

Classification of structures – function, material and shape- different structural systems – requirements of structures – basic structural requirements- stability, strength and stiffness. Design process – codes of practice. Working Stress Method –Limit State Method of Design – Probabilistic approach to design – load and resistance – factor design – design for strength, stiffness and stability considerations- choice between different structural materials – concrete, timber, masonry and steel. Structural Loads: Dead load – live load – wind load – calculation of wind load for a structure – seismic load.

### **UNIT II - DESIGN OF SIMPLE CONNECTIONS**

**9+3**

Types of connections, Types of bolts – black bolts – turned and fitted bolts – high strength friction grip bolts–Types of bolted connections -lap joint-simple and double cover butt joint, welded connections, types, advantages, defects - fillet and butt weld, mode of failures, Limit State Design of bolted and welded connections for axial load, joint efficiency –design of bolted and welded connections for eccentric load.

### **UNIT III - DESIGN OF MASONRY WALLS AND COLUMNS**

**9+3**

Brick masonry – brick walls – allowable stresses – design of load bearing wall – walls with opening – bed stones – axially loaded square and rectangular column with uniaxial eccentricity.

Laterally Loaded masonry Structures: Structures and loads- stability of masonry – middle third rule – masonry dams – trapezoidal dam – retaining wall.

### **UNIT IV - TIMBER STRUCTURES**

**9+3**

Knots, Wanes, Checks and Shakes – slope of grain – classification and grading – factors of safety – permissible stresses –flexural members – flitched beam – timber columns and strut – members subjected to bending and axial stresses.

### **UNIT V - DESIGN OF TRUSS PROJECT**

**9+3**

Load distribution and load calculation on trusses, design of purlin, thickness of gusset plate, analysis and design of simple type of trusses and connections – Model making of truss as the mini-project(for Internal assessment only).

### **COURSE OUTCOMES**

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

- CO.1 Classify structures requirements and steps involved in design methods.
- CO.2 Design bolted and welded connections.
- CO.3 Design masonry walls and columns.
- CO.4 Explain grading and properties of timber and design timbers subjected to bending and axial forces.

  
**BoS Chairman**

CO.5 Calculate loads on truss and design truss members.

**TEXT BOOKS:**

1. Daniel L. Schodek and Martin Bechthold, "Structures", PHI Learning Pvt Ltd, New Delhi (2011)
2. Subramanian N., "Design of steel structures", Oxford University Press, New Delhi (2011)

**REFERENCE BOOKS:**

1. Duggal, S K., "Limit State Design of Steel Structures", Tata Mcgraw-Hill Pub. Co. Ltd., 2012.
2. V.N Vazirani and M.M Ratwani, "Steel Structures and Timber Structures", Khanna Publishers, New Delhi (2013)
3. IS 800:2007, "Indian Standard GENERAL CONSTRUCTION IN. STEEL — CODE OF PRACTICE", Third Revision, Bureau of Indian Standards, New Delhi (2007)

**WEB REFERENCES:**

1. [https://engineering.purdue.edu/~ahvarma/CE%20470/F05\\_CE470/Lec\\_Mat/CE470\\_Chapter1\\_revised.pdf](https://engineering.purdue.edu/~ahvarma/CE%20470/F05_CE470/Lec_Mat/CE470_Chapter1_revised.pdf)(updated 20-Jan-2015)
2. <http://www.bgstructuralengineering.com/>(updated 10-Dec-2015)
3. [https://www.aisc.org/uploadedFiles/Steel\\_Solutions\\_Center/Conceptual/My\\_Project/Files/ArchitectsGuide.pdf](https://www.aisc.org/uploadedFiles/Steel_Solutions_Center/Conceptual/My_Project/Files/ArchitectsGuide.pdf)(updated 05-Mar-2014)



BoS Chairman

<b>Course Code : 141CE0407</b>	<b>Course Title : HYDRAULIC ENGINEERING LABORATORY</b>		
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 4 : 2</b>	
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>45</b>	

**PREREQUISITE: 141CE0303 – FLUID MECHANICS**

### **COURSE OBJECTIVES**

The course is intended to:

1. Identify the laminar and turbulent flow using Reynolds apparatus.
2. Calculate and draw the characteristic curves of the Hydraulic Machines
3. Measure the flow through pipe and open channel
4. Verify the Bernoulli s Theorem
5. Determine the losses for different pipes and fittings

### **LIST OF EXPERIMENTS**

#### **FLOW EXPERIMENTS**

1. Determination of Meta centric height of a floating body
2. Determination of laminar and turbulent flow using Reynolds apparatus
3. Verification of Bernoulli s Theorem.
4. Measurement of Flow using Venturimeter and orifice meter
5. Measurement of Flow through Orifice/ Mouthpiece
6. Determination of Friction Factor of the Pipe Materials (Major losses).
7. Determination of head losses for different pipe fittings (Minor losses).
8. Measurement of Flow through Notch.

#### **FLUID MACHINERY EXPERIMENTS**

9. Performance Test on Centrifugal Pump.
10. Performance Test on Reciprocating Pump.
11. Performance Test on Pelton Wheel.
12. Performance Test on Kaplan turbine

### **COURSE OUTCOMES**

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

- CO.1 Identify the laminar and turbulent flow using Reynolds apparatus.
- CO.2 Calculate and draw the characteristic curves of the Hydraulic Machines
- CO.3 Measure the flow through pipe and open channel
- CO.4 Verify the Bernoulli s Theorem
- CO.5 Determine the losses for different pipes and fittings

### **REFERENCE**

1. "Hydraulic Engineering Laboratory manual of civil engineering department", MCET, Pollachi

<b>Course Code : 141CE0408</b>	<b>Course Title : SURVEYING PRACTICE LABORATORY II</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>0 : 0 : 4: 2</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0306 SURVEYING**

**141CE0308 SURVEYING PRACTICE LABORATORY I**

### **COURSE OBJECTIVES**

The course is intended to:

1. Compute the area using tacheometer.
2. Determine the elevation of a given object using tacheometer
3. Determine the gradients between various points using tacheometer.
4. Set out simple curves using different methods.
5. Set out foundation layout for a given building.

### **LIST OF EXPERIMENTS**

1. To determine the tacheometry constants for the given tacheometer.
2. To compute the area by Tacheometric traversing
3. Study and demonstration of total station
4. To determine the elevation of a given object by single plane method
5. To determine the elevation of a given object by double plane method.
6. To determine the gradients between given points by stadia method
7. To determine the gradients between given points by tangential method
8. To determine the area for the given points by tangential method
9. To set out a simple circular curve by the concept of ordinates from long chord.
10. To set out a simple circular curve by Rankine's method
11. To set out a simple circular curve by Double Theodolite method
12. To set out a given foundation layout with standard markings

### **COURSE OUTCOMES**

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

CO.1 Compute the area using tacheometer.

CO.2 Determine the elevation of a given object using tacheometer

CO.3 Determine the gradients between various points using tacheometer.

CO.4 Set out simple curves using different methods.

CO.5 Set out foundation layout for a given building.

### **REFERENCE**

1. Surveying Practice Laboratory II manual of civil engineering department, MCET, Pollachi.

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**BoS Chairman**

<b>Course Code : 141CE0409</b>	<b>Course title : ETHICAL AND MORAL RESPONSIBILITY</b>		
<b>Core/Elective: General</b>	<b>L: T: P: C</b>	<b>0: 0: 2: 1</b>	
<b>Type : Theory &amp; Practical</b>	<b>Total Contact hours:</b>	<b>30</b>	

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Articulate the importance of ethical and moral responsibilities
2. Explain the fundamental aspects of ethical practices
3. Validate one's appropriate and inappropriate behaviors in various roles
4. Elaborate code of conduct of professional bodies
5. Explain the importance of professional practices as a future employee/entrepreneur.

### **UNIT I - ETHICAL PRACTICES – IMPORTANCE**

**8**

Why ethical practices; The current day scenario of ethical practices – parents, society, politics & business; Awareness of skewedness of information – news, advertisements and other media; The need for ethical and moral responsibility on a personal level; Handling oneself amidst peer pressure and societal pressure.

### **UNIT II - ETHICAL PRACTICES – FUNDAMENTALS**

**6**

Morality & Ethics; Moral issues, inquiry, moral dilemmas; Moral autonomy – Kohlberg's theory and Gilligan's refinement; Theories on "right action" – virtue ethics, utilitarianism, duty ethics, rights ethics – resolving moral dilemmas; justifying moral obligations.

### **UNIT III - CODES OF CONDUCT**

**8**

Importance of code of conduct and its role; Evolving draft Code of conduct for different roles – son/daughter, student, future employee & citizen; Reflection on real time incidences at the college Engineers as responsible experimenters; Faith of the Engineer (ABET); Pledge and Code of ethics as per National Society of Professional Engineers (NSPE); Code of Ethics of Institution of Engineers (India); Case studies and discussions in professional context.

### **UNIT IV - PROFESSIONAL PRACTICES AT WORK**

**8**

Transition from a student to a professional; Importance of professional practices at work; Integrity as the topmost virtue of a professional; Self-awareness: Where competence ends and professionalism takes over; Professional qualities; Need to align oneself to culture & values of organizations; Need to embrace diversity in organizations.

### **COURSE OUTCOMES**

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

- CO.1 Articulate the importance of ethical and moral responsibilities
- CO.2 Explain the fundamental aspects of ethical practices
- CO.3 Validate one's appropriate and inappropriate behaviors in various roles
- CO.4 Elaborate code of conduct of professional bodies
- CO.5 Explain the importance of professional practices as a future employee/entrepreneur.

### **COURSE HANDOUTS: (compiled by PS team, MCET)**

1. Instructor's Manual (for the faculty)
2. Learner's workbook (for the student)

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**REFERENCE BOOKS:**

1. Mike W Martin & Roland Schinzenger, *Ethics in Engineering*, Latest Edition, Tata McGraw-Hill
2. Code of conduct document, MCET student handbook
3. Gail D Baura, *Engineering Ethics - an industrial perspective*, Academic Press, Elsevier,
4. SubratoBagchi, *The professional - Defining the new standard of Excellence at work*, Penguin Books India

**Assessments:**

Assessment	Details	Wt:	Administration	When
Class room participation	Group assignments presentation; Case discussions participation	70%	Continuous assessment in class	During class
Knowledge test	Multiple choice questions	10%	Pen and Paper	End of course
Scenario based assessments	Multiple choice questions	20%	Pen and Paper	End of course

**No. of hours& credits:**

Enablement through class room lecture, case discussions and group presentations	Conducted by trained internal faculty	30 hours – 1 credit
At least two guest lectures	Delivered by senior people from Industries/Government organizations	

**END OF SEMESTER IV**

  
BoS Chairman

<b>Course Code : 141CE0501</b>	<b>Course title : WATER RESOURCES AND IRRIGATION ENGINEERING</b>	
<b>Core/ Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

## COURSE OBJECTIVES

The course is intended to:

1. Explain fundamentals of water resources engineering.
2. Estimate and measure the processes involved in the Hydrological cycle.
3. Analyze the steady and unsteady ground water flow problems.
4. Adopt the suitable Irrigation methods for managing the irrigation water.
5. Design the different structures involved in irrigation.

### UNIT I - WATER RESOURCES ENGINEERING AND MANAGEMENT

9

Water resource potential - Majors rivers in India - Classification of river basins, Water requirements and Water demands for irrigation , Domestic purpose hydro power generation ,Navigation and recreation, Optimum utilization of water resources in irrigation - Social economic aspects & scope of water resource engineering- Water resources survey- Description of water resources planning - National Water Policy- Conjunctive use of surface and ground water – Consumptive and non- consumptive water use

### UNIT II - SURFACE WATER HYDROLOGY

9

Hydrologic cycle – Climate – Weather – Layers in atmosphere – Types and forms of precipitation – Hydro meteorological measurements – Cyclones – Fronts – Winds – Monsoon – Clouds – Requirements for Precipitation- Rainfall – Rain gauges – Adequacy of network –Frequency and Intensity/duration analysis – Consistency - Missing data – Abstractions – Infiltration – Evaporation – Interception – Process, Estimation and Measurement – Depression and detention storages - Detailed study of runoff process. Hydrograph analysis- Unit Hydrographs

### UNIT III - GROUND WATER HYDROLOGY

9

Occurrence, distribution & movement of ground water supply- Geologic formation of ground water - Assessment of ground water potential supply - Aquifer properties - Hydrologic properties of aquifer- Flow through aquifers properties-Properties of water in relation to flow- Storage equations, steady and unsteady flow in confined, unconfined & semi confined aquifer-Seepage from canal, stream aquifer- Ground water modelling - Ground water balances - Ground water recharge

### UNIT IV - IRRIGATION ENGINEERING AND MANAGEMENT

9

Irrigation – Need, mode and Influence of irrigation – Crop and crop seasons – Consumptive use of water – Duty- Factors affecting duty - Relationship between Duty, Delta, Base period- Irrigation efficiencies - Irrigation scheduling – Planning and Development of irrigation projects. Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Irrigation methods-Surface and Sub-Surface - Micro Irrigation – Drip and Sprinkler Irrigation - Merits and demerits

### UNIT V - IRRIGATION STRUCTURES

9

Diversion and impounding Structures - Types of impounding structures - Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams. Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal head works – Canal regulators – River Training works

## COURSE OUTCOMES

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

CO.1 Explain fundamentals of water resources engineering.

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- CO.2 Estimate and measure the processes involved in the Hydrological cycle.  
CO.3 Analyze the steady and unsteady ground water flow problems.  
CO.4 Adopt the suitable Irrigation methods for managing the irrigation water.  
CO.5 Design the different structures involved in irrigation.

**TEXT BOOKS:**

1. Asawa. G.L, "Irrigation Engineering", New Age International Publishers.1<sup>st</sup> Edition, reprint 2012.
2. Sharma. R.K, and Sharma T.K., "Irrigation Engineering", S. Chand and company, New Delhi, 2008
3. Gupta, B.L, & Amir Gupta, "Irrigation Engineering", SatyaPraheshan, New Delhi
4. Subramanya. K., "Hydrology", Tata McGraw Hill Co., New Delhi, 1994.
5. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000

**REFERENCE BOOKS:**

1. Basak, N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co, Edition:2011-2012
2. Garg, S.K., "Irrigation Engineering", Khanna Publishers, 2006
3. H.M., Ragunath, "Irrigation Engineering", Wiley India Pvt Ltd., 2011
4. Garg. S. K, "Hydrology And Water Resources Engineering", KhannaPublishsers-Delhi, 2010

**WEB REFERENCES:**

1. <http://nptel.ac.in/downloads/105105110/>
2. <http://www.civilenggforall.com/2015/09/irrigation-and-water-resources-engineering-gl-asawa-free-download-pdf-civilenggforall.html>
3. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-731-water-resource-systems-fall-2006/lecture-notes/>



<b>Course Code : 141CE0502</b>	<b>Course title : STRUCTURAL ANALYSIS I</b>	
<b>Core/ Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

**PREREQUISITE: 141CE0402 Mechanics of Solids - II**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Analyze statically determinate structures.
2. Obtain influence lines for statically determinate and indeterminate structures subjected to different types of loads.
3. Analyze the two hinged and three hinged arches.
4. Derive slope deflection equations and applications to continuous beams and frames.
5. Determine bending moment and shear force in statically indeterminate structures by using moment distribution method.

### **UNIT I - DEFLECTION OF DETERMINATE STRUCTURES**

**9+3**

Introduction to Structural Analysis – methods of structural analysis–static and kinematic indeterminacy- Principle of superposition – Virtual work - Principles of Virtual Work, derivation of virtual work equation for deflection – Determination of deflections of determinate plane trusses, beams and rigid plane frames using Virtual Work method.

### **UNIT II - MOVING LOADS AND INFLUENCE LINES**

**9+3**

System of moving loads- criteria for maximum shear force and bending moment under moving loads for simply supported beams- absolute maximum bending moment- Equivalent UDL -Curves of maximum B.M.D. and S.F.D. - Influence lines for reactions in statically determinate structures – influence lines for member forces in plane trusses – Influence lines for shear force and bending moment in beam sections –Muller Breslau's principle – Application of Muller Breslau's principle to Influence lines for determinate structure only.

### **UNIT III - ARCHES**

**9+3**

Arches structural forms – Examples of arch structures – Types of arches – Linear arch – arch action – horizontal thrust – Eddy's theorem for bending moment – determination of normal thrust, shear force and bending moment in three hinged and two hinged, parabolic and circular arches – Settlement and temperature effects – influence line for three hinged arches.

### **UNIT IV - SLOPE DEFLECTION METHOD**

**9+3**

Introduction to Displacement methods – assumptions in slope deflection method - Fixed end moments – sign conventions –degrees of freedom - Slope deflection equations – procedure for analysis using slope deflection method- Analysis of continuous beams, simple frames and portal frames (with and without sway) - Simplification for Symmetry and antisymmetry - Support settlements.

### **UNIT V - MOMENT DISTRIBUTION METHOD**

**9+3**

Basics of moment distribution method – absolute stiffness-relative stiffness – Distribution factor- carry over moments-carry over factors – Application of Moment distribution method to continuous beams - Analysis of plane rigid frames with and without sway. Simplification for Symmetry and antisymmetry – Naylor's Simplification.

### **COURSE OUTCOMES**

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

- CO.1 Describe the principle of virtual work and to determine deflection in trusses, beams and frames.

  
BoS Chairman

- CO.2 Explain the effect of moving loads on stress resultants and to draw influence lines for trusses and beams.
- CO.3 Calculate the stress resultants in two and three hinged arches.
- CO.4 Analyze the structure using slope-deflection method.
- CO.5 Analyze the structure using moment distribution method.

**TEXT BOOKS:**

1. Vaidyanathan, R. and Perumal, P., "Structural Analysis Vol. I (4th Edition) and Vol. II (3rd Edition)", Laxmi Publications, New Delhi, 2016 & 2017.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications, New Delhi, 2017.
3. Negi, L.S. and R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2003.

**REFERENCE BOOKS:**

1. Jain A.K. and Arya A.S., "Structural Analysis, Vol.II", Nemchand Publishers, Roorkee, 1996.
2. Ashok K. Jain, "Advanced Structural Analysis", Nem Chand & Bros, Roorkee, 2015.
3. Reddy C.S., "Basic Structural Analysis". Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2010.
4. Harry H West., "Fundamentals of Structural Analysis" John Wiley & sons Inc, 2011.
5. Timoshenko S.P., "Theory of Structures", McGraw Hill Publishing Intl Ltd, 1965.

**WEB REFERENCES:**

1. [https://ecourses.ou.edu/cgi-bin/ebook.cgi?doc=&topic=me&chap\\_sec=03.3&page=theory](https://ecourses.ou.edu/cgi-bin/ebook.cgi?doc=&topic=me&chap_sec=03.3&page=theory)
2. [https://www.civil.iitb.ac.in/800-dir/Kalani\\_Book.pdf](https://www.civil.iitb.ac.in/800-dir/Kalani_Book.pdf)
3. <http://www.faadooengineers.com/threads/18572-Structural-Analysis-Full-Book-in-pdf-All-units-of-structure-I-II-III>
4. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-571-structural-analysis-and-control-spring-2004/lecture-notes/>
5. <http://profkodali.blogspot.in/>
6. <http://www.learnerstv.com/Free-engineering-Video-lectures-ltv085-Page1.htm>

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<b>Course Code : 141CE0503</b>	<b>Course title : FOUNDATION ENGINEERING</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

**PREREQUISITE:** 141CE0403 SOIL MECHANICS

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe the stages in site investigation to select the suitable foundation types based on soil conditions
2. Explain the methods available in determining bearing capacity of shallow foundations and their settlements
3. Design of shallow foundations and rafts
4. Design of pile foundation and computing carrying capacity of pile groups and its settlement
5. Apply the knowledge of earth pressure theory and able to analysis retaining walls

### **UNIT I - SITE INVESTIGATION AND SELECTION OF FOUNDATION**

**9+3**

Scope and objectives – Methods of exploration – Boring – Depth of boring – Spacing of bore hole - Sampling – Types of samples – Sampling techniques – In-situ penetration tests (SPT and SCPT) - Bore log report, interpretation of test results —Subsurface profile – Types of foundation - Selection of foundation based on soil condition

### **UNIT II - BEARING CAPACITY AND SETTLEMENT OF SHALLOW FOUNDATIONS**

**9+3**

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

### **UNIT III - FOOTINGS AND RAFT FOUNDATIONS**

**9+3**

Contact pressure distribution below footings & raft – Design (no structural design) of Isolated, combined footings (rectangular and trapezoidal), strap footings and mat foundation – types – importance of proportioning– floating foundation - Identification of expansive soil – design (no structural design) of foundations on expansive soil – under reamed piles

### **UNIT IV - PILE FOUNDATIONS**

**9+3**

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil - Static formula - Dynamic formulae (Engineering news and Hiley's) – Capacity from in-situ tests (SPT and SCPT) – Pile load test - Negative skin friction – uplift capacity – Group capacity (Individual pile method and Block failure criterion) – Pile group efficiency by Feld's rule, Converse Labarra formula - Settlement of pile groups

### **UNIT V - EARTH PRESSURE AND RETAINING WALLS**

**9+3**

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil - Coloumb's wedge theory – Types of retaining walls - Earth pressure on retaining walls of simple configurations – Graphical methods (Culmann's method only) – Stability (no structural design) of retaining walls

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**BoS Chairman**

## **COURSE OUTCOMES**

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

- CO.1 Describe the stages in site investigation, methods of explorations, techniques followed in sampling and to select the suitable foundation types based on soil conditions
- CO.2 Explain the methods available in determining bearing capacity of shallow foundations and their settlements
- CO.3 Design of shallow foundations and rafts and explain about expansive soils
- CO.4 Design of pile foundation and computing carrying capacity of pile groups and its settlement
- CO.5 Apply the knowledge of earth pressure theory and able to analysis retaining walls

## **TEXT BOOKS:**

- 1. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2017
- 2. Murthy, V.N.S, Text book of "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd, New Delhi, 2015.
- 3. Arora.K.R,"Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, Pvt. Ltd., New Delhi, 2011.
- 4. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 2005.

## **REFERENCE BOOKS:**

- 1. Coduto, D.P., "Geotechnical Engineering Principles and Practices", 2<sup>nd</sup> edition, Prentice Hall of India Private Limited, New Delhi, 2010.
- 2. GopalRanjan and Rao A.S.R., "Basic and Applied soil mechanics", New Age International Publishers, New Delhi, 2016.
- 3. Varghese P.C., "Foundation Engineering", PHI Learning Private Limited, New Delhi, 2012.
- 4. Das, B.M. "Principles of Foundation Engineering (Eighth edition), Thomson Books /COLE, 2014.
- 5. Bowles J.E, "Foundation analysis and design", McGraw-Hill, 1994.
- 6. Purushothma Raj P "Soil Mechanics and Foundation Engineering" 2<sup>nd</sup> Edition, Pearson Education, 2013.

## **WEB REFERENCES:**

- 1. <http://nptel.ac.in/courses/105103097/>
- 2. <http://home.iitk.ac.in/~pkbd/A%20Preview%20of%20Soil%20Behavior.pdf>
- 3. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/lecture-notes/>
- 4. <http://www.aboutcivil.org/soil-mechanics.html>

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**BoS Chairman**

<b>Course Code : 141CE0504</b>	<b>Course title : DESIGN OF STEEL STRUCTURES</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60 Hours</b>

**PREREQUISITE: 141CE0406 Basic Structural Design**

### **COURSE OBJECTIVES**

The course is intended to:

1. Explain the properties of steel sections and design basics and codal provisions- Design of connections
2. Design steel members subjected to tension and compression
3. Design of beams, built up beams and design of plate girder
4. Design of elements of roof truss, joints, etc.-use of hand books in steel roof truss design
5. Design beam connections

### **UNIT I - INTRODUCTION**

**9+3**

Steel Structures types, Indian standard rolled steel sections - maintenance of steel structures - loads on structures and load combination - Limit State Design Concepts - Bolted and welded connections - friction grip bolts - failure of joints - strength of fillet and butt welded joints – Review of bolted and welded connections for members subjected to axial forces - design of bolted and welded eccentric connections.

### **UNIT II - TENSION AND COMPRESSION MEMBERS**

**9+3**

Net area, Net effective section for angles and Tees in tension - Design of simple and built up members subjected to tension - tension splices – Use of lug angles – concept of shear lag - compression members - effective lengths – slenderness ratio - design of axially loaded simple and built up compression members with lacing and battens - design of column bases and gusseted base.

### **UNIT III - BEAMS**

**9+3**

Bending, bearing and shear stresses in beams – Design of laterally unsupported beams - design of built-up beams – design of plate girders - curtailment of flange plates - connection of flange plates and beams – intermediate and bearing stiffeners – flange and web splices.

### **UNIT IV - ROOF TRUSSES**

**9+3**

Framing plan – metal roof sheets - Types of roof trusses – components of roof truss - Estimation of dead, live and wind loads - Design of roof purlins – design of tension and compression members – need for bracing – design of bracing

### **UNIT V - BEAM CONNECTIONS**

**9+3**

Types – framed beam connections – stiffened and unstiffened seated connections – moment connection - welded plate attachment to column flange – bolted attachment – end plate connection – continuous beam to beam connection

### **COURSE OUTCOMES**

- CO.1 Describe the properties of steel sections and design bolted/welded joints
- CO.2 Design tension and compression members
- CO.3 Design for steel beams and plate girders
- CO.4 Design different elements in a roof truss, purlins and bracings
- CO.5 Distinguish different beam connections and design them

### **TEXT BOOKS:**

1. Subramanian. N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
2. Gambhir. M.L., "Fundamentals of Structural Steel design", McGraw Hill Education India Pvt. Ltd., 2013.

**BoS Chairman**

3. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, New Delhi, 2010.

**REFERENCE BOOKS:**

1. Ramchandra S., "Design of Steel of Structures", Vol 1&2.Scientific publishers, Delhi, 2007
2. Dayarathnam P., "Design of Steel Structures", Wheelers Publishing Co. Ltd., 2nd Edition. 1996
3. Punmia B.C, Ashok Kumar Jain, Arun Kumar Jain., "Design of steel Structures", Laxmi publications ltd, 2005
4. Narayanan.R.et.al. "Teaching Resource on structural Steel design", INSDAG, Ministry of Steel Publications, 2002.

**WEB REFERENCES:**

1. [https://engineering.purdue.edu/~ahvarma/CE%20470/F05\\_CE470/Lec\\_Mat/CE470\\_Chapter1\\_revised.pdf](https://engineering.purdue.edu/~ahvarma/CE%20470/F05_CE470/Lec_Mat/CE470_Chapter1_revised.pdf)(updated 20-Jan-2015)
2. <http://www.bgstructuralengineering.com/>(updated 10-Dec-2015)
3. [https://www.aisc.org/uploadedFiles/Steel\\_Solutions\\_Center/Conceptual/My\\_Project/Files/ArchitectsGuide.pdf](https://www.aisc.org/uploadedFiles/Steel_Solutions_Center/Conceptual/My_Project/Files/ArchitectsGuide.pdf)(updated 05-Mar-2014)
4. <http://nptel.ac.in/courses/105103094/>
5. <http://nptel.ac.in/courses/105106112/>

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**BoS Chairman**

<b>Course Code : 141CE0505</b>	<b>Course title : HIGHWAY ENGINEERING</b>	
<b>Core / Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

### COURSE OBJECTIVES

The course is intended to:

1. Explain the basic concepts of highway planning as per IRC Codal Provisions.
2. Describe about the materials and construction practices
3. Design the elements of highway.
4. Design Flexible and Rigid Pavements as per IRC Codal Provisions.
5. Describe the failures and various repairing methods used in highway maintenance.

### UNIT I -HIGHWAY PLANNING AND DEVELOPMENT

9

Role of transportation in society - economical, social, political and environmental significance - History of Road Construction, Highway Development in India - Concepts of Ongoing Highway Development Programmes at National Level, Institutions for Highway Development at National level - Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements - Cross sections of different Class of Roads.

### UNIT II - HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE

9

Desirable properties and testing of highway materials– soil – CBR test – field density test – aggregate, crushing, abrasion, impact tests, water absorption –flakiness and elongation indices and stone polishing value test – bitumen – penetration, ductility, viscosity, binder content and softening point tests – construction practice –water bound macadam road – bituminous road and cement concrete road (as per IRC and MORTH specification) – highway drainage (IRC recommendations).

### UNIT III - GEOMETRIC DESIGN OF HIGHWAYS

9

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

### UNIT IV - FLEXIBLE AND RIGID PAVEMENTS

9

Rigid and flexible pavements – components and their functions – design principles of flexible and rigid pavements – factors affecting the design of pavements – ESWL, climate, sub-grade soil and traffic – design practice for flexible pavements (CBR method, IRC method and recommendations) – design practice for rigid pavements – IRC recommendations.

### UNIT V - HIGHWAY MAINTENANCE

9

Types of failures in flexible pavements – surface defects – cracks, deformation, disintegration – symptoms – causes and treatments – types of pavement – failures in rigid pavements – scaling, shrinkage, warping, structural cracks spalling of joints and mud pumping – special repairs – pavement evaluation – pavement surface conditions and structural evaluation – evaluation of pavement failure and strengthening – overlay design by Benkelman beam method (procedure only).

### COURSE OUTCOMES

CO.1 Explain the basic concepts of highway planning as per IRC Codal Provisions.

CO.2 Describe about the materials and construction practices used in Highway Engineering.

BoS Chairman

CO.3 Design the elements of highway.

CO.4 Design Flexible and Rigid Pavements as per IRC Codal Provisions.

CO.5 Describe the failures and various repairing methods used in highway maintenance.

**TEXT BOOKS:**

1. Khanna, S. K. and Justo, C. E. G., "Highway Engineering", Nemchand bros., Roorkee, 1991.
2. Subramaniam K.P., "Highway, Railway, Airport and Harbour engineering", Scitech Publications (India) pvt Ltd. Chennai, 2010.
3. Sharma S. K., Principles, Practice and Design of Highway Engineering Including Airport Pavements, S Chand and Company publication, 2012

**REFERENCE BOOKS:**

1. Kadiyali, I. R., "Traffic engineering and Transportation planning", Khanna publishers, New Delhi, 2011.
2. Huang, Y. H. "Pavement analysis and design", prentice hall, Englewood cliffs, New Jersey, 2010.

**WEB REFERENCES:**

1. <https://www.vidyarthiplus.com/vp/attachment.php?aid=10395>
2. <https://www.scribd.com/doc/119865487/Pavement-Engineering-Notes-2012>
3. <http://nptel.ac.in/courses/105101087/>



<b>Course Code : 141CE0507</b>	<b>Course Title : CONCRETE AND HIGHWAY LABORATORY</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 4 : 2</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

**PREREQUISITE:**141CE0304 Construction Materials and Methods-I

### **COURSE OBJECTIVES**

The course is intended to:

- CO.1 Determine the fresh properties of concrete as per IS codes of practice.
- CO.2 Determine the hardened properties of concrete as per IS codes of practice.
- CO.3 Demonstrate the quality of hardened concrete using NDT.
- CO.4 Perform tests on Self Compacting Concrete.
- CO.5 Conduct tests on bitumen as per IS codes of practice.

### **LIST OF EXPERIMENTS**

#### **Tests on Fresh and Hardened concrete:**

1. Preparation of concrete mix design using IS code of practice.
2. Determination of workability of concrete.
3. Determination of compressive strength of concrete.
4. Determination of split tensile strength of concrete.
5. Determination of flexural strength of concrete.
6. Determination of compressive strength of concrete using rebound hammer.
7. Determination of quality of concrete using ultrasonic pulse velocity test.

#### **Tests on Performance of Self Compacting Concrete:**

1. Determination of workability of SCC.
2. Determination of flowability of SCC.

#### **Tests on Bitumen:**

1. Determination of flash and fire point of bitumen.
2. Determination of binder content of bitumen using binder recovery extraction test.

### **COURSE OUTCOMES**

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

- CO.1 Prepare concrete mix design and determine the fresh properties of concrete as per IS codes of practice.
- CO.2 Determine the hardened properties of concrete as per IS codes of practice.
- CO.3 Demonstrate the quality of hardened concrete using NDT.
- CO.4 Perform tests on Self Compacting Concrete.
- CO.5 Conduct tests on bitumen as per IS codes of practice.

### **REFERENCE**

1. Concrete and Highway laboratory manual of Civil Engineering Department, MCET, Pollachi, 2017.

<b>Course Code : 141CE0508</b>	<b>Course Title : GEOTECHNICAL ENGINEERING LABORATORY</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 4 : 2</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>45 Hours</b>

**PREREQUISITE: 141CE0403 Soil Mechanics**

### **COURSE OBJECTIVES**

The course is intended to:

1. Determine index properties of soils
2. Perform the grain size distribution of soils.
3. Demonstrate the relationship between moisture and density by compaction tests.
4. Determine the engineering properties of the soil samples
5. Perform and interpret shear tests and estimate the shear strength parameters.

### **LIST OF EXPERIMENTS**

1. Determination of Water content by Oven drying method and Specific gravity of soil grains by Pycnometer method and Density bottle method
2. Determination of Relative density of sands and Grain size distribution of coarse grained soils by Sieve analysis
3. Determination of grain size distribution of fine grained soils by Hydrometer Analysis
4. Determination of Field density by core cutter method and sand replacement method
5. Determination of Liquid limit and plastic limit (Casagrande's Method)
6. Determination of Shrinkage limit of soil
7. Determination of moisture - density relationship by Standard Proctor compaction test
8. Determination of Soil Permeability by constant head and falling head methods
9. Determination of coefficient of consolidation of clays by One dimensional consolidation test
10. Determination of shear strength parameters of cohesion less soils by Direct shear test
11. Determination of shear strength parameters by Unconfined compression test on cohesive soil
12. Determination of shear strength parameters of soils by Triaxial compression test

### **COURSE OUTCOMES**

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

- CO.1 Determine index properties of soils – water content, specific gravity, liquid limit, plastic limit, shrinkage limit, relative density and field density of soils
- CO.2 Perform grain size distribution in order to classify the soils
- CO.3 Develop the relationship between moisture and density and demonstrate the importance of optimum moisture content and dry density determination
- CO.4 Determine the engineering properties of the soil samples such as permeability and coefficient of consolidation
- CO.5 Determine the shear strength parameters of cohesion less and cohesive soil with appropriate tests.

### **REFERENCE**

1. Soil Mechanics Laboratory Manual of Civil Engineering Department, MCET, Pollachi, 2017
2. Soil Mechanics Laboratory Manual, Braja M. Das, 8th Edition, Oxford University Press 2016.
3. Soil Mechanics Laboratory Manual, Micheal E Kalinski, 2nd Edition, 2011
4. "I.S.Code of Practice (2720) Relevant Parts"

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**BoS Chairman**

<b>Course Code : 141CE0509</b>	<b>Course title : TEAMNESS AND INTER-PERSONAL SKILLS</b>	
<b>Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type : PS</b>	<b>Total Contact hours:</b>	<b>30</b>

### **COURSE OBJECTIVES**

#### **The course is intended to:**

- CO.1 Be aware of attitudinal, behavioral and emotional aspects of self
- CO.2 Prefer to learn continuously about self and be in harmony with self
- CO.3 Understand others' preferences, values, roles & contexts and be in harmony with others
- CO.4 Identify barriers to harmonious relationships and derive ways to handle them
- CO.5 Work collaboratively as a team to deliver expected outcomes.

### **UNIT I - HARMONY WITH SELF**

Importance of learning about self continuously; Approaches to learn about self: introspection, being open to feedback, critical incidences as opportunities; Understanding life stages and challenges associated with them; Healthy ways of handling self in response to life's challenges;

Instruments/inventories to understand self and others: A) Know your temperament, B) Interpersonal Needs Inventory (tentative).

### **UNIT II - HARMONY WITH OTHERS**

Importance of living in harmony with others; What it takes to live in harmony with others; Understanding preferences, values, roles and contexts of others; Approaches to navigating through differences between self and others;

Barriers to harmonious relationships - Perceptions, Judgments, and Emotional instability; Ways to handle each of the barriers; Importance of reaching-out to others

### **UNIT III - GROUP DYNAMICS AND CONFLICTS RESOLUTION**

Group dynamics: overt and covert processes at micro and macro levels; Understanding the basis of conflicts; Understanding one's own conflict handling style; Methods to handling conflicts effectively.

### **UNIT IV - WORKING IN TEAMS**

Effectiveness in communication; Forming – storming – norming and performing model; Competition vs collaboration – impact of both on team tasks; TEAM Questionnaire – components of a healthy team and approaches to improving them

#### **Mode of delivery:**

##### **1. A 2-day learning workshop**

1. Activities (experiential learning)
2. Audio visuals (affective learning)
3. Case discussions (cognitive learning)
4. Instruments/questionnaires (reflective learning)

Guided by Learner's workbook.

##### **2. Continuous learning guided by learning journal, and reviews by faculty**

##### **3. Half-day reinforcement session towards the end of the semester**

#### **Assessments and Evaluation:**

  
BoS Chairman

Assessment	Details	Weightage	Administration	By Whom	When
<b>Continuous Assessment</b>					
Initial Knowledge Test	Multiple choice questions (20)	10%	Pen and paper	Internal team	Immediately after the initial workshop.
Review of student journal	Student held journal book.	50%	Student journals to be reviewed	Trained Internal faculty	Once in a week.
<b>Semester End Examination:</b>					
Final comprehensive Knowledge test	Multiple choice questions (40)	10%	Pen and paper	Internal team	End of semester after the reinforcement program.
Viva-Voce	Scenario based questions	30%		Internal team	

Continuous Assessment = 60%

Semester end examination = 40%

An overall mark of 50 is to be scored for a pass in the course

## COURSE OUTCOMES

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

CO.1 Be aware of attitudinal, behavioral and emotional aspects of self

CO.2 Prefer to learn continuously about self and be in harmony with self

CO.3 Understand others' preferences, values, roles & contexts and be in harmony with others

CO.4 Identify barriers to harmonious relationships and derive ways to handle them

CO.5 Work collaboratively as a team to deliver expected outcomes.

**END OF SEMESTER V**

  
BoS Chairman

<b>Course Code : 141CE0601</b>	<b>Course title : WATER SUPPLY AND TREATMENT ENGINEERING</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0501 Water Resources and Irrigation Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the sources of drinking water supply systems and its quality
2. Describe the conveyance systems for the water supply
3. Describe the primary methods for water treatment
4. Outline the advanced methods involved in the treatment of water.
5. Design the water distribution networks for buildings

### **UNIT I - PLANNING FOR WATER SUPPLY SYSTEM**

**9**

Public water supply system -Planning - Objectives -Design period – Population forecasting – Waterdemand -Sources of water and their characteristics -Surface and Groundwater-Impounding. Reservoir Well hydraulics -Development and selection of source - Water quality – Characterizationand standards- Impact of climate change.

### **UNIT II - CONVEYANCE SYSTEM**

**9**

Water supply -intake structures -Functions and drawings -Pipes and conduits for water- Pipematerials - Hydraulics of flow in pipes -Transmission main design -Laying, jointing and testing ofpipes - Drawings appurtenances - Types and capacity of pumps -Selection of pumps and pipematerials.

### **UNIT III - WATER TREATMENT**

**9**

Objectives - Unit operations and processes - Principles, functions design and drawing of Chemicalfeeding, Flash mixers, flocculators, sedimentation tanks and sand filters - Disinfection- ResidueManagement - Construction and Operation & Maintenance aspects of Water Treatment Plants.

### **UNIT IV - ADVANCED WATER TREATMENT**

**9**

Principles and functions of Aeration - Iron and manganese removal, Defluoridation and demineralization -Water softening - Desalination - Membrane Systems - Recent advances.

### **UNITV - WATER DISTRIBUTION AND SUPPLY TO BUILDINGS**

**9**

Requirements of water distribution -Components -Service reservoirs -Functions and drawings - Network design -Economics -Computer applications -Analysis of distribution networks - Appurtenances -operation and maintenance -Leak detection, Methods. Principles of design ofwater supply in buildings -House service connection -Fixtures and fittings - Systems of plumbingand drawings of types of plumbing.

### **COURSE OUTCOMES**

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

- CO.6 Explain the sources of drinking water supply systems and its quality
- CO.7 Describe the conveyance systems for the water supply
- CO.8 Describe the primary methods for water treatment
- CO.9 Outline the advanced methods involved in the treatment of water.
- CO.10 Design the water distribution networks for buildings

### **TEXT BOOKS:**

1. Garg, S.K., "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi, 2005.

*BoS*  
**BoS Chairman**

2. Modi, P.N. "Water Supply Engineering", Vol. I Standard Book House, New Delhi, 2005.

**REFERENCE BOOKS:**

1. Punmia, B.C., Jain, A.K., Jain, A.K., "Water Supply Engineering", Laxmi publications Pvt. Ltd., New Delhi, 2005
2. Government of India, "Manual on Water Supply and Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 2003
3. Syed, R.Q., Motley, E.M., Zhu, G., "Water Works Engineering Planning", Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.

**WEB REFERENCES:**

1. <http://nptel.ac.in/downloads/105105110/>
2. <http://www.civilenggforall.com/2015/09/irrigation-and-water-resources-engineering-gl-asawa-free-download-pdf-civilenggforall.html>
3. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-731-water-resource-systems-fall-2006/lecture-notes/>



**BoS Chairman**

<b>Course Code : 141CE0602</b>	<b>Course title : STRUCTURAL ANALYSIS - II</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE:** 141CE0502 STRUCTURAL ANALYSIS – I

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Determine member forces in space trusses and stress resultants in beams curved in plan.
2. Explain the concept of plastic analysis of structure and to design the structure.
3. Analyze the structure using Matrix flexibility method.
4. Analyze the structure using Matrix Stiffness method.
5. Describe the concept of finite element method and the steps involved in it.

### **UNIT I - SPACE STRUCTURES**

**9+3**

Basic forms of space trusses – Tension coefficients – procedure for analysis of space trusses using method of tension coefficients – Determination of member forces in space trusses using tension coefficient method – Curved beams – application of Castigliano's theorems – Determination of shear force, bending moment and twisting moment in beams curved in plan.

### **UNIT II - PLASTIC ANALYSIS**

**9+3**

True and idealized stress - strain curve for mild steel in tension, stress distribution in elastic, elasto-plastic and plastic stage - Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Concept of plastic hinge and collapse mechanism -statical and kinematical methods of analysis, upper bound, lower bound and uniqueness theorems- Plastic analysis of determinate and indeterminate beams, single bay single storied portal.

### **UNIT III - MATRIX FLEXIBILITY METHOD**

**9+3**

Flexibility coefficients – Flexibility matrices for truss, beam and frame elements -system flexibility matrix by direct approach-load transformation matrix-development of total flexibility matrix of the structure by indirect approach- Static indeterminacy - Primary structure – Compatibility conditions – steps involved in matrix flexibility method-analysis of simple structures-plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects.

### **UNIT IV - MATRIX STIFFNESS METHOD**

**9+3**

Stiffness coefficients – Development of stiffness matrices by physical approach-Stiffness matrices for truss, beam and frame elements -system stiffness matrix for simple structure by direct approach-displacement transformation matrix – system stiffness matrix for simple structure by indirect approach-steps involved in matrix stiffness method -Analysis of Continuous Beams – Analysis of plane trusses and plane frames- lack of fit and temperature effects.

### **UNIT V - FINITE ELEMENT METHOD**

**9+3**

Basic concept, Steps involved in finite element method -discretization – node numbering system- displacement functions – formulation and calculation of element stiffness matrices (truss and beam)-element load vector calculations- assembling of stiffness matrices and load vectors – boundary conditions – determination of nodal displacements, stresses and strains- Plane stress and plane strain- stiffness matrix for 2D constant strain Triangular element, Steps involved in finite element method. (No Numerical Problems)

### **COURSE OUTCOMES**

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

- CO.1 Determine member forces in space trusses and stress resultants in beams curved in plan.

- CO.2 Explain the concept of plastic analysis of structure and to design the structure.  
CO.3 Analyze the structure using Matrix flexibility method.  
CO.4 Analyze the structure using Matrix Stiffness method.  
CO.5 Describe the concept of finite element method and the steps involved in it.

**TEXT BOOKS:**

1. Vaidyanathan, R. and Perumal, P., "Structural Analysis Vol. I (4th Edition) and Vol. II (3rd Edition)", Laxmi Publications, New Delhi, 2016& 2017.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures" 12<sup>th</sup> Edition, Laxmi Publications, New Delhi, 2017.
3. Negi, L.S. and R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2003

**REFERENCE BOOKS:**

1. William Weaver, Jr & James M. Gere, "Matrix analysis of framed structures", 2<sup>nd</sup> Edition, CBS Publishers & Distributors, Delhi, 2004.
2. Ashok K. Jain, "Advanced Structural Analysis", 2<sup>nd</sup> Edition, Nem Chand & Sons, Roorkee, 2015.
3. Reddy C.S., "Basic Structural Analysis". Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2010.
4. Pandit G.S. and Gupta S.P., "Structural Analysis – A Matrix Approach", 2<sup>nd</sup> Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2008.

**WEB REFERENCES:**

1. [https://ecourses.ou.edu/cgibin/ebook.cgi?doc=&topic=me&chap\\_sec=03.3&page=theory](https://ecourses.ou.edu/cgibin/ebook.cgi?doc=&topic=me&chap_sec=03.3&page=theory)
2. <http://www.nptel.ac.in/downloads/105101085/>
3. <http://www.learnerstv.com/Free-engineering-Video-lectures-ltv085-Page1.htm>
4. [https://www.civil.iitb.ac.in/800-dir/Kalani\\_Book.pdf](https://www.civil.iitb.ac.in/800-dir/Kalani_Book.pdf)
5. <http://www.faadooengineers.com/threads/18572-Structural-Analysis-Full-Book-in-pdf-All-units-of-structure-I-II-III>
6. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-571-structural-analysis-and-control-spring-2004/lecture-notes/>

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**BoS Chairman**



<b>Course Code : 141CE0603</b>	<b>Course title : DESIGN OF RC ELEMENTS</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE:** 141CE9116 Concrete Technology

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Design and detailing of RC beams.
2. Design and detailing of RC slabs.
3. Design RC columns subjected to axial load, uniaxial and biaxial bending
4. Design various RC footings.
5. Analyze the stability requirements and design the elements of RC retaining walls

### **UNIT I - LIMIT STATE DESIGN OF BEAMS**

**9+3**

Design of singly and doubly reinforced rectangular and flanged beams – use of design aids for flexure – Behaviour of R.C. beams in shear, bond anchorage and torsion – Shear and torsional reinforcement – Limit State design of R.C. members for combined bending, shear and torsion – Use of design Aids. Design requirement for bond and anchorage as per IS code.

### **UNIT II - LIMIT STATE DESIGN OF SLABS**

**9+3**

Behaviour of one way and two way slabs – Analysis and design of one way and two way rectangular slab subjected to uniformly distributed load for various boundary conditions and corner effects, Types of staircases, design dog-legged staircase. Application of virtual work method to square, rectangular, circular and triangular slabs

### **UNIT III - LIMIT STATE DESIGN OF COLUMNS**

**9+3**

Assumptions, minimum eccentricity, Types of columns – Braced and unbraced columns – Short and Long Columns - Design of short and long columns for axial, uniaxial and biaxial bending – Use of design aids

### **UNIT IV - LIMIT STATE DESIGN OF FOOTING**

**9+3**

Design of wall footing – Design of axially and eccentrically loaded square, rectangular and circular footings – Design of combined rectangular and trapezoidal footing – Design of Strap footing – Raft foundation.

### **UNIT V - RETAINING WALLS**

**9+3**

Types - Pressure on wall due to Earth fill and Live loads - Stability requirements of Earth retaining structures - Elements of Cantilever retaining wall - stem, toe slab and heel slab - Design and detailing of Cantilever RC retaining wall - Elements of Counterfort retaining wall - stem, toe slab, heel slab and Counterfort - Design and detailing of Counterfort RC retaining wall- Effect of surcharge loading in Design of retaining wall.

### **COURSE OUTCOMES**

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

- CO.1 Design and detailing of RC beams.
- CO.2 Design and detailing of RC slabs.
- CO.3 Design RC columns subjected to axial load, uniaxial and biaxial bending
- CO.4 Design various RC footings.
- CO.5 Analyze the stability requirements and design the elements of RC retaining walls

### **TEXT BOOKS:**

1. Gambhir, M.L., "Reinforced Concrete Structures", PHI Learning Private Ltd, New Delhi, 2008
2. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India

**BoS Chairman**

- Pvt. Ltd., 2nd Edition, New Delhi, 2009.
3. Unnikrishna Pillai and Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 3<sup>rd</sup> Edition, New Delhi, 2009.
  4. Krishna Raju, N., "Design of Reinforced Concrete Structures", 3<sup>rd</sup> Edition, CBS Publishers & Distributors, New Delhi, 2013.

**REFERENCE BOOKS:**

1. Purushothaman, P. "Reinforced Concrete Structural Elements", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1992.
2. Jain, A.K., A.K. Jain and B.C. Punmia, "Limit State Design of RC Structures", Laxmi Publications, New Delhi, 2007.
3. Sinha, S.N., "Reinforced Concrete Design", 2<sup>nd</sup> Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2014.

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105105105/6>
2. <http://www.rajalakshmi.org/dept/CIVIL/CE2306-NOL.pdf>
3. <http://nptel.ac.in/courses/105105104/pdf/m13135.pdf>



**BoS Chairman**

<b>Course Code : 141CE0604</b>	<b>Course title : CONSTRUCTION PROJECT MANAGEMENT</b>		
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>	
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>	

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Outline the concepts of projects formulation
2. Define the planning concepts of a construction project
3. Explain the scheduling procedures and techniques for a construction project.
4. Describe the cost Estimation procedure and prepare cost estimates for a construction project.
5. Explain the organization and use of project information

### **UNIT I - CONSTRUCTION PROJECT FORMULATION**

**9**

Construction Participants - Roles and Responsibilities of Client, Construction management consultants, Architect-engineering associates and contractors - different types of construction projects -Project Life Cycle- phases in project life cycle- Pre-feasibility report and clearance- project estimate - Techno Economic feasibility report - Detailed project report

### **UNIT II - CONSTRUCTION PLANNING**

**9**

Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships among Activities - Estimating Activity Durations - Estimating Resource Requirements for Work Activities - Coding Systems

### **UNIT III - SCHEDULING PROCEDURES AND TECHNIQUES**

**9**

Construction Schedules - Critical Path Method – Scheduling Calculations - Float - Presenting Project Schedules - Scheduling for Activity-on-Arrow and with Leads, Lags, and Windows - Scheduling with Resource Constraints and Precedences - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs – Improving the Scheduling Process.

### **UNIT IV - COST ESTIMATION**

**9**

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs.

### **UNIT V - ORGANIZATION AND USE OF PROJECT INFORMATION**

**9**

Types of Project Information - Accuracy and Use of Information – Computerized Organization and Use of Information - Organizing Information in Databases – Relational Model of Databases - Other Conceptual Models of Databases - Centralized Database Management Systems - Databases and Applications Programs - Information Transfer and Flow.

### **COURSE OUTCOMES**

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

- CO.1 Outline the concepts of projects formulation
- CO.2 Define the planning concepts of a construction project
- CO.3 Explain the scheduling procedures and techniques for a construction project.
- CO.4 Describe the cost Estimation procedure and prepare cost estimates for a construction project.
- CO.5 Explain the organization and use of project information

**TEXT BOOKS:**

1. Chris Hendrickson and Tung Au, Project Management for Construction – “Fundamental Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall, Pittsburgh, 2000.
2. Chitkara. K.K, “Construction Project Management: planning, Scheduling and control”, Tata McGraw Hill Publishing Company, New Delhi, Reprint 2009

**REFERENCE BOOKS:**

1. Kumar NeerajJha, “Construction Project Management: Theory and Practice”, second edition, Pearson Education India, 2015
2. Seetharaman. S., “Construction Engineering and Management”, Umesh Publications, New Delhi, Reprint 2010
3. Calin M. Popescu, ChotchaiCharoenngam, “Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Application’s, Wiley, New York, 1995.
4. Willis, E. M., Scheduling Construction Projects, John Wiley & Sons, 1986.
5. Halpin, D. W., Financial and Cost Concepts for Construction Management, John Wiley & Sons, New York, 1985.
6. George J.Ritz , Total Construction Project Management - McGraw-Hill Inc, second edition, 2013

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105103093/>
2. <https://www.vidyarthiplus.com/vp/attachment.php?aid=5816>
3. <https://www.vidyarthiplus.com/vp/thread-18563.html#.WF5t7dJ97cs>
4. <https://drive.google.com/file/d/0B-lbNSAhk4D2WUJ2NWlwaktOclE/view?pref=2&pli=1>
5. <https://drive.google.com/file/d/0B-lbNSAhk4D2RUZDdmdtUWhOblE/view?pref=2&pli=1>

**BoS Chairman**

Course Code : 141CE0607	Course Title : COMPUTER AIDED DESIGN AND DRAFTING LABORATORY	
Core/Elective: Core	L: T : P : C	0 : 0 : 4 : 2
Type : Practical	Total Contact hours:	60

**PREREQUISITE:**141CE0208 COMPUTER AIDED BUILDING DRAWING LABORATORY

### COURSE OBJECTIVES

The course is intended to:

1. Perform the designing and drawing the detail of RC Elements.
2. Design and draw the detailing of retaining
3. Design and draw the detailing of different tanks in ground and overhead levels
4. Analyze and Design of RC slab, Tee beam deck slab bridges, plate and truss girder bridges used for both railways and highways.
5. Analyze and Design of steel roof trusses

### LIST OF EXPERIMENTS

1. Study on components of various construction drawings
2. Design and drawing the detailing of RCC Slabs – one way and two way slabs for continuous and discontinuous edges
3. Design and drawing the detailing of continuous RCC Beams
4. Design and drawing the detailing of short and long Columns
5. Design and drawing the detailing of Isolated and combined footings
6. Design and drawing of R.C.C. counter fort retaining walls with reinforcement details
7. Design and drawing of rectangular ground level water tanks with reinforcement details
8. Design and drawing of rectangular overhead water tanks with reinforcement details
9. Design and drawing the detailing of R.C. Tee Beam Bridge deck and reinforcement details
10. Design and drawing the detailing of Deck type highway bridge with welded connections and detailed drawing
11. Design of truss girder - through type highway bridge with bolted connections and detailed drawing
12. Design and drawing the detailing of detailing of Steel Roof Trusses

### COURSE OUTCOMES

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

- CO.1 Perform the designing and drawing the detail of RC Elements.
- CO.2 Design and draw the detailing of retaining
- CO.3 Design and draw the detailing of different tanks in ground and overhead levels
- CO.4 Analyze and Design of RC slab, Tee beam deck slab bridges, plate and truss girder bridges used for both railways and highways.
- CO.5 Analyze and Design of steel roof trusses

### TEXT BOOKS:

1. Krishnaraju, "Structural Design & Drawing" (Concrete & Steel – Volume II and III) – CBS Publishers, 2005.
2. B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, "Comprehensive Design of Steel Structures" Laxmi Publications Pvt. Ltd., 2008.
3. P.C Varghese, "Limit State Design of Reinforced Concrete" Prentice Hall of India Pvt Ltd., 2008.

### REFERENCE

  
 BoS Chairman

1. Computer Aided Design and Drawing Laboratory Manual, MCET, Pollachi, 2014
2. Krishnamurthy, D., "Structural Design and Drawing Vol. II", CBS, Publishers & Distributors, Delhi, 2010
3. Krishnamurthy, D., "Structural Design and Drawing Vol.III (Steel Structures)", CBS, Publishers & Distributors, Delhi, 2010

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BoS Chairman

<b>Course Code : 141CE0608</b>	<b>Course Title : STRUCTURAL MECHANICS LABORATORY</b>		
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 4 : 2</b>	
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>60</b>	

**PREREQUISITE:**141CE0502 STRUCTURAL ANALYSIS-I

### **COURSE OBJECTIVES**

The course is intended to:

1. Perform the test on concrete to find the properties, qualities and strength.
2. Measure the strain by using strain gauges of cantilever and simply supported beam.
3. Test the RC concrete beam in a testing frame.
4. Verify the deflection of plane truss and beam with theory.
5. Verify the reaction of two and three hinged arches.

### **LIST OF EXPERIMENTS**

1. Study the quality of hardened concrete by using Ultrasonic pulse velocity test method
2. Determination of Compressive Strength of concrete by using Rebound Hammer test Techniques
3. Introduction to mechanical strain gauge and Strain recording instruments - Measurement of strain in steel and concrete cantilever beam using mechanical strain gauge
4. Measurement of strain in steel and concrete simply supported beam using mechanical strain gauge
5. Testing of a RC concrete beam in a testing frame
6. Analysis and verification of displacement in plane truss for various loads
7. Analysis and verification of deflection in beam for various loads and support conditions
8. Analysis and verification of buckling for columns with different end conditions
9. Verification of reaction in two hinged arches
10. Verification of reaction in three hinged arches

### **COURSE OUTCOMES**

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

- CO.1 Perform the test on concrete to find the properties, qualities and strength.  
CO.2 Measure the strain by using strain gauges of cantilever and simply supported beam.  
CO.3 Test the RC concrete beam in a testing frame.  
CO.4 Verify the deflection of plane truss and beam with theory.  
CO.5 Verify the reaction of two and three hinged arches.

### **REFERENCES**

1. Structural Mechanics Laboratory Manual of Civil Engineering department, MCET, Pollachi, 2014
2. Kukreja C.B. and V.V. Shastri, "Experimental methods in structural mechanics", Standard Publishers Distributors, New Delhi, 2009



**BoS Chairman**

<b>Course Code : 141CE0609</b>	<b>Course title : CAMPUS TO CORPORATE</b>	
<b>Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 2 : 1</b>
<b>Type : PS</b>	<b>Total Contact hours:</b>	<b>30</b>

## **COURSE OBJECTIVES**

**The course is intended to:**

- CO.1 Display gratitude and social responsibility
- CO.2 Understand various business environments
- CO.3 Explain the Transition from a campus mindset to corporate mindset
- CO.4 Be prepared to the work culture
- CO.5 Choose to be presentable and agile

### **UNIT I - GRATITUDE AND SOCIAL RESPONSIBILITY**

Importance of gratitude; Finding opportunities to give back to society; Responsible behaviour in public places; Volunteerism during calamities; Social relevancy during engineering design and manufacturing – how social issues could be tackled by engineering solutions;

### **UNIT II - THE WORLD OF BUSINESS**

World of business - Perceptions vs reality; Various business types - B2B, B2C, & other business models; Various industry verticals – fundamentals, dynamics & nuances; Nature of work as per various functions – Sales & Marketing, Service, Research & Development, Production etc; Self-reflective questionnaire to identified the fitment to a particular field/function

### **UNIT III - TRANSITION FROM A CAMPUS MINDSET TO CORPORATE MINDSET**

ROCK as an acronym (Responsibility, Ownership, Contribution, Knowledgeable (continuous learning)); Responsibility – ways in which responsibility should be demonstrated; Ownership – owning one's career, owning mistakes, desisting from complaining; Contribution – focus on creating value, giving more than receiving (salary & perks); Knowledgeable (continuous learning) – learning just begins after campus, aspects of learning mindset, various opportunities to learn and how they can be utilised at work

### **UNIT IV - PREPAREDNESS TO ADAPT TO WORK CULTURE**

Skills to get through selection process – Interview conversations, resume writing, group discussion, & presentation;  
Handling Cultural differences; Handling Gender dynamics; Alignment to Ethics and values; Handling multiple (often conflicting) demands; Handling peer influence; Conducting sensitively with subordinates, peers & boss; Managing personal finance; Maintaining work-life balance – work & social life, hobbies etc;

### **UNIT V - PRESENTABLE AND AGILE**

Dressing & grooming – Reasons for good dressing & grooming; Professional etiquette – what is etiquette, professional etiquette vs social etiquette, Aspects of professional etiquette; Wellness – Healthy eating habits, Importance of sleep, Importance of fitness; Importance of cleanliness of surroundings – desk, work area, place of stay (5S);

**Mode of delivery:**

1. A 2-day learning workshop Guided by Learner's workbook.
2. Continuous learning guided by learning journal, and reviews by faculty

  
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**Assessments and Evaluation:**

Assessment	Details	Weightage	Administration	By Whom	When
Workbook record assessment	Assess the necessary elements to be entered in the workbook	20%	Individual workbooks reviewed by the faculty		Immediately after the learning workshop
Initial Knowledge Test and Scenario based knowledge test	Multiple choice questions (20)	25%	Pen and paper,	Internal team	Immediately after the learning workshop
Review of student journal	Student held journal with enough pages for the whole semester	30%	Individual journals reviewed by the faculty	Trained faculty members	Once in a week.
Final Knowledge test and Scenario based knowledge test	Multiple choice questions (40)	10%		Internal team	End of semester
Review of student journal by external expert		15%	Student journal comprehensive review	Trained faculty members	

**COURSE OUTCOMES**

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

- CO.1 Display gratitude and social responsibility
- CO.2 Understand various business environments
- CO.3 Explain the Transition from a campus mindset to corporate mindset
- CO.4 Be prepared to the work culture
- CO.5 Choose to be presentable and agile

<b>Course Code : 141CE0701</b>	<b>Course title : WASTE WATER ENGINEERING</b>	
<b>Core/Elective: Core</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0601 Water supply and Treatment Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Estimate the sewage generation and storm runoff
2. Design the sewer system including sewage pumping stations
3. Design the unit operations and processes in primary sewage treatment
4. Design the processes involved in secondary sewage treatment
5. Describe the sludge management process

### **UNIT I - PLANNING FOR SEWERAGE SYSTEMS**

**9**

Sources of wastewater generation – Effects – Estimation of sanitary sewage flow – Estimation of storm runoff – Factors affecting Characteristics and composition of sewage and their significance – Effluent standards – Legislation requirements.

### **UNIT II - SEWER DESIGN**

**9**

Sewerage – Hydraulics of flow in sewers – Objectives – Design period - Design of sanitary and storm sewers – Small bore systems - Computer applications – Laying, joining & testing of sewers – appurtenances – Pumps – selection of pumps and pipe Drainage -. Plumbing System for Buildings – One pipe and two pipe system.

### **UNIT III - PRIMARY TREATMENT OF SEWAGE**

**9**

Objective – Selection of treatment processes – Principles, Functions, Design and Drawing of Units- Onsite sanitation - Septic tank with dispersion - Grey water harvesting – Primary treatment – Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks – Construction, operation and Maintenance aspects.

### **UNIT IV - SECONDARY TREATMENT OF SEWAGE**

**9**

Objective – Selection of Treatment Methods – Principles, Functions, Design and Drawing of Units - Activated Sludge Process and Trickling filter – Oxidation ditches, UASB – Waste Stabilization Ponds – Reclamation and Reuse of sewage - sewage recycle in residential complex – Recent Advances in Sewage Treatment – Construction and Operation & Maintenance of Sewage Treatment Plants.

### **UNIT V - DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT**

**9**

Standards for Disposal - Methods – dilution – Self-purification of surface water bodies – Oxygen sag curve – Land disposal – Sludge characterization – Thickening – Sludge digestion – Biogas recovery – Sludge Conditioning and Dewatering – disposal – Advances in Sludge Treatment and disposal.

### **COURSE OUTCOMES**

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

- CO.1 Estimate the sewage generation and storm runoff
- CO.2 Design the sewer system including sewage pumping stations
- CO.3 Design the unit operations and processes in primary sewage treatment
- CO.4 Design the processes involved in secondary sewage treatment
- CO.5 Describe the sludge management process

**TEXT BOOKS:**

1. Garg, S.K., "Environmental Engineering" Vol. II, Khanna Publishers, New Delhi, 2003.
2. Punmia, B.C., Jain, A.K., and Jain. A.K., "Environmental Engineering", Vol.II, Lakshmi Publications.

**REFERENCE BOOKS:**

1. Government of India, "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, New Delhi, 1997.
2. Metcalf & Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw Hill Company, New Delhi, 2003.
3. Karia, G. L., Christian, R. A., "Wastewater Treatment", Prentice Hall of India, New Delhi, 2013.

**WEB REFERENCES:**

1. <http://nptel.ac.in/downloads/105105110/>
2. <http://www.civilenggforall.com/2015/09/irrigation-and-water-resources-engineering-gl-asawa-free-download-pdf-civilenggforall.html>
3. <https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-731-water-resource-systems-fall-2006/lecture-notes/>

**BoS Chairman**

<b>Course Code : 141CE0702</b>	<b>Course title : STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>3 : 1 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE: 141CE0603 Design of RC Elements**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Formulate equation of motion of SDOF systems and obtain their response.
2. Explain the response of MDOF systems when subjected to dynamic loads
3. Describe the elements of seismology and measurement of the earthquake parameters
4. Explain the effects of structures under seismic loading based on IS Codal provisions for evaluating earthquake forces
5. Design and detailing the earthquake resistant structures using IS guidelines.

### **UNIT I - THEORY OF VIBRATIONS**

**9+3**

Difference between static loading and dynamic loading – Degree of freedom – idealisation of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system – D'Alemberts principles – effect of damping – free and forced vibration of damped and undamped structures – Natural frequency - Response to harmonic and periodic forces.

### **UNIT II - MULTIPLE DEGREE OF FREEDOM SYSTEM**

**9+3**

Two degree of freedom system – modes of vibrations – formulation of equations of motion of multi-degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods.

### **UNIT III - ELEMENTS OF SEISMOLOGY**

**9+3**

Elements of Engineering Seismology - Causes of Earthquake – Plate Tectonic theory – Elastic rebound Theory – Characteristic of earthquake – Measurement of earthquake parameters - Magnitude and intensity of earthquakes – Spectral Acceleration - learning from past earthquake history.

### **UNIT IV - RESPONSE OF STRUCTURES TO EARTHQUAKE**

**9+3**

Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Evaluation of earthquake forces as per IS:1893 – 2016 - Response Spectra - lessons from failures of structures

### **UNIT V - DESIGN METHODOLOGY**

**9+3**

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 2013 – Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings –Design and detailing as per IS:13920 – 2016.

### **COURSE OUTCOMES**

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

- CO.1 Formulate equation of motion of SDOF systems and obtain their response.
- CO.2 Explain the response of MDOF systems when subjected to dynamic loads
- CO.3 Describe the elements of seismology and measurement of the earthquake parameters
- CO.4 Explain the effects of structures under seismic loading based on IS Codal provisions for evaluating earthquake forces
- CO.5 Design and detailing the earthquake resistant structures using IS guidelines.

*BoS*  
**BoS Chairman**

**TEXT BOOKS:**

1. Chopra A.K., "Dynamics of Structures (Theory and Applications to Earthquake Engineering)", 4<sup>th</sup> Edition, Prentice Hall of India Private Limited. New Delhi, 2012
2. Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007
3. Duggal S.K, "Earthquake Resistant Design of Structures", 2nd Edition, Oxford University Press, New Delhi, 2013.

**REFERENCE BOOKS:**

1. Damodarasamy, S. R., Kavitha.S, "Basics of structural dynamics and aseismic design", PHI Learning private limited, Delhi-2014.
2. Biggs, J.M., "Introduction to Structural Dynamics", McGraw Hill Book Co., New York, 1964
3. Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 2009
4. Paz, M. and Leigh.W. "Structural Dynamics – Theory & Computation", 4th Edition, CBS Publishers & Distributors, Shahdara, Delhi, 2006
5. Jai Krishna, A.R. Chandrasekaran and Brijesh Chandra, "Elements of Earthquake Engineering", 2nd Edition, South Asian Publishers, Pvt. Ltd.
6. Stefen L Kramer, "Geotechnical Earthquake Engineering", Pearson Education Publications, 2003
7. Clough R.W & Penzien, "Dynamics of Structures", 4th Edition, McGraw Hill Book Co Ltd, 2008
8. Manickaselvam, V.K, "Elementary Structural Dynamics", DhanpatRai& Sons, 2001
9. IS Codes: IS: 1893-1(2016), IS: 4326(1993) and IS:13920(2016), Bureau of Indian Standards, New Delhi.

**WEB REFERENCES:**

1. [https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/BSSC/P-749\\_Chapter5.pdf](https://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/BSSC/P-749_Chapter5.pdf)
2. [http://www.preventionweb.net/files/687\\_10092.pdf](http://www.preventionweb.net/files/687_10092.pdf)

**BoS Chairman**

<b>Course Code : 141CE0707</b>	<b>Course Title : ENVIRONMENTAL ENGINEERING LABORATORY</b>	
<b>Core/Elective: Core</b>	<b>L: T: P: C</b>	<b>0: 0: 4: 2</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>60</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Determine the physical properties of the given water sample.
2. Determine the chemical properties of the given water sample.
3. Conduct tests to determine the amount of oxygen in the water.
4. Determine the amount of hardness in the given water sample.
5. Calculate the dosing of different chemicals required for the water treatment.

### **LIST OF EXPERIMENTS**

1. Determination of  $p^H$  and Electrical Conductivity
2. Determination of Turbidity, Total Solids (TS), Suspended Solids, Settleable Solids (SS) and Volatile Solids(VS)
3. Determination of Sulphates
4. Determination of Chlorides
5. Determination of Dissolved Oxygen (DO)
6. Determination of COD
7. Determination of Alkalinity
8. Determination of Hardness
9. Determination of Available chlorine in Bleaching powder
10. Determination of Residual Chlorine, Chloride and Fluoride
11. Determination of Percentage Absorbance and Concentration by Spectrometer
12. Determination of Optimum amount of Coagulant

### **COURSE OUTCOMES**

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

- CO.1 Determine the physical properties of the given water sample.
- CO.2 Determine the chemical properties of the given water sample.
- CO.3 Conduct tests to determine the amount of oxygen in the water.
- CO.4 Determine the amount of hardness in the given water sample.
- CO.5 Calculate the dosing of different chemicals required for the water treatment.

### **REFERENCES**

1. Environmental Engineering Laboratory manual of Civil Engineering Department, MCET, Pollachi, 2018.

*BoS*

**BoS Chairman**

<b>Course Code : 141CE0708</b>	<b>Course Title : QUANTITY SURVEYING AND ESTIMATION LABORATORY</b>	
<b>Core/Elective: Core</b>	<b>L : T : P : C</b>	<b>0 : 0 : 4 : 2</b>
<b>Type : Practical</b>	<b>Total Contact hours:</b>	<b>60</b>

### **COURSE OBJECTIVES**

The course is intended to:

1. Estimate the quantities for the given load bearing as well as framed structure.
2. Prepare the cost abstract for the quantities used in a given structure.
3. Estimate the quantities for irrigation and environmental structures.
4. Estimate the volume of earthwork for bituminous and concrete roads.
5. Determine the rent and depreciation value of a given building.

### **LIST OF EXPERIMENTS**

1. Introduction to building components with detailed drawing.
2. Determine the rate for Damp proof course, RCC and plain concrete for various mix proportions with reference to the current schedule of rate.
3. Estimation of quantities for the given simple load bearing structures and give the cost abstract statement
4. Estimation of quantities for the given G+1 framed structures and give the cost abstract statement
5. Estimation of quantities for the given simple industrial building and give the cost abstract statement
6. Estimation of quantities for the given retaining wall.
7. Estimation of quantities for the given culvert
8. Estimation of quantities for the given septic tank and soak pit.
9. Estimation of quantities for bituminous and cement concrete roads
10. Estimate the quantities and calculate the rate for residential building with reference to the current schedule of rate.
11. Determination of rent for building.
12. Preparation of plan and costing using softwares for duplex residential building

### **COURSE OUTCOMES**

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

- CO.1 Estimate the quantities for the given load bearing as well as framed structure.
- CO.2 Prepare the cost abstract for the quantities used in a given structure.
- CO.3 Estimate the quantities for irrigation and environmental structures.
- CO.4 Estimate the volume of earthwork for bituminous and concrete roads.
- CO.5 Determine the rent and depreciation value of a given building.

### **REFERENCES**

1. Quantity Surveying and Estimation Lab Manual, Department of Civil Engineering, Dr.MCET, Pollachi.
2. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 28<sup>th</sup> Edition, 2016.
3. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S. Chand & Company Ltd, 2012
4. Chakraborti. M., "Estimating, Costing, Specification and Valuation in Civil Engineering", 24<sup>th</sup> edition 2012(Reprint 2013).
5. Schedule of Rate for the year 2018- 2019, Section I - Civil Engineering Section, Coimbatore Corporation
6. Schedule of Rate for the year 2018- 2019, Section II - Road Works, Coimbatore Corporation

*BoS*

**BoS Chairman**

<b>Course Code : 141CE9111</b>	<b>Course title : PROFESSIONAL ETHICS AND HUMAN VALUES</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Identify the core values that shape the ethical behavior of an engineer
2. Describe the role of an engineer as a responsible experimenter
3. Explain the importance of public safety in professional ethics
4. Undertake the social responsibilities of an engineer
5. Provide solutions to moral dilemmas arising in professional life

### **UNIT I - ENGINEERING ETHICS**

**9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas–Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy –Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

### **UNIT II - ENGINEERING AS SOCIAL EXPERIMENTATION**

**9**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics- Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study.

### **UNIT III - ENGINEER'S RESPONSIBILITY FOR SAFETY**

**9**

Safety and Risk – Assessment of Safety and Risk – Risk Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Case Studies Chernobyl and Bhopal.

### **UNIT IV - RESPONSIBILITIES AND RIGHTS**

**9**

Professional Obligation – Overview of NBC - Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality –Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

### **UNIT V - GLOBAL ISSUES**

**9**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics – Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

### **COURSE OUTCOMES**

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

- CO.1 Identify the core values that shape the ethical behavior of an engineer
- CO.2 Describe the role of an engineer as a responsible experimenter
- CO.3 Explain the importance of public safety in professional ethics
- CO.4 Undertake the social responsibilities of an engineer
- CO.5 Provide solutions to moral dilemmas arising in professional life

### **TEXT BOOKS:**

1. Martin. M., Schinzing, R. "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Harris, C.E., Pritchard, M.S., Rabins, M.J., "Engineering Ethics: Concepts and Cases", 4<sup>th</sup>Edition, Wadsworth Publishing, New Delhi, 2012.

*BoS*

**BoS Chairman**



**REFERENCE BOOKS:**

1. Fleddermann. C.D., "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. Boatright. J.R., Patra, B.P., "Ethics and the Conduct of Business", 6th Edition, Pearson Education, Delhi, 2011
3. Seebauer. E.G., Barry, R.L., "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press India, New Delhi, 2005
4. Bajaj, P.S., Agrawal, R., "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.

**WEB REFERENCES:**

1. <http://www.slideshare.net/Kalpнатomar/human-values-and-professional-ethics-notes-unit-1>
2. <https://niyatigarg.files.wordpress.com/2011/08/question-bank1.pdf>
3. [http://www.bietjhs.ac.in/pdf/human\\_values.pdf](http://www.bietjhs.ac.in/pdf/human_values.pdf)
4. <http://www.gupshupstudy.com/note/31353131/professional-ethics-and-human-values-by-rsnaagarazan-full-ebook-pdf-download>

**BoS Chairman**

## ENVIRONMENTAL ENGINEERING STREAM

<b>Course Code : 141CE9112</b>	<b>Course title : AIR POLLUTION MANAGEMENT</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0305 Environmental Science and Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Brief the Classification, Sources and Effects of Air Pollutants
2. Illustrate the dispersion of air pollutants
3. Acquire the air pollution control techniques, strategy and equipments
4. Explain the standards, monitoring, and indices of air quality with case studies.
5. Explain the sources, characteristics, effects, assessment, control and prevention of noise pollution

### **UNIT I - CLASSIFICATION, SOURCES AND EFFECTS OF AIR POLLUTANTS 9**

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

### **UNIT II - DISPERSION OF POLLUTANTS 9**

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

### **UNIT III - AIR POLLUTION CONTROL TECHNIQUES 9**

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion- Biological air pollution control technologies – Bioscrubers, Biofilters..

### **UNIT IV - AIR QUALITY MONITORING AND MANAGEMENT 9**

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

### **UNIT V - NOISE POLLUTION 9**

Sources of noise pollution – Definitions- Characteristics of noise and its measurement – Effects of noise – Assessment – Noise level Standards – Noise Abatement and Control methods – Prevention.

### **COURSE OUTCOMES**

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

- CO.1 Brief the Classification, Sources and Effects of Air Pollutants
- CO.2 Illustrate the dispersion of air pollutants
- CO.3 Acquire the air pollution control techniques, strategy and equipments
- CO.4 Explain the standards, monitoring, and indices of air quality with case studies.
- CO.5 Explain the sources, characteristics, effects, assessment, control and prevention of noise pollution

*BoS*

**BoS Chairman**

**TEXT BOOKS:**

1. Anjaneyulu. D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Rao. C.S. "Environmental Pollution Control Engineering", New Age International (P) Ltd., 2<sup>nd</sup> Edition, 2006.
3. Rao M.N. and Rao H. V. N., "Air Pollution Control", Tata McGraw-Hill, New Delhi, 1996

**REFERENCE BOOKS:**

1. W.L. Heumann, "Industrial Air Pollution Control Systems", Tata McGraw-Hill, New York, 1997
2. Mahajan S.P., "Pollution Control in Process Industries", Tata McGraw-Hill Publishing Company, New Delhi, 2009.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. "Environmental Engineering", Tata McGraw Hill, New Delhi, 1985.
4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi, 2010.

**WEB REFERENCES:**

1. <http://www.niehs.nih.gov/health/topics/agents/air-pollution/>
2. <http://newdelhi.usembassy.gov/airqualitydata.html>
3. <http://www.moef.nic.in/division/introduction-20>
4. <https://aqicn.org/links/>
5. <http://nptel.ac.in/courses/105104099/>

**BoS Chairman**

<b>Course Code : 141CE9113</b>	<b>Course title : ECOLOGICAL ENGINEERING</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0305 Environmental Science and Engineering**

**COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the scope and applications of ecological principles.
2. Describe the ecosystem functions.
3. Apply the ecological principles in rehabilitation of ecosystems.
4. Estimate the various effects of industrialization on ecology.
5. Explain appropriate case studies of integrated ecological engineering systems.

**UNIT I - PRINCIPLES AND CONCEPTS OF ECOSYSTEM**

**9**

Scope and applications of Ecological Engineering - Development and evolution of ecosystems - principles and concepts pertaining to species, populations and community.

**UNIT II - ECOSYSTEM FUNCTIONS**

**9**

Energy flow and nutrient cycle - Food chain and food webs- biological magnification. Diversity and stability, immature and mature systems. Primary productivity- Biochemical cycling of nitrogen, phosphorous, sulphur and carbon dioxide: Habitat ecology- Terrestrial, fresh water, estuarine and marine habitats.

**UNIT III - ECOLOGICAL ENGINEERING METHODS**

**9**

Bio monitoring and its role in evaluation of aquatic ecosystem; Rehabilitation of ecosystems through ecological principles- step cropping, bio-wind screens, Wetlands, ponds, Root Zone Treatment for waste water, Reuse of treated waste water through ecological systems.

**UNIT IV - ECOLOGICAL EFFECTS OF INDUSTRIALISATION**

**9**

Ecological effects of exploration, production, extraction, processing, manufacture and transport.

**UNIT V - CASE STUDIES**

**9**

Case studies of integrated ecological engineering systems.

**COURSE OUTCOMES**

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

- CO.1 Explain the scope and applications of ecological principles.
- CO.2 Describe the ecosystem functions.
- CO.3 Apply the ecological principles in rehabilitation of ecosystems.
- CO.4 Estimate the various effects of industrialization on ecology.
- CO.5 Explain appropriate case studies of integrated ecological engineering systems.

**TEXT BOOKS:**

1. Odum, E.P., "Fundamentals of Ecology", W.B. Saunders, 1990.
2. Kormondy, E.J., "Concepts of Ecology", Prentice Hall, New Delhi, 1996.

**REFERENCE BOOKS:**

1. Patrick C Kangas., "Ecological Engineering Principles And Practices", Crc Press, 2005
2. Sven Erik, "Applications In Ecological Engineering", 2009.
3. Mitch, J.W., and Jorgensen, S.E., "Ecological Engineering – An Introduction to ecotechnology", John Willey & Sons, 1996.

**WEB REFERENCES:**

1. <http://ces.iisc.ernet.in/new/>
2. <http://www.environmentandecology.com/downloads>
3. <http://nptel.ac.in/courses/122102006/>

*BoS*

**BoS Chairman**

<b>Course Code : 141CE9114</b>	<b>Course title : INDUSTRIAL WASTE MANAGEMENT</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0305 Environmental Science and Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe the generation of wastes and its minimization.
2. Explain the concept of waste audit and cleaner production.
3. Classify the major waste producing industries.
4. Illustrate the control techniques for recovery, reuse and disposal of wastes in Indian Industries.
5. Explain the hazardous waste management concept.

### **UNIT I - INTRODUCTION**

**9**

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

### **UNIT II - CLEANER PRODUCTION**

**9**

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

### **UNIT III - POLLUTION FROM MAJOR INDUSTRIES**

**9**

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

### **UNIT IV - TREATMENT TECHNOLOGIES**

**9**

Equalization – Neutralization – Removal of suspended and dissolved organic solids – Chemical oxidation – Adsorption - Removal of dissolved inorganic – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal

### **UNIT V - HAZARDOUS WASTE MANAGEMENT**

**9**

Hazardous wastes - Physico chemical treatment –solidification – incineration – Dumping of solid waste; Secured land fill-site selection, design and operation of sanitary landfills– Leachate collection and treatment

### **COURSE OUTCOMES**

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

- CO.1 Describe the generation of wastes and its minimization.
- CO.2 Explain the concept of waste audit and cleaner production.
- CO.3 Classify the major waste producing industries.
- CO.4 Illustrate the control techniques for recovery, reuse and disposal of wastes in Indian Industries.
- CO.5 Explain the hazardous waste management concept.

### **TEXT BOOKS:**

1. M.N. Rao & A.K. Dutta, "Wastewater Treatment", Oxford - IBH Publication, 1995.
2. W.W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company,

New Delhi, 2000.

3. Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw Hill Publishing Company, New Delhi, 2009.

**REFERENCE BOOKS:**

1. T.T. Shen, "Industrial Pollution Prevention", Springer, 1999.
2. R.L. Stephenson and J.B. Blackburn, Jr., "Industrial Wastewater Systems Handbook", LewisPublisher, New York, 1998
3. H.M. Freeman, "Industrial Pollution Prevention Hand Book", McGraw-Hill Inc., New Delhi, 1995
4. Bishop, P.L., "Pollution Prevention: Fundamental & Practice", McGraw-Hill, 2000

**WEB REFERENCES:**

1. <http://iwma.in/>
2. <https://www.epa.gov/sites/production/files>
3. <http://www.recyclenow.com/>

<b>Course Code : 141CE9115</b>	<b>Course title : MUNICIPAL SOLID WASTE MANAGEMENT</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0305 Environmental Science and Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the different types and sources of municipal solid waste.
2. Demonstrate the reduction of waste at source and storage methods for municipal solid waste.
3. Explain the different methods of collection and transport of municipal solid waste.
4. Describe the various methods for processing municipal solid waste.
5. Distinguish the different aspects of the disposal of municipal solid waste.

### **UNIT I - SOURCES AND TYPES**

**9**

Sources and types of municipal solid wastes-Waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management – Municipal solid waste (M&H) rules- Integrated management.- Social and Financial aspects; Public awareness; Role of NGO's.

### **UNIT II - SOURCE REDUCTION AND ON-SITE STORAGE**

**9**

Source reduction of waste- Reduction, Reuse and Recycling - On-site storage methods- Effect of storage, materials used for containers- segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions –Critical Evaluation of Options.

### **UNIT III - COLLECTION AND TRANSFER**

**9**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems – solving.

### **UNIT IV - PROCESSING OF WASTES**

**9**

Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation composting, Thermal processing options-incineration, Pyrolysis; case studies under Indian conditions.

### **UNIT V - DISPOSAL**

**9**

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills –Landfill liners – Leachate collection & treatment-Management of leachate and landfill gas – Land fill bioreactor.-Dumpsite Rehabilitation.

### **COURSE OUTCOMES**

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

- CO.1 Explain the different types and sources of municipal solid waste.
- CO.2 Demonstrate the reduction of waste at source and storage methods for municipal solid waste.
- CO.3 Explain the different methods of collection and transport of municipal solid waste.
- CO.4 Describe the various methods for processing municipal solid waste.
- CO.5 Distinguish the different aspects of the disposal of municipal solid waste.

*BoS*

**BoS Chairman**

**TEXT BOOKS:**

1. George Tchobanoglous and Frank Kreith (2002). Handbook of Solid waste Management, McGraw Hill, New York.
2. Paul T Williams (2000), Waste Treatment and Disposal, John Wiley and Sons

**REFERENCE BOOKS:**

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. Solid Waste Management Collection, Processing and Disposal, 2001, ISBN 81-7525-282-0
3. Manser A.G.R and Keeling A.A (1996) ,Practical Handbook of Processing and Recycling of Municipal solid Wastes, Lewis Publishers, CRC Press

**WEB REFERENCES:**

1. <http://nswaienviis.nic.in/>
2. <http://nptel.ac.in/courses/120108005/>
3. <http://www.moef.nic.in/legis/hsm/mswmhr.html>
4. [http://moud.gov.in/advisory/swm\\_manual](http://moud.gov.in/advisory/swm_manual)



## STRUCTURAL ENGINEERING STREAM

Course Code : 141CE9116	Course title : CONCRETE TECHNOLOGY	
Core / Elective: Elective	L: T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45 Hours

**PREREQUISITE: 141CE0304 Construction Materials and Methods I  
141CE0404 Construction Materials and Methods II**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the ingredients of concrete.
2. Illustrate the application of chemical and mineral admixtures.
3. Design concrete mix as per IS and ACI code of practices
4. Describe the fresh and hardened properties of concrete.
5. Describe the various special concretes and their application.

### **UNIT I - CONCRETE CONSTITUENTS**

**9**

Composition of cement - Hydration of cement - Structure of hydrated cement - Aggregate - Classification - Testing - Methods of combining aggregates - Grading requirements as per BIS - Quality of water.

### **UNIT II - ADMIXTURES**

**9**

Chemical admixture - Accelerators - Retarders - Plasticisers - Super plasticisers - Water proofers - Effects on fresh and hardened properties - Mineral admixture - Fly ash - Silica fume - Ground granulated blast furnace slag- Metakaoline - Effects on fresh and hardened properties.

### **UNIT III - CONCRETE MIX PROPORTIONING**

**9**

Basic considerations - Principles of mix proportioning – Quality control - Methods of mix proportioning - BIS and ACI mix design procedure - Mix design examples - Correction for moisture content and bulking.

### **UNIT IV - PROPERTIES OF CONCRETE**

**9**

Fresh concrete properties - Workability and factors affecting it - Segregation - Bleeding - Hardened concrete properties - Factors affecting strength - curing - methods of curing - Dimensional stability - Creep - Shrinkage - Permeability - Tests on permeability - RCPT – Half cell - Non-destructive testing - Rebound hammer test - Ultrasonic pulse velocity method.

### **UNIT V - SPECIAL CONCRETES**

**9**

Light weight concrete - High strength concrete - High performance concrete - Fibre reinforced concrete - Ferrocement - Polymer Concrete - Ready mix concrete - Shotcrete - Self compacting concrete - their production, properties and application.

### **COURSE OUTCOMES**

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

- CO.1 Explain clearly about the ingredients of concrete.
- CO.2 Illustrate the application of chemical and mineral admixtures.
- CO.3 Design concrete mix as per IS and ACI code of practices.
- CO.4 Elucidate the fresh and hardened properties of concrete.
- CO.5 Describe the various special concretes and their application.

### **TEXT BOOKS:**

1. Shetty. M.S, "Concrete Technology", S. Chand and Company Ltd., New Delhi, 2010.
2. Gambhir. M.L, "Concrete Technology", Tata Mc-Graw Hill Company, New Delhi, 2013.

**BoS Chairman**

**REFERENCE BOOKS:**

1. Santhakumar.A.R, "Concrete Technology", Oxford university press, New Delhi, 2007.
2. Neville A.M "Properties of Concrete", Pearson Education Asia Pvt Ltd., New Delhi, 2012.
3. Povindar K. Mehta, Paulo J. M. Monteiro, "Concrete: Microstructure, Properties, and Materials", Mc-Graw Hill Company, 2011.

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105102012/>
2. <https://drive.google.com/file/d/0B-lbNSAhk4D2aVRGd1h4Z0QtbU0/view?pref=2&pli=1>
3. <http://freevideolectures.com/Course/3357/Concrete-Technology/1>

<b>Course Code : 141CE9117</b>	<b>Course title : DESIGN OF RC STRUCTURES</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>4 : 0 : 0 : 4</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>60</b>

**PREREQUISITE: 141CE0603 DESIGN OF RC ELEMENTS**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Analyze and design retaining walls.
2. Analyze and design all the elements of circular and rectangular water tanks.
3. Design concrete bunkers and silos.
4. Explain the classification of bridges and design simple type of bridges.
5. Design flat slabs & RC walls and to understand principle and methods related to prestressed concrete.

### **UNIT I - RETAINING WALLS**

**12**

Design and detailing of cantilever and counter fort RC retaining walls

### **UNIT II - WATER TANKS**

**12**

Underground circular, rectangular tanks – Domes – Overhead circular and rectangular tanks – Design of staging and foundations-Design as per BIS Codal Provisions

### **UNIT III - BUNKERS AND SILOS**

**12**

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

### **UNIT IV - RCC BRIDGES**

**12**

Introduction, Classification of bridges - IRC Loadings - Effective width of load dispersion - Design of solid slab Bridge - Box culverts

### **UNIT V - SELECTED TOPICS**

**12**

Design of flat slabs – Hillerberg's strip method of design of slab - Design of Reinforced concrete walls – mat foundation– Pile cap - Introduction to prestressed concrete -Principles –types and methods of prestressing - BIS Codal Provisions

### **COURSE OUTCOMES**

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

- CO.1 Analyze and design retaining walls.
- CO.2 Analyze and design all the elements of circular and rectangular water tanks.
- CO.3 Design concrete bunkers and silos.
- CO.4 Explain the classification of bridges and design simple type of bridges.
- CO.5 Design flat slabs & RC walls and to understand principle and methods related to prestressed concrete.

### **TEXT BOOKS:**

1. Gambhir, M.L., "Reinforced Concrete Structures", PHI Learning Private Ltd, New Delhi, 2008
2. Varghese. P. C., Limit State Design of Reinforced Concrete, 2nd Edition, PHI Learning Private Ltd, NewDelhi, 2009

### **REFERENCE BOOKS:**

1. S Unnikrishna Pillai and Devadas Menon, *Reinforced Concrete Design* (3rd edition), Tata McGraw-Hill Education Private limited, Fourth reprint 2010.

2. Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company, 1997.
3. Punmia, B.C., Ashok.K.Jain and Arun.K.Jain. "Reinforced Concrete Structures" Vol. II, Laxmi Publications, New Delhi, Reprint 2003.
4. Syal, I.C. and Goel, A.K; Reinforced Concrete Structures", A.H Wheelers & Co Pvt Ltd.1994.

**WEB REFERENCES:**

1. <http://nptel.ac.in/downloads/105105104/>
2. <http://www.ce.memphis.edu/4135/PDF/Notes/Chapter1-0%20.pdf>
3. <https://arch.usc.edu/sites/default/files/mbs/papers/kang-kyu%20choi.pdf>

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**BoS Chairman**

Course Code : 141CE9118	Course title : BRIDGE STRUCTURES	
Core/Elective: Elective	L: T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

**PREREQUISITE: 141CE0603 Design of RC Elements**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the concepts of IRC loadings and design of various truss girder used as Highway bridges
2. Perform the design of various steel plate girder bridges used as railway bridge
3. Describe the IRC loading and design the various concrete bridges
4. Design the aqueducts, box culverts and composite bridges
5. Apply the Concepts of prestressed concrete bridges and design the prestressed concrete bridges

### **UNIT I - HIGHWAY STEEL BRIDGES**

**9**

Design of through type steel highway bridges for IRC loading – Design of stringers, cross girders and main girders – Design of deck type steel highway bridges for IRC loading – Design of main girders – Design of pratt type truss girder highway bridges – Design of top chord, bottom chord, web members – Effect of repeated loading.

### **UNIT II - RAILWAY STEEL BRIDGES**

**9**

Design of plate girder railway bridges for railway loading – Wind effects – Design of web and flange plates – Vertical and horizontal stiffeners – Web and flange splicing.

### **UNIT III - REINFORCED CONCRETE BRIDGES**

**9**

Types of Bridges - Design of solid slab bridges for IRC loading - Design of kerb – Design of tee beam bridges – Design of panel and cantilever for IRC loading – Design of tee beams - Courbon's theory – Pigeaud's curves – Design of balanced cantilever bridges – Deck slab– Main girder – Design of cantilever – Design of articulation

### **UNIT IV - AQUEDUCTS, BOX CULVERTS AND COMPOSITE BRIDGES**

**9**

Design of Aqueducts and Syphon Aqueducts – Design of Box Culverts – Design of composite bridges – composite action - shear connectors – design of concrete deck slab – design of composite section – design of steel plate girders

### **UNIT V - PRESTRESSED CONCRETE BRIDGES**

**9**

Design of prestressed concrete bridges – Preliminary dimensions – Flexural and torsional parameters – Courbon's theory – Distribution coefficient by exact analysis – Design of girder section – Maximum and minimum prestressing forces – Eccentricity – Live load and dead load shear forces – Cable zone in girder – Check for stresses at various sections – Check for diagonal tension – Diaphragms – End block – Short term and long term deflections.

### **COURSE OUTCOMES**

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

- CO.1 Explain the concepts of IRC loadings and design of various truss girder used as Highway bridges
- CO.2 Perform the design of various steel plate girder bridges used as railway bridge
- CO.3 Describe the IRC loading and design the various concrete bridges
- CO.4 Design the aqueducts, box culverts and composite bridges
- CO.5 Apply the Concepts of prestressed concrete bridges and design the prestressed concrete bridges

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**BoS Chairman**

**TEXT BOOKS:**

1. Johnson Victor, D., Essentials of Bridge Engineering, Oxford and IBH Publishing Co., New Delhi 1995
2. Ponnuswamy S., Bridge Engineering, Tata McGraw Hill, New Delhi, 1996.
3. Phatak D.R., Bridge Engineering, SatyaPrakashan, New Delhi, 1990.

**REFERENCE BOOKS:**

1. Dr. Punmia B. C., Ashok Kumar, Jain and Arun Kumar Jain, R.C.C. Designs, Laxmi Publications 2000

**WEB REFERENCES:**

1. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-051-structural-engineering-design-fall-2003/lecture-notes/>
2. [http://nptel.ac.in/courses/105106113/9\\_bridges/1\\_introduction.pdf](http://nptel.ac.in/courses/105106113/9_bridges/1_introduction.pdf)

Course Code : 141CE9119	Course title : COMPUTER AIDED DESIGN OF STRUCTURES	
Core/Elective: Elective	L : T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

**PREREQUISITE: 141CE0603 Design of RC Elements  
141CE0607 Computer Aided Design and Drafting Laboratory.**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Get them know about graphic primitives
2. Describe the knowledge about optimization and design principles
3. Explain finite element method and to apply for simple problems
4. Apply the use of standard software packages for analysis
5. Identifying the various structural analysis packages

### **UNIT I - INTRODUCTION**

**9**

Fundamentals of CAD - Hardware and Software requirements - Design process - Application and benefits - drafting packages - Applications to layout of buildings and structures, use of AUTOCAD. Introduction of design softwares and their application

### **UNIT II - DESIGN & OPTIMIZATION**

**9**

Principles of design of steel and RC structures - Applications to simple design problems - optimization techniques - user interactive format, input, output techniques - Display techniques - Sever control techniques and feedback systems- Design & optimization softwares introduction only.

### **UNIT III - INTRODUCTION TO FINITE ELEMENT ANALYSIS**

**9**

Fundamentals of a Finite Element Analysis - Steps involved - Boundary value problems - Galerkin's approach - Variational principles - Isoparametric formulations - field application - Finite Element Division, Element matrix - assemblage, matrix and solution for deflection - Stresses & Strains - Simple problem using triangular elements.

### **UNIT IV - STRUCTURAL ENGINEERING PACKAGES**

**9**

Introduction of various structural engineering packages - Analysis and design of structures by using softwares

### **UNIT V - ANALYSIS OF STRUCTURES BY FINITE ELEMENT METHOD**

**9**

Analysis of plane truss, space truss, plane frames, space frames using FEM packages

### **COURSE OUTCOMES**

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

- CO.1 Get them know about graphic primitives
- CO.2 Describe the knowledge about optimization and design principles
- CO.3 Explain finite element method and to apply for simple problems
- CO.4 Apply the use of standard software packages for analysis
- CO.5 Identifying the various structural analysis packages

### **TEXT BOOKS:**

1. Krishnamoorthy C.S. and Rajeev .S, "Computer Aided Design", - Narosa Publishing House, New Delhi 1991
2. Rajasekaran S., "Finite Element Analysis", - A.H. Wheelers Publishing Co. Ltd., 1993
3. S.S.Rao, "The Finite Element Method in Engineering", Fourth Edition, Elsevier, 2006

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**BoS Chairman**

**REFERENCE BOOKS:**

1. Grover M.P. and ZimmersE.W.Jr. CAD/CAM, "Computer Aided Design and Manufacturing", - Prentice Hall of India Ltd., 1996
2. Harrison H.B. "Structural Analysis and Design, Parts I and II"- Pergamon Press, Oxford, 1970
3. Rao, S.S. "Optimization Theory and Applications" - Wiley Eastern Ltd. New Delhi 1977
4. AUTOCAD Manual, 2000
5. Reddy, "Finite Element Methods", II Edition. - McGraw Hill Co., 1993

**WEB REFERENCES:**

1. <http://www.nptelvideos.in/2012/12/computer-aided-design.html>
2. [http://web.iitd.ac.in/~hegde/cad/lecture/L01\\_Introduction.pdf](http://web.iitd.ac.in/~hegde/cad/lecture/L01_Introduction.pdf)
3. <http://nptel.ac.in/courses/105105041/>

**BoS Chairman**



<b>Course Code : 141CE9120</b>	<b>Course title : DESIGN OF PLATE AND SHELL STRUCTURES</b>		
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>	
<b>Type : Theory</b>	<b>Total Contact hours:</b>		<b>45</b>

**PREREQUISITE:** 141CE0602 Structural Analysis - II

**COURSE OBJECTIVES**

**The course is intended to:**

1. Derive the governing equations for thin plates with small deflection
2. Compute the response of rectangular plates due to external loading
3. Explain thin shells and their behaviour
4. Analyze different types of shells for external loading
5. Design the domes, conical shells and cylindrical shells

**UNIT I - THIN PLATES WITH SMALL DEFLECTION**

9

Laterally loaded thin plates - Governing differential equation, various boundary conditions.

**UNIT II - RECTANGULAR PLATES**

9

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

**UNIT III - THIN SHELLS**

9

Classification of shells - Types of shells - Structural action.

**UNIT IV - ANALYSIS OF SHELLS**

9

Shells of revolution – Spherical dome, Conical shell and ellipsoid of revolution – Shells of translation – Cylindrical shell and Hyperbolic paraboloid.

**UNIT V - DESIGN OF SHELLS**

9

Spherical dome, Conical shell and cylindrical shell.

**COURSE OUTCOMES**

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

- CO.1 Derive the governing equations for thin plates with small deflection
- CO.2 Compute the response of rectangular plates due to external loading
- CO.3 Explain thin shells and their behaviour
- CO.4 Analyze different types of shells for external loading
- CO.5 Design the domes, conical shells and cylindrical shells

**TEXT BOOKS:**

1. Timoshenko, S. and Krieger S.W., "Theory of Plates and Shells", McGraw Hill, 1993.
2. Ramasamy, G.S., "Design and Construction of Concrete Shells Roofs", CBS Publishers and Distributors, New Delhi, 1996.

**REFERENCE BOOKS:**

1. Billington D.P., "Thin Shell Concrete Structures", McGraw Hill, 1995
2. Chatterjee B.K., "Theory and design of Concrete Shells", Oxford and IBH Publishing Co., New Delhi, 1998
3. Szilard, R., "Theory and Analysis of Plates", Prentice Hall Inc., 1995

**WEB REFERENCES:**

1. <https://www.ethz.ch/content/specialinterest/baug/institute-ibk/structural-design-existing-structures/en/studium/vorlesungen/flaechentragwerke.html>
2. <http://nptel.ac.in/courses/105105041/m6l37.pdf>
3. <https://ocw.mit.edu/courses/mechanical-engineering/2-081j-plates-and-shells-spring-2007/readings/lecturenote.pdf>

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4. [http://www.math.uci.edu/~fwan/pdf/65\\_theoryofthinelasticshellsnotes.pdf](http://www.math.uci.edu/~fwan/pdf/65_theoryofthinelasticshellsnotes.pdf)
5. [http://www.unipune.ac.in/Syllabi\\_PDF/revised\\_2013/engg/ME%20Civil%20\(Structures%20Engg.\).pdf](http://www.unipune.ac.in/Syllabi_PDF/revised_2013/engg/ME%20Civil%20(Structures%20Engg.).pdf)
6. <http://www.nptelvideos.in/2012/12/marine-construction-welding.html>



**BoS Chairman**

<b>Course Code : 141CE9121</b>	<b>Course title : INDUSTRIAL STRUCTURES</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0504 Design of Steel Structures  
141CE0603 Design of RC Elements**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Plan and prepare the layout for an industrial structure
2. Decide the utility requirements for an industrial structure.
3. Design the various elements of an industrial steel structure.
4. Design the various elements of a RC industrial structure
5. Plan and outline the prefabrication process for various elements of an industrial structure.

### **UNIT I - PLANNING OF INDUSTRIES**

**9**

Classification of Industries and Industrial structures - General requirements for industries like cement, chemical and steel plants – site layout - Planning of Industrial structures – steel plant, cement and refinery industries

### **UNIT II - UTILITY REQUIREMENTS**

**9**

Lighting - Illumination levels – Characteristics of Good lighting – Principles of day lighting design – Artificial lighting Ventilation – Passive and active ventilation – principles of ventilation system - Fire safety and electrical installations - Guidelines from factories etc.

### **UNIT III - DESIGN OF STEEL STRUCTURES**

**9**

Industrial roof structures – truss system - different components of steel roof trusses - design of structural roof components – gable frames - Design of steel gable frame with knee joint – steel bunkers and silos – design of steel bunker and silo – design of crane girder – design concept of mill buildings

### **UNIT IV - DESIGN OF RC STRUCTURES**

**9**

General components of RC bunkers and silos - Design of silos and bunkers – Components of RC chimney – different stresses in RC chimney wall - Design of RC chimney – types of cooling tower – various parts – design of cooling tower

### **UNIT V - BASICS OF PREFABRICATION**

**9**

Principles of Prefabrication - - advantages and limitations - functional requirements of precast concrete units - beams - columns - walls - roof trusses - footings - joints in prefabricated elements - erection of precast elements.

### **COURSE OUTCOMES**

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

- CO.1 Plan and prepare the layout for an industrial structure
- CO.2 Decide the utility requirements for an industrial structure.
- CO.3 Design the various elements of an industrial steel structure.
- CO.4 Design the various elements of a RC industrial structure
- CO.5 Plan and outline the prefabrication process for various elements of an industrial structure.

### **TEXT BOOKS:**

1. Dayaratnam. P, "Design of Concrete Structure", S. Chand and Co., New Delhi, 2004
2. Subramanian, N. "Design of Steel Structures", Oxford University Press, NewDelhi,2008

**BoS Chairman**

3. Krishna Raju, "Advanced Concrete Structures", McGraw Hill, New Delhi, 2005
4. Bhavikatti.S.S., "Design of Steel Structures", J.K. International Publishing House Pvt. Ltd., 2009

#### REFERENCE BOOKS:

1. Edwin H. Gaylord, Charles N. Gaylord. Japes R. Stallmeyer, "Steel Structures", McGraw Hill, NewDelhi, 1995
2. S.K. Duggal, "Design of Steel Structures", McGraw Hill, New Delhi, Second Edition, 1996
3. S. Arya and J.L. Ajmani, "Design of Steel Structures", New Chand and Bros, Roorkee
4. Lothers, Structural Design in Steel, Prentice Hall, 1986
5. Ramamrutham.S., "Design of Reinforced Concrete Structures", DhanpatRai Publishing Company, 2007.
6. Varghese.P.C., "Limit State Design of Reinforced Concrete", PHI, Eastern Economy Editions, 2nd Edition, 2003.
7. Handbook on "Functional Requirements of Industrial buildings", SP32-1986, Bureau of Indian Standards, 1990.

#### WEB REFERENCES:

1. <https://www.peri.in/projects/industrial-structures.html>
2. [http://www.freyssinet.com/freyssinet/wfreyssinet\\_en.nsf/sb/repair.industrial-structures](http://www.freyssinet.com/freyssinet/wfreyssinet_en.nsf/sb/repair.industrial-structures)
3. [http://authors.library.caltech.edu/26539/1/Tangshan/Volume4\\_Chapter\\_6.pdf](http://authors.library.caltech.edu/26539/1/Tangshan/Volume4_Chapter_6.pdf)
4. <http://nptel.ac.in/courses/105106113/3>
5. <http://nptel.ac.in/downloads/105106113/>
6. <http://www.nptelvideos.in/2012/11/advanced-structural-analysis.html>

Course Code : 141CE9122	Course title : MAINTENANCE AND REHABILITATION OF STRUCTURES	
Core/Elective: Elective	L : T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

**PREREQUISITE: 141CE0404 Construction Materials and Methods II  
141CE9116 Concrete Technology**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the maintenance and repair strategies
2. Outline the serviceable and durable characterization of concretes under thermal and corrosive environment
3. Explain repair techniques for different materials
4. Apply the principles of repair, rehabilitation and retrofitting of structures
5. Describe the modern demolition methods used in fields

### **UNIT I - MAINTENANCE AND REPAIR STRATEGIES**

**9**

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

### **UNIT II - SERVICEABILITY AND DURABILITY OF CONCRETE**

**9**

Quality assurance for concrete construction concrete properties - strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion - design and construction errors - Effects of cover thickness and cracking

### **UNIT III - REPAIR MATERIALS AND TECHNIQUES**

**9**

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, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks

### **UNIT IV - REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES**

**9**

Strengthening of super structures, Sub structures – Increasing the load carrying capacity of footing - Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure - shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

### **UNIT V - DEMOLITION TECHNIQUES**

**9**

Introduction – Planning, precautions and protective measures in demolition works – Sequences of operations – Demolition of structural elements - Engineered demolition techniques for dilapidated structures - case studies

### **COURSE OUTCOMES**

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

- CO.1 Explain the maintenance and repair strategies
- CO.2 Outline the serviceable and durable characterization of concretes under thermal and corrosive environment
- CO.3 Explain repair techniques for different materials
- CO.4 Apply the principles of repair, rehabilitation and retrofitting of structures
- CO.5 Describe the modern demolition methods used in fields

**TEXT BOOKS:**

1. Dayarathnam. P and Rao. R, "Maintenance and Durability of Concrete Structures", University Press, India 2015
2. Denison Campbell, and Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 2001
3. Allen R.T. and Edwards S.C., "Repair of Concrete Structures", Blakie and Sons, UK, second Edition, 2004
4. Vidivelli. B; Rehabilitation of Concrete Structures, Standard Publishers Distributors, New Delhi, 2009
5. Gupta B.L. and Amit Gupta, " Maintenance and Repair of Civil Structures", Standard Publishers Distributors, 2009

**REFERENCE BOOKS:**

1. Gambhir M.L., Concrete Technology - Theory and Practice, Tata McGraw Hill, New Delhi, Third Edition, 2013.
2. Santhakumar, A.R., Training Course notes on Damage Assessment and repair in Low Cost Housing , "RHDC-NBO" Anna University, July 1992.
3. Palaniappan. N, Estate Management, Anna Institute of Management, Chennai, 2002
4. CPWD and Indian Building Concepts, Hand Book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
5. Dodge Woodson. R "Concrete Structures – Protection, Repair and Rehabilitation", Elsevier, Butterworth – Heinmann, UIC 2009.

**WEB REFERENCES:**

1. [http://fmcet.in/CIVIL/CE2071\\_uw.pdf](http://fmcet.in/CIVIL/CE2071_uw.pdf)
2. <https://theconstructor.org/concrete/repair-rehabilitation-concrete-structure-failure-damage/13870/>
3. <https://www.vidyarthiplus.com/vp/attachment.php?aid=22642>

**BoS Chairman**

<b>Course Code : 141CE9123</b>	<b>Course title : PREFABRICATED STRUCTURES</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0504 Design of Steel Structures  
141CE0603 Design of RC Elements**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Illustrate the concept of prefabrication
2. Explain the components of prefabrication like roof, wall panel and column etc
3. Describe the design principles involves in the prefabrication
4. Explain the details and principles of the joints in the structural members
5. Design the different connections for abnormal loads

### **UNIT I - INTRODUCTION**

**9**

Components with monolithic construction of prefabrication Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization –Systems Production – Transportation –handling- Erection- Elimination of handling and erection stresses

### **UNIT II - PREFABRICATED COMPONENTS**

**9**

Planning for components of prefabrication structures- Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs Wall panels – Columns – Shear walls- Provisions for non-structural fastenings

### **UNIT III - DESIGN PRINCIPLES**

**9**

Disuniting of structures – Design of cross section based on efficiency of material used - Problems in design because of joint flexibility – Allowance for joint deformation- Design of simple rectangular beams and I beams

### **UNIT IV - JOINTS IN STRUCTURAL MEMBERS**

**9**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints-Jointing Materials.

### **UNIT V - DESIGN FOR ABNORMAL LOADS**

**9**

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

### **COURSE OUTCOMES**

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

- CO.1 Illustrate the concept of prefabrication
- CO.2 Explain the components of prefabrication like roof, wall panel and column etc
- CO.3 Describe the design principles involves in the prefabrication
- CO.4 Explain the details and principles of the joints in the structural members
- CO.5 Design the different connections for abnormal loads

### **TEXT BOOKS:**

1. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge Based Process Planning for Construction and Manufacturing, Academic Press Inc., 1989
2. Koncz T., Manual of Precast Concrete Construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
3. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in

the Use of Precast Concrete, Netherland BetorVerlag, 1978.

**REFERENCE BOOKS:**

1. Building Materials and Components, CBRI, , India, 1990.
2. Glover C.W, "Structural Precast Concrete", Asia Publishing House, 1965
3. M. Levitt, "Precast Concrete Material, Manufacture, Properties and Usage" Applied Science Publishers Ltd., 1982.

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105108075/11>
2. <http://nptel.ac.in/courses/105108075/10>
3. [http://nptel.ac.in/Clarify\\_doubts.php.subjectId=105108075&lectureId=10](http://nptel.ac.in/Clarify_doubts.php.subjectId=105108075&lectureId=10)



**BoS Chairman**



<b>Course Code : 141CE9124</b>	<b>Course title : STORAGE STRUCTURES</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0504 Design of Steel Structures  
141CE0603 Design of RC Elements**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Design the Steel Water tanks including pressed steel tanks.
2. Design and Detailing of circular and rectangular water tanks.
3. Analyze and Design the steel bunkers and silos.
4. Analyze and Design of Concrete bunkers and silos
5. Explain principles of prestressing and apply design concepts on prestressed concrete structures

### **UNIT I - STEEL WATER TANKS**

**9**

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

### **UNIT II - CONCRETE WATER TANKS**

**9**

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

### **UNIT III - CONCRETE BUNKERS AND SILOS**

**9**

Design of square bunker – Side walls – design of pyramidal hopper bottom – Top and bottom longitudinal edge beams – Design of Cylindrical silo- wall portion – Design of conical hopper bottom – Ring beam at junction.

### **UNIT IV - STEEL BUNKERS AND SILOS**

**9**

Design of Square bunker – Jansen's and Airy's theories – IS codal provisions – Design of side plates – Stiffeners – design of hopper bottom – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – Stiffeners.

### **UNIT V - PRESTRESSED CONCRETE WATER TANKS AND FOUNDATION**

**9**

Principles of circular prestressing – Design of prestressed concrete circular water tanks. Design of foundation -Design of various types of foundation like isolated, combined and raft foundation for a Water tanks, Bunkers and Silo's.

### **COURSE OUTCOMES**

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

- CO.1 Design the Steel Water tanks including pressed steel tanks.
- CO.2 Design and Detailing of circular and rectangular water tanks.
- CO.3 Analyse and Design the steel bunkers and silos.
- CO.4 Analyse and Design of Concrete bunkers and silos
- CO.5 Explain principles of prestressing and apply design concepts on prestressed concrete structures

### **TEXT BOOKS:**

1. Rajagopalan K., Storage structures, Tata McGraw Hill, New Delhi, 1989.

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2. Krishna Raju N., Advanced Reinforced Concrete Design, CBS Publishers and Distributors, New Delhi, 1988.

**REFERENCE BOOKS:**

1. Ram Chandra and Virendra Gehlot, Design of Steel structures Vol – II Scientific Publishers(India), Jodhpur, 2007
2. Anand .S. Arya and J.L. Ajmani, Design of Steel structures , Nemchand & Bros, Roorkee, 2007
3. B.C. Punmia, Ashokkumar Jain and Arunkumar Jain, RCC Designs, Laxmi Publications(P) Ltd, New Delhi, 2006

**WEB REFERENCES:**

1. <http://ethesis.nitrkl.ac.in/108/1/10401010.pdf>
2. [http://www.iitk.ac.in/nicee/wcee/article/13\\_3017.pdf](http://www.iitk.ac.in/nicee/wcee/article/13_3017.pdf)



**BoS Chairman**

<b>Course Code : 141CE9125</b>	<b>Course title : TALL BUILDINGS</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0602 Structural Analysis II  
141CE0603 Design of RC Elements**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe the essentials of tall building and its components
2. Describe different types of loads and their computations
3. Classify various structural systems for medium rise buildings and analyze their behaviour
4. Classify various structural systems for high rise buildings and analyze their behaviour.
5. Describe the concept of stability analysis of various systems

### **UNIT I - INTRODUCTION**

**9**

Design Philosophy- vertical city concepts - Essential amenities - Fire safety -Water supply - Drainage and garbage disposal - Service systems - Structural and Foundation systems - Factors affecting height, growth and Structural form- materials – high performance concrete, fibre reinforced concrete, light weight concrete

### **UNIT II - LOADS**

**9**

Gravity Loading - Dead and Live Load - Reduction of Live Load- Impact and Construction Loads. Wind loading -.Static and Dynamic Approach, Analytical method-Earthquake loading - Equivalent Lateral Force- Combination of loading.

### **UNIT III - BEHAVIOUR OF MEDIUM RISE BUILDINGS**

**9**

Behaviour of Medium rise structures -Vertical and Horizontal load resistant systems - Rigid frames - Infilled frames - Approximate Analysis

### **UNIT IV - BEHAVIOUR OF HIGH RISE BUILDINGS**

**9**

Behaviour of High rise structures -Vertical and Horizontal load transfer systems - Braced frames - Shear walls - Wall frames - Tubular systems - Outrigger-braced systems- Approximate Analysis methods.

### **UNIT V - STABILITY ANALYSIS AND DESIGN OF TALL BUILDINGS**

**9**

Stability Analysis (Qualitative Treatment only) - Overall buckling analysis of frames, Wall frames, approximate methods, P- effects and various methods of analysis - Influence of foundation instability – Elastic Deformations. Design for various secondary effects - Creep, Shrinkage and Temperature, fire resistance

### **COURSE OUTCOMES**

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

- CO.1 Describe the essentials of tall building and its components
- CO.2 Describe different types of loads and their computations
- CO.3 Classify various structural systems for medium rise buildings and analyze their behaviour
- CO.4 Classify various structural systems for high rise buildings and analyze their behaviour.
- CO.5 Describe the concept of stability analysis of various systems

### **TEXT BOOKS:**

1. Taranath. B.S. , Structural Analysis and Design of Tall Buildings, McGraw Hill co., 1988

2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", -Analysis and Design, John Wiley and Sons, Inc., 1991

**REFERENCE BOOKS:**

1. Lynn. S. Beedle, Advances in Tall Buildings, CBS Publishers and Distributers, New Delhi, 2001
2. Lin.T.Y. and StotesBurry.D, Structural Concepts and Systems for Architects and Engineers, John Wiley & Sons, 1988
3. Dr.Gupta.Y.P, mEditor, Proceedings of National Seminar on High Rise Structures- Design and construction Practices for Middle Level Cities, Nov.14-16,1955, New Age International Pub. Ltd., Chennai.
4. Lecture Notes on, Tall Buildings - Short term Course Organised by Civil Engineering Dept., SRM Engineering College, Kattankulathur. June 2002

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2. [http://nptel.ac.in/courses/105106113/3\\_multi\\_storey/1\\_introduction.pdf](http://nptel.ac.in/courses/105106113/3_multi_storey/1_introduction.pdf)
3. [http://nptel.ac.in/courses/105106113/2\\_industrial\\_building/1\\_introduction.pdf](http://nptel.ac.in/courses/105106113/2_industrial_building/1_introduction.pdf)
4. [http://nptel.ac.in/courses/105106113/3\\_multi\\_storey/6\\_structural\\_forms.pdf](http://nptel.ac.in/courses/105106113/3_multi_storey/6_structural_forms.pdf)



**BoS Chairman**

<b>Course Code : 141CE9126</b>	<b>Course title : PRESTRESSED CONCRETE STRUCTURES</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0603 Design of RC Elements  
141CE9116 Concrete Technology**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe general principle in the principle of prestressing
2. Design the members for flexure and shear
3. Analyze and design of continuous beams
4. Design the tension and compression members
5. Analyze and Design the composite members

#### **UNIT I - PRINCIPLES OF PRESTRESSING**

**9**

Principles of Prestressing, Analysis of prestress – Concentric and eccentric tendons – resultant stresses - Types and systems of prestressing. Concepts of prestressing – stress, strength and load balancing. Need for High Strength materials, Losses, deflection (short-long term), camber, cable layouts.

#### **UNIT II - DESIGN OF MEMBERS FOR FLEXURE AND SHEAR**

**9**

Behaviour of flexural members, determination of ultimate flexural strength – Codal provisions - Design of flexural members, Design for shear, bond and torsion. Design of end blocks.

#### **UNIT III - DESIGN OF CONTINUOUS BEAMS**

**9**

Analysis and design of continuous beams - Methods of achieving continuity – concept of linear transformations, concordant cable profile and gap cables

#### **UNIT IV - DESIGN OF TENSION AND COMPRESSION MEMBERS**

**9**

Design of tension members - application in the design of prestressed pipes and prestressed concrete cylindrical water tanks - Design of compression members with and without flexure - its application in the design piles and flag masts.

#### **UNIT V - DESIGN OF COMPOSITE MEMBERS**

**9**

Composite beams - analysis and design, longitudinal shear transfer, ultimate strength - their applications. Partial prestressing - its advantages and applications.

### **COURSE OUTCOMES**

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

- CO.1 Describe general principle in the principle of prestressing
- CO.2 Design the members for flexure and shear
- CO.3 Analyze and design of continuous beams
- CO.4 Design the tension and compression members
- CO.5 Analyze and Design the composite members

### **TEXT BOOKS:**

1. Krishna Raju, Prestressed Concrete, Tata McGraw Hill Publishing Co, New Delhi, 2000.
2. Lin. T. Y. and Burns Ned. H., Design of Prestressed Concrete Structures, John Wiley and Sons, New York, 2009.

### **REFERENCE BOOKS:**

1. Nilson Arthur. H., Design of Prestressed Concrete, John Wiley and Sons, New York, 2004
2. Guyon. Y., Prestressed Concrete, Vols I and II, C. R. Books Ltd., London, 2008

  
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3. Rajagopalan.N, Prestressed Concrete, Narosa Publications, New Delhi, 2008.
4. IS: 1343 – 1980, "IS Code of Practice for Concrete", BIS, New Delhi, 1980.

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1. <http://www.nptelvideos.in/2012/11/prestressed-concrete-structures.html>
2. <https://www.youtube.com/watch?v=4KYPltsNAWs>
3. <https://www.youtube.com/playlist?list=PLB50EF6A79D1F8C14>
4. <http://www.nptel.ac.in/courses/105106117/>

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## REMOTE SENSING STREAM

Course Code : 141CE9127	Course title : ELECTRONIC SURVEYING	
Core/Elective: Elective	L : T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

**PREREQUISITE: 141CE0306 SURVEYING**

### COURSE OBJECTIVES

The course is intended to:

1. Brief the fundamental principles of EDM
2. Explain the basic concepts about the electronics related to measuring devices
3. Explain the basics of electromagnetic waves and their properties for the application of measuring technology.
4. Describe the measuring technology using the EDM compared with the traditional methods.
5. Illustrate the EDM technology and other modern instruments with field applications.

### UNIT I - FUNDAMENTALS

9

Methods of measuring distance, Basic Principles of Electronic Distance Measurement, Historical Development Classifications, applications and comparison with conventional surveying.

### UNIT II - BASIC ELECTRONICS

9

Oscillators (Crystal controlled and Gunn diode) Kerrcell / Pockel's modulator, Frequency mixing, modulation and Demodulation Measurement of phase differences, reflectors (Corner, Antenna), Transducers and power sources.

### UNIT III - ELECTROMAGNETIC WAVES

9

Classification and applications of Electromagnetic waves, propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting RI, Computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions. Computation of RI for microwaves - Reference refractive index - Real time application of first velocity correction. Measurement of atmospheric parameters - Mean refractive index, Second velocity correction, Total atmospheric correction, Use of temperature and pressure transducers.

### UNIT IV - ELECTROMAGNETIC DISTANCE MEASURING SYSTEM

9

Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser EDM instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave EDM instruments. Comparison between Electro-optical and Microwave system.

### UNIT V - FIELD STUDIES

9

Total station and its applications - Care and maintenance of EDM instruments - Modern positioning systems - EDM traversing, trilateration and base line measurement using EDM. Study of different EDM instruments and Total Station. EDM traversing, trilateration and base line measurement.

### COURSE OUTCOMES

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

- CO.1 Brief the fundamental principles of EDM
- CO.2 Explain the basic concepts about the electronics related to measuring devices
- CO.3 Explain the basics of electromagnetic waves and their properties for the application of measuring technology.

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CO.4 Describe the measuring technology using the EDM compared with the traditional methods.

CO.5 Illustrate the EDM technology and other modern instruments with field applications.

**TEXT BOOKS:**

1. SatheeshGopi, R. Sathikumar, N. Madhu, Advanced Surveying: Total Station, GIS And Remote Sensing, Dorling Kindersley (India) Pvt Ltd., © 2007.
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
3. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.

**REFERENCE BOOKS:**

1. Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1991.
2. Soastamoinen, J.J. Surveyor's guide to Electro-magnetic Distance Measurement, Adam Hilger
3. Chandra. A. M, Higher Surveying, New Age International Publishers, 2005.

**WEB REFERENCES:**

1. <http://sociology.soc.uoc.gr/socmedia/papageo/electronic%20survey%20technique.pdf>
2. [http://web.itu.edu.tr/~coskun/contents/lessons/structure/LECTURE\\_2\\_Theodolite.pdf](http://web.itu.edu.tr/~coskun/contents/lessons/structure/LECTURE_2_Theodolite.pdf)
3. [http://www.lonestar.edu/departments/landsurveyingmapping/Surveying\\_Equipment.pdf](http://www.lonestar.edu/departments/landsurveyingmapping/Surveying_Equipment.pdf)



**BoS Chairman**



<b>Course Code : 141CE9128</b>	<b>Course title : REMOTE SENSING AND GIS</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0306 SURVEYING**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe the basic concepts and principles of Remote Sensing.
2. Classify the sensors in India and other countries with their characteristics.
3. Explain various types of image processing used for data products.
4. Describe the components of GIS and its practical applications in civil engineering.
5. Distinguish raster and vector data compression, analysis and modeling

### **UNIT I - PHYSICS OF REMOTE SENSING**

**9**

Introduction of Remote Sensing - Electro Magnetic Spectrum, Physics of Remote Sensing- Effects of Atmosphere Scattering – Different types –Absorption-Atmospheric window- Energy interaction with surface features – Spectral reflectance of vegetation, soil ,and water –atmospheric influence on spectral response patterns.

### **UNIT II - BASICS OF SENSORS AND PLATFORM CONCEPTS**

**9**

Passive and Active sensors - Across track and along track scanners – Multi spectral scanners and thermal scanners - Types of platforms – PSLV and GSLV – Resolution – Spatial, Spectral, Radiometric and temporal resolutions – Pay load description of LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD.

### **UNIT III - IMAGE PROCESSING**

**9**

Data Products –image interpretation types – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

### **UNIT IV - INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEM**

**9**

Introduction – Maps – Map projections – types of map projections – GIS definition – components of GIS – standard GIS softwares – Data type – Spatial and non-spatial data – measurement scales – Input and Output devices – Analysis Tools.

### **UNIT V - DATA ENTRY, STORAGE AND ANALYSIS**

**9**

Data models – vector and raster data – data compression – data input by digital and analog methods – attribute data analysis – integrated data analysis – Modeling in GIS – Different case studies in remote sensing and GIS applications

### **COURSE OUTCOMES**

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

- CO.1 Describe the basic concepts and principles of Remote Sensing.
- CO.2 Classify the sensors in India and other countries with their characteristics.
- CO.3 Explain various types of image processing used for data products.
- CO.4 Describe the components of GIS and its practical applications in civil engineering.
- CO.5 Distinguish raster and vector data compression, analysis and modeling

### **TEXT BOOKS:**

1. Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman, Remote Sensing and Image Interpretation. VI Edition. John Willey and Sons (Asia) Pvt. Ltd., New Delhi, 2008.
2. Anjireddy. M., Remote Sensing and Geographical Information Systems: An Introduction

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BS Publications, 4<sup>th</sup> Edition, 2012.

3. BasudebBhatta, Remote Sensing and GIS, OUP Publications, 2<sup>nd</sup> revision Edition, 2011.

#### **REFERENCE BOOKS:**

1. Victor Mesev, Integration of GIS and Remote Sensing, John Wiley and Sons Ltd., 2007.
2. Dr. S. Kumar, Basics of Remote Sensing and GIS, Laxmi Publications, 2007.
3. Chandra. A. M, Ghosh. S. K., "Remote sensing and geographical information system", Alpha Science Publications, 2015

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2. [http://ags.geography.du.ac.in/Study%20Materials\\_files/Punyatoya%20Patra\\_AM.pdf](http://ags.geography.du.ac.in/Study%20Materials_files/Punyatoya%20Patra_AM.pdf)
3. [http://hydrologie.org/hysj/410/hysj\\_41\\_04\\_0593.pdf](http://hydrologie.org/hysj/410/hysj_41_04_0593.pdf)
4. [http://www.wiley.com/legacy/wileychi/gis/Volume1/BB1v1\\_ch14.pdf](http://www.wiley.com/legacy/wileychi/gis/Volume1/BB1v1_ch14.pdf)
5. [http://gis-lab.info/docs/books/aerial-mapping/cr1557\\_15.pdf](http://gis-lab.info/docs/books/aerial-mapping/cr1557_15.pdf)



**BoS Chairman**

<b>Course Code : 141CE9129</b>	<b>Course title : CARTOGRAPHY</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0306 Surveying**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the fundamentals of cartography and its modern trends.
2. Distinguish the different types of projections in map making.
3. Illustrate the various sources of data.
4. Describe the perception and design of cartography with the colour theory.
5. Produce a map with proper symbols.

### **UNIT I - FUNDAMENTALS OF CARTOGRAPHY**

**9**

Cartography today – Nature of Cartography – History of Cartography – Cartographic Visualization – Web Cartography – Graticules – Cartometry – Map Characteristics - Modern Trends.

### **UNIT II - EARTH**

**9**

Earth-Map Relations – Basic Geodesy – Map Projections – Scale – Reference and Coordinate system – Transformation – Basic Transformation – Affine Transformation.

### **UNIT III - SOURCES OF DATA**

**9**

Sources of data – Ground Survey and Positioning – Remote Sensing data collection – Census and sampling – data – Models for digital cartographic information – Map digitizing.

### **UNIT IV - PERCEPTION AND DESIGN**

**9**

Cartographic design – Colour theory and models – Colour and pattern creation and specification – colour and pattern – Typography and lettering the map – Map compilation – Demography and Statistical mapping.

### **UNIT V - CARTOGRAPHY ABSTRACTION**

**9**

Selection and Generalization Principles – Symbolization – Topographic and thematic maps – Map production and Reproduction – Map series.

### **COURSE OUTCOMES**

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

- CO.1 Explain the fundamentals of cartography and its modern trends.
- CO.2 Distinguish the different types of projections in map making.
- CO.3 Illustrate the various sources of data.
- CO.4 Describe the perception and design of cartography with the colour theory.
- CO.5 Produce a map with proper symbols.

### **TEXT BOOKS:**

1. Anson. R.W and Ormeling. F.J, Basic Cartography for students and Technicians. Vol. I, II and III Elsevier Applied Science Publishers 3<sup>rd</sup> Edition, 2004.
2. Arthur, H. Robinson et al Elements of Cartography, Seventh Edition, John Wiley and Sons, 2004.
3. Misra. R.P, Ramesh. A, Fundamentals of Cartography, Concept Publishing Company, 2009.

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**REFERENCE BOOKS:**

1. John Campbell, Introductory Cartography Third Edition, Wm. C. Brown Publishers, 2004.
2. Menno – Jan Kraak&FerjanOrmeling, Cartography Visualization of Geospatial Data, Second Edition, Pearson 2004.
3. Prithvish Nag, Digital Remote Sensing, Concept Publishing Company, 1998.

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1. [http://www.sfu.ca/gis/geog\\_x55/web255/icons/lec\\_2\\_basic\\_concept.pdf](http://www.sfu.ca/gis/geog_x55/web255/icons/lec_2_basic_concept.pdf)
2. <http://www.tc.umn.edu/~fharvey/courses/CompScholar/Ch1-CompleatScholar.pdf>
3. <http://cca-acc.org/resources/what-is-cartography/>

**BoS Chairman**

## TRANSPORTATION ENGINEERING STREAM

Course Code : 141CE9130	Course title : RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING	
Core/Elective: Elective	L: T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

### COURSE OBJECTIVES

The course is intended to:

1. Plan and design the railway along with understanding the various components of railway
2. Explain construction and maintenance of railway tracks
3. Plan and design the airport along with understanding the various components of Airport
4. Describe the importance of airport layouts, visual aids, and air traffic control
5. Explain about docks and harbour

### UNIT I - RAILWAY PLANNING & DESIGN

9

Role of Indian Railways in National Development - Engineering Surveys for Track Alignment – Obligatory points - Conventional methods Permanent Way, its Components and Functions of each Component: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Defects in rails- Sleepers – Functions, Materials, Density Ballasts – Functions, Materials, Ballast less Tracks - Gradient and grade compensation – super elevation – Transition curve-Horizontal and Vertical curves-widening of gauges in curves.

### UNIT II - RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION

9

Points and Crossings - Design of Turnouts, Working Principle Signaling, Interlocking and Track Circuiting, Construction & Maintenance – Conventional, Modern methods and Materials, Track - Drainage Track Modernization– Automated maintenance and upgrading, Technologies, Re-laying of Track, Lay outs of Railway Stations and Yards, Level Crossings.

### UNIT III - AIRPORT PLANNING AND DESIGN

9

Advantages and Limitations of Air Transport, Components of Airports - Airport Planning – Site Selection, Runway Design - Orientation, Cross wind Component, Wind rose Diagram (Problems), Geometric Design and Corrections for Gradients (Problems), Drainage Taxiway Design – Geometric Design Elements, Minimum Separation Distances, Design Speed, Airport Drainage Airport Zoning - Clear Zone, Approach Zone, Buffer Zone, Turning Zone, Clearance over Highways and Railways.

### UNIT IV - AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL

9

Airport Layouts – Apron, Terminal Building, Hangers, Motor Vehicle Parking Area and Circulation Pattern, Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings.

### UNIT V - HARBOUR AND DOCKS ENGINEERING

9

Definition – requirement of harbour- classification – location of harbours – planning and design of harbours – layouts and terminal facilities – docks – mooring and mooring accessories–navigational aids coastal structures(piers,breakwaters,wharves,jetties,quays,springfenders,dolphins,landing stage and floating landing stage (FLS) – waves and their action on coastal structures – environmental concern in port operations.

### COURSE OUTCOMES

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

- CO.1 Plan and design the railway along with understanding the various components of railway
- CO.2 Explain construction and maintenance of railway tracks
- CO.3 Plan and design the airport along with understanding the various components of

BoS Chairman

## Airport

CO.4 Describe the importance of airport layouts, visual aids, and air traffic control

CO.5 Explain about docks and harbour

### TEXT BOOKS:

1. Subramaniam K.P., "Highway, Railway, Airport and Harbour Engineering", Scitech Publications (India) pvt Ltd. Chennai (2010)
2. Satish Chandra and Agarwal M.M, "Railway Engineering", 2nd Edition, Oxford University Press, New Delhi, 2013.
3. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.
4. Bindra S P, "A Course in Docks and Harbour Engineering", DhanpatRai and Sons, New Delhi, 2013

### REFERENCE BOOKS:

1. Saxena, S.C. Arora, S. P. "A course in Railway Engineering", DhanpatRai& Sons, New Delhi. (2009).
2. Horonjeff, R. Mckelvey, F. X. "Planning & Design of Airports", McGraw hill, New York. (1994).
3. Ashford, N. And Wright, P. H. "Airport Engineering", John wiley, New York. (1979).
4. Hay, W. W. "Railroad Engineering", John wiley and sons, New York. (1988).
5. Agarwal, M. M. "Indian railway track", Sachdeva press, Mayapuri, New Delhi. (1991).

### WEB REFERENCES:

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2. <http://www.srividyaengg.ac.in/elearn1/coursematerial/civil/103641.pdf>
3. <https://annauniversityplus.com/plus/attachment.php?aid=2236>
4. <https://www.vidyarthiplus.com/vp/attachment.php?aid=9271>
5. <http://nptel.ac.in/courses/105107123/>

BoS Chairman

Course Code : 141CE9131	Course title : TRAFFIC ENGINEERING AND MANAGEMENT	
Core/Elective: Elective	L: T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

**PREREQUISITE: 141CE0505 Highway Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe Indian Roads Congress (IRC) specifications and Guidelines
2. Explain various Traffic surveys and their studies.
3. Describe the various traffic control with computer applications in signal design
4. Design various types of grade intersections.
5. Describe various traffic control and management measures.

### **UNIT I - INTRODUCTION**

**9**

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

### **UNIT II - TRAFFIC SURVEYS AND ANALYSIS**

**9**

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

### **UNIT III - TRAFFIC CONTROL**

**9**

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

### **UNIT IV - GEOMETRIC DESIGN OF INTERSECTIONS**

**9**

Conflicts at Intersections, Classification of Intersections at Grade, - Channelized and Unchanallised Intersection – Type of interchanges - Grade Separators - Principles of Intersection Design, Elements of Intersection Design, Channelization and Rotary design (Problems).

### **UNIT V - TRAFFIC MANAGEMENT**

**9**

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

### **COURSE OUTCOMES**

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

- CO.1 Describe Indian Roads Congress (IRC) specifications and Guidelines
- CO.2 Explain various Traffic surveys and their studies.
- CO.3 Describe the various traffic control with computer applications in signal design
- CO.4 Design various types of grade intersections.
- CO.5 Describe various traffic control and management measures.

### **TEXT BOOKS:**

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2013.
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.
3. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2013.

  
**BoS Chairman**

**REFERENCE BOOKS:**

1. Guidelines of Ministry of Road Transport and Highways, Government of India.
2. Subhash C. Saxena, A Course in Traffic Planning and Design, DhanpatRai Publications, New Delhi, 1989.
3. Papacostas C. S., Panos D. Prevedouros, "Transportation Engineering and Planning SI", Pearson/Prentice Hall, 2005

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2. <http://nptel.ac.in/downloads/105101008/>
3. <https://annauniversityplus.com/plus/Thread-TRAFFIC-ENGINEERING-AND-MANAGEMENT-NOTES>

**BoS Chairman**



<b>Course Code : 141CE9132</b>	<b>Course title : URBAN AND REGIONAL PLANNING</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

#### **The course is intended to:**

1. Describe the concepts, policies and programmes in Urban and Regional Development trends.
2. Explain step by step planning process.
3. Apply the socio economic concepts along with spatial planning in a sustainable development
4. Explain the concepts of project formulation and evaluation.
5. List and describe the various planning acts for urban and regional planning

### **UNIT I - BASIC CONCEPTS POLICIES AND PROGRAMMES**

**9**

Definitions and Concept- Urbanization, Towns, Cities, Metropolis, Megalopolis, Satellite and New towns, CBD, Peri urban areas, Suburban areas, Census Definition, Classification of urban settlements, Transit Oriented Development (TOD) of Land Uses -- National policies, National Urban Transport Policy 2006, National Policy for Urban street vendors 2009- Programme objectives and salient features of Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Urban infrastructure development scheme for small and medium towns (UIDSSMT), Rajiv AwasYojana (RAY).

### **UNIT II - PLANNING PROCESS**

**9**

Steps in Planning Process- Plans; levels; objectives, content, and data requirement-regional plan, master plan, detail development plan, city development plan, development control regulation, Zoning Regulation, Layout and Building Regulations.

### **UNIT III - SOCIO ECONOMIC AND SPATIAL PLANNING**

**9**

Economic and social concepts in urban and regional planning and their relevance, Economic principals of zoning, Components of sustainable development, Inclusive development, Compact cities, Quality of life-Form of cities, issues related to inner city fringe areas, and suburban areas, Application of Remote sensing and GIS in Urban and Regional planning.

### **UNIT IV - PROJECT FORMULATION AND EVALUATION**

**9**

Constraints for plan implementation – Industrial, Financial and Legal Constraints, Institutional Arrangements for Urban Development – Financing of Urban Developments - Legislation related to Urban Development. Urban infrastructure projects planning, appraisal, formulation, feasibility and preparation of detailed project report, site planning, layout, road network, and service ducts under the road, Environmental impact assessment, and Traffic assessment.

### **UNIT V - URBAN GOVERNANCE AND MANAGEMENT**


**9**

Planning laws -- Town and Country planning act -- Urban Development authorities Act-- Constitutional (74th Amendment) Act 1992- Local bodies, Functions, powers and Interfaces.

### **COURSE OUTCOMES**

#### **At the end of this course, students will be able to:**

- CO.1 Describe the concepts, policies and programmes in Urban and Regional Development trends.
- CO.2 Explain step by step planning process.
- CO.3 Apply the socio economic concepts along with spatial planning in a sustainable development
- CO.4 Explain the concepts of project formulation and evaluation.
- CO.5 List and describe the various planning acts for urban and regional planning

  
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### REFERENCE BOOKS:

1. CMDA, Second Master Plan for Chennai, Chennai 2008
2. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002
3. George Chadwick, A Systems view of planning, Pergamon press, Oxford 1978
4. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi 2001
5. Edwin S.Mills and Charles M.Becker, Studies In Urban Development, A World Bank Publication, 1986
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7. Tumlin Jeffrey, Sustainable Transportation Planning Tools for Creating Vibrant Healthy and Resilient Communities, John Wiley And Sons, 2012.

### WEB REFERENCES:

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2. <https://ocw.mit.edu/courses/urban-studies-and-planning/11-001j-introduction-to-urban-design-and-development-spring-2006/lecture-notes/>
3. <http://textofvideo.nptel.iitm.ac.in/105106058/lec2.pdf>
4. <http://nptel.ac.in/courses/105107067/>

<b>Course Code : 141CE9133</b>	<b>Course title : TRANSPORTATION PLANNING</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0306 Surveying  
141CE0505 Highway Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the advancements of Transportation Systems Planning
2. Apply the surveying concepts in transportation planning.
3. Explain the importance of Land use transport models.
4. Brief the trip generation and distribution modeling
5. Generate different models for transportation system

### **UNIT I - TRANSPORTATION SYSTEM**

**9**

Status of existing Transportation System – Systems Approach to Transport Planning — Stages in Transportation Planning – Transportation Plan – Plan Refinement -- Transport gap --Overview of Traffic Impact Studies - Transportation and Sustainability.

### **UNIT II - TRANSPORTATION SURVEY AND SAMPLING**

**9**

Concepts of Zoning – Transportation Surveys –Home interview Surveys-Origin Destination Surveys – other types of surveys - Inventory of Transportation and other activities – Sampling Techniques -- Sampling Data Expansion.

### **UNIT III - LAND USE TRANSPORT (LUT) MODELS**

**9**

Interdependencies between Land Use and Transport Systems –Characteristics of Land Use Forecasting -- Classification of Land Use Models –Land Use Development Models- Lowry Derivatives Model- Garin Model - Iteration processes.

### **UNIT IV - TRIP GENERATION AND DISTRIBUTION MODELING**

**9**

Trip Generation Models –Multiple Linear Regression Methods- Step wise regression and their methods - Trip Distribution Models –Growth Factor and Synthetic models-Estimation of trip interchanges- Problems - Model Calibration and Validation –Gravity models.

### **UNIT V - MODE CHOICE AND TRIP ASSIGNMENT MODELING**

**9**

Methods of Trip Assignment Models –Capacity Restraint Method and other methods of Trip Assignment - Multi Modal Trip Assignment – Mode Choice and Modal Split Models – Pre and post Distribution modal split Models- Multi modal Transportation Planning -- Evaluation Needs —Overview of Various Transportation Software.

### **COURSE OUTCOMES**

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

- CO.1 Explain the advancements of Transportation Systems Planning
- CO.2 Apply the surveying concepts in transportation planning.
- CO.3 Explain the importance of Land use transport models.
- CO.4 Brief the trip generation and distribution modeling
- CO.5 Generate different models for transportation system

### **TEXT BOOKS:**

1. Kadiyali L.R. 'Traffic Engineering and Transport Planning' Seventh Edition, Khanna Publishers, Delhi 2013.

### **REFERENCE BOOKS:**

1. John Khisty C, Kent Lall B, Transportation Engineering – An Introduction, Third Edition, Prentice Hall of India (PHI) Learning Pvt. Ltd., New Delhi, 2012.

  
**BoS Chairman**

2. Papacostas C.S., Prevedouros, Transportation Engineering and Planning, Third Edition, Prentice Hall of India, (PHI) Learning Pvt. Ltd., New Delhi, 2010
3. Paul H. Wright Norman J. Ashford et.al. 'Transportation Engineering- Planning and Design, Fourth Edition, Institute of Transportation Engineers, Prentice Hall Inc., Washington DC, USA, 1998.
4. Myer Kutz 'Handbook of Transportation Engineering, Volume II, Second Edition, 2011.

**WEB REFERENCES:**

1. <https://ocw.mit.edu/courses/urban-studies-and-planning/11-540j-urban-transportation-planning-fall-2006/lecture-notes/>
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## WATER RESOURCES & IRRIGATION STREAM

<b>Course Code : 141CE9134</b>	<b>Course title : DESIGN AND MANAGEMENT OF IRRIGATION SYSTEM</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE:** 141CE501 – Water Resources and Irrigation Engineering

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Compute the Irrigation system requirements.
2. Design the storage, conveyance and diversion structures
3. Design the micro irrigation system.
4. Optimize the irrigation system for improving the performance of the system
5. Explain the Local and global perceptions and approaches to participatory water resource management.

### **UNIT I - IRRIGATION SYSTEM REQUIREMENTS**

**9**

Irrigation systems – Supply and demand of water – Cropping pattern– Estimation of total and peak crop water requirements – Effective and dependable rainfall – Irrigation efficiencies- Time of irrigation –Criteria for scheduling irrigation – Frequency and interval of irrigation- Types of irrigation systems and their selection criteria- Source for Irrigation water –System requirements-Main intake structure and pumping station.

### **UNIT II - STORAGE CONVEYANCE AND DIVERSION SYSTEM**

**9**

Investigation necessary for planning a diversion structure & Storage structures- Storage structure and appurtenant works – Design of Dams, Spillways and energy dissipaters - Sluices and outlets- Diversion structure and appurtenant works – Design of Barrage ,Canal head regulator ,River training works, water conveyance structures – Canal-Canal sections and layout – Design of canal Components -Cross regulators, Drops – Canal lining-Maintenance.

### **UNIT III - FIELD APPLICATION SYSTEM**

**9**

Methods of applying water to the field- Surface irrigation system- Design of Border irrigation system, basin irrigation system, furrow irrigation system-subsurface irrigation system-natural subsurface irrigation system, design of artificial sub surface irrigation system, micro irrigation system –components design and maintenance Sprinkler of Drip and Sprinkler irrigation system- Automation in Drip irrigation system

### **UNIT IV - IRRIGATION SYSTEMS AND PERFORMANCE INDICATORS**

**9**

Systems classification – Institutions for irrigation management – Diagnostic Analysis of Irrigation Systems -Rehabilitation and modernization –Performance indicators –Improving system performance –Conjunctive management –constraints faced- Main system components –Reservoir allocation rule, Operating rule and optimization methods to improve main system performance -irrigation scheduling –Constraints.

### **UNIT V - PARTICIPATORY IRRIGATION MANAGEMENT AND IRRIGATION POLICY**

**9**

Command area development principles – Participatory Irrigation Management and Irrigation management transfer – Case studies – Constraints - Present status of irrigation policy and institutions – Irrigation related conflicts –Institutional transformation needed –Constraints in effecting institutional transformation –Irrigation financing –Water pricing –Water market – Policy changes.

  
**BoS Chairman**

## **COURSE OUTCOMES**

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

- CO.1 Compute the Irrigation system requirements.
- CO.2 Design the storage, conveyance and diversion structures
- CO.3 Design the micro irrigation system.
- CO.4 Optimize the irrigation system for improving the performance of the system
- CO.5 Explain the Local and global perceptions and approaches to participatory water resource management.

## **TEXT BOOKS:**

- 1. Dilip Kumar Majumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000
- 2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi
- 3. Svendsen, Mark Groenfeldt, David, "Case Studies in Participatory Irrigation Management", WBI Learning Resources Series, Washington, 2000.

## **REFERENCE BOOKS:**

- 1. "Hand Book on Irrigation System Operation Practices", Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 1990
- 2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 1994.
- 3. Creager, W.P. Justin, J.D., and Hinds J., "Engineering for dams", Vol.II, Wiley Eastern Private Limited, 1945.
- 4. Creager W.P. and Justin J.D. "Hydroelectric hand book", John Wiley & Sons Inc., Newyork, 1949.
- 5. U.S.B.R. "Design of small Dams", 1960.
- 6. Streeter, V.L. and Wylie, G.B. "Hydraulic Transients", McGraw Hill Book Company, 1967.
- 7. Hanif Chaudhry, M. "Applied Hydraulic Transients", Van Nostrand Reinhold Company, 1979.

## **WEB REFERENCES:**

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- 2. [https://umanitoba.ca/faculties/engineering/departments/biosystems/pdf/BIOE\\_4600.pdf](https://umanitoba.ca/faculties/engineering/departments/biosystems/pdf/BIOE_4600.pdf)
- 3. [http://www.gap.metu.edu.tr/html/yayinlar/issues\\_in\\_design\\_AKibaroglu.pdf](http://www.gap.metu.edu.tr/html/yayinlar/issues_in_design_AKibaroglu.pdf)
- 4. <http://www.fao.org/docrep/r4082e/r4082e06.htm#5.2> conveyance and distribution system

*BoS*

**BoS Chairman**

<b>Course Code : 141CE9135</b>	<b>Course title : GROUND WATER ENGINEERING</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0501 – Water Resources and Irrigation Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the basics of ground water hydrology & movement of ground water
2. Outline the objectives of groundwater hydraulics & properties of aquifer materials
3. Classify the various types of wells, construction and maintenance
4. Describe the different methods of evaluation of aquifer parameter
5. Explain the concepts involved in modeling and recharge of ground water

### **UNIT I - GROUNDWATER-HYDROLOGY**

**9**

Introduction – Water bearing formations – geological formation of water supply – subsurface distribution of water - hydrological cycle – sources of groundwater – types of aquifers – aquifer parameters – groundwater movement in different rocks- Ground water table fluctuation and its interpretations Groundwater development and Potential in India.

### **UNIT II - GROUNDWATER HYDRAULICS**

**9**

Objectives – Groundwater flow – Permeability – Transmissibility – Darcy's law and its limitations -properties of aquifer materials – radial flow towards a well in an unconfined aquifer – confined aquifer – relation of well size to yield – unsteady flow conditions – determination of aquifer constants – Theis method – Jacob's method – Chow's method – Theis recovery method –conditions to check for steady state – unconfined aquifer constants – well losses and well efficiency and well interfaces.

### **UNIT III - WELLS AND EXPLORATION**

**9**

Types of wells – water wells design – drilling of tube wells – drilling methods – percussion drilling– rotary drilling – auger core drilling and water jet methods — construction of wells – collector wells and infiltration wells - construction of strainer type tube wells – types of strainers –construction of cavity type tube wells – construction of gravel packed (shrouded) well – construction of open wells – testing yield of tube wells – verticality of tube wells – incrustation and corrosion of tube wells.

### **UNIT IV - EVALUATION OF AQUIFER PARAMETERS**

**9**

Introduction – pumping test analysis – Recuperation test - well characteristics – well capacity –confined aquifer and unconfined aquifer – hydraulics of open wells – groundwater investigation –geological methods – geophysical methods – remote sensing methods.

### **UNIT V - GROUNDWATER QUALITY AND CONSERVATION**

**9**

Groundwater development – hydrological maps – groundwater quality standards– groundwater contamination - seawater intrusion – control measures – Groundwater recharge – recharge methods– Groundwater modeling – Mathematical modeling – numerical modeling.

### **COURSE OUTCOMES**

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

- CO.1 Explain the basics of ground water hydrology & movement of ground water
- CO.2 Outline the objectives of groundwater hydraulics & properties of aquifer materials
- CO.3 Classify the various types of wells, construction and maintenance
- CO.4 Describe the different methods of evaluation of aquifer parameter
- CO.5 Explain the concepts involved in modeling and recharge of ground water

*Roy*  
**BoS Chairman**

**TEXT BOOKS:**

1. Raghunath, H.M., "Ground Water Hydrology", Wiley Eastern Ltd., Second reprint, New Delhi, 2005.
2. Todd, D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

**REFERENCE BOOKS:**

1. Murthy, V.V.N., "Land and Water Management Engineering", Kalyani Publishers, New Delhi, 1985.
2. Ramakrishnan S, "Ground Water", Tamil Nadu, 1998.
3. Delleur, J.W., "The Handbook of Groundwater Engineering", CRC Press, Taylors & Francis Group, 2007.

**WEB REFERENCES:**

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3. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-72-groundwaterhydrology-fall-2005/lecture-notes/>

**BoS Chairman**



<b>Course Code : 141CE9136</b>	<b>Course title : HYDROLOGY</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

#### **The course is intended to:**

1. Explain the basic concepts in hydrological cycle
2. Describe the features of evaporation, transpiration and infiltration
3. Illustrate the estimation and modeling of runoff
4. Carry out flood frequency analysis and flood routing
5. Estimate the aquifer parameters and yield of wells

### **UNIT I - INTRODUCTION**

**9**

Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. Precipitation: Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves.

### **UNIT II - ABSTRACTIONS FROM PRECIPITATION**

**9**

Initial abstractions. Evaporation: factors affecting, measurement, reduction Evapotranspiration: factors affecting, measurement, control. Initial losses: Interception and depression storage. Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

### **UNIT III - RUNOFF**

**9**

Runoff process – Unit hydrograph – Derivation and analysis – S-hydrograph – Synthetic unit hydrograph-Instantaneous Unit hydrograph – methods of determining IUH – conceptual models of IUH – Formulation of models – concept of linear reservoir, Nash and Clark's model. general hydrological models- Chow – Kulandaiswamy model.

### **UNIT IV - FLOODS**

**9**

Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management. Flood Routing: Hydrologic routing, channel and reservoir routing- Muskingum and Puls methods of routing.

### **UNIT V - GROUNDWATER**

**9**

Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

### **COURSE OUTCOMES**

#### **At the end of this course, students will be able to:**

- CO.1 Explain the basic concepts in hydrological cycle
- CO.2 Describe the features of evaporation, transpiration and infiltration
- CO.3 Illustrate the estimation and modeling of runoff
- CO.4 Carry out flood frequency analysis and flood routing
- CO.5 Estimate the aquifer parameters and yield of wells

### **TEXT BOOKS:**

1. Subramanya, K., " Engineering Hydrology" , Tata McGraw Hill, 2005
2. Raghunath.H.M., "Hydrology: Principles, Analysis and Design", New Age Publications, 2006.
3. Linsley. R. L., Kholer. M. A., Paulhus. J. L.H., "Hydrology for Engineers", McGraw Hill International Book Company, 1982.

**REFERENCE BOOKS:**

1. Mays, L.W., "Water Resources Engineering" Wiley India Pvt. Ltd., 2013
2. Mutreja, K.N., "Applied Hydrology" " Tata McGraw Hill, 1986
3. Rastogi,A.K., "Numerical groundwater hydrology" Penram international publishing (India) Pvt. Ltd., 2007
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**BoS Chairman**

## GEOTECHNICAL ENGINEERING STREAM

Course Code : 141CE9137	Course title : ENGINEERING GEOLOGY	
Core/Elective: Elective	L : T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

### COURSE OBJECTIVES

The course is intended to:

1. Describe the geological formations
2. Explain the rock forming minerals and their properties
3. Classify the various distinct rocks and their engineering properties.
4. Describe the importance of geology with respect to foundations for structures like dams, bridges, buildings, etc.
5. Explain the causes and prevention for earthquakes and landslides.

### UNIT I - PHYSICAL GEOLOGY

9

Geology in Civil Engineering - Branches of geology - Earth structures and its composition; atmosphere and greenhouse effect – Weathering of rocks – Landforms and geological processes associated with wind, surface water (rivers, sea) and ground water and their engineering importance - sea erosion and coastal protection

### UNIT II - MINERALOGY

9

Physical, chemical and engineering properties of minerals – study of the following rock forming minerals – Quartz group, Feldspar group, Pyroxene group, Amphibole and Mica group, Calcite, Garnet and Clay minerals – Formation of ore minerals – Origin and occurrence of Coal and Petroleum in India

### UNIT III - PETROLOGY

9

Classification of rocks – distinction between igneous, sedimentary and metamorphic rocks – description occurrence, engineering properties and distribution of igneous rocks (Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite, Basalt), sedimentary rocks (Sandstone, Limestone, Laterite, Shale, Conglomerate, Breccia) and metamorphic rocks (Quartzite, Marble, Slate, Phyllite, Gniess, Schist)

### UNIT IV - STRUCTURAL GEOLOGY AND GEOPHYSICS

9

Attitude of beds – Outcrops - Introduction to Geological maps - study of structures – Folds, faults and joints - their bearing on engineering construction. Plate tectonics, continental drifts, earthquake and tsunami - Seismic zonation in India and earthquake belts. Geophysical methods (seismic and electrical methods) for subsurface investigations

### UNIT V - GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING

9

Geological investigations – Prospecting ground water, oil and gases. Remote sensing techniques – study of air photos and satellite images – Interpretation for Civil Engineering projects - Geological conditions necessary for the construction of Dams, Reservoirs, Tunnels, Buildings, Road cuttings. Landslides – causes and prevention

### COURSE OUTCOMES

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

- CO.1 Describe the geological formations
- CO.2 Explain the rock forming minerals and their properties
- CO.3 Classify the various distinct rocks and their engineering properties.
- CO.4 Describe the importance of geology with respect to foundations for structures like dams, bridges, buildings, etc.
- CO.5 Explain the causes and prevention for earthquakes and landslides.



BoS Chairman

**TEXT BOOKS:**

1. Parbin Singh, "Engineering and General Geology", S.K. Kataria & Sons, 8<sup>th</sup> Edition, 2010
2. Varghese P.C., "Engineering Geology for Civil Engineers", PHI Learning Private Limited, New Delhi, 2012

**REFERENCE BOOKS:**

1. Venkat Reddy D., "Engineering Geology", Vikas Publishers, 2010, ISBN-978-81259-19032
2. Tony Waltham, "Foundations of Engineering Geology", Spon press, 2009, ISBN: 0-203-89453-7
3. Marland P. Billings, "Structural Geology", Prentice-Hall, 2009, ISBN 0-87692-059-8
4. Bell F.G., "Engineering Geology", Butterworth-Heinemann, 2007

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1. <https://web.viu.ca/earle/geol111/lecture-notes.htm>
2. <http://www.soest.hawaii.edu/martel/Courses/GG454/>
3. <http://nptel.ac.in/courses/105105106/>

**BoS Chairman**

<b>Course Code : 141CE9138</b>	<b>Course title : GROUND IMPROVEMENT TECHNIQUES</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0403 Soil Mechanics**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the characteristics of problematic soils and understand the selection of suitable ground improvement in the construction field
2. Identify the methods available in the design of dewatering and drainage process
3. Apply the knowledge on earth reinforcement (geosynthetics) and grouting techniques available and used in the current scenario
4. Demonstrate the various insitu treatment of cohesive and cohesionless soil
5. Describe the insitu treatment of soils based on the knowledge gained

### **UNIT I - INTRODUCTION AND NEED FOR GROUND IMPROVEMENT TECHNIQUES**

**9**

Different types of problematic soils – Lateritic, Black cotton, Alluvial - Origin, formation, preloading -Engineering properties of soft, weak and compressible deposits - Need for ground improvement – Emerging trends in ground improvement. – Relative merits and demerits of different techniques - Selection of ground improvement techniques based on soil conditions

### **UNIT II - GROUND IMPROVEMENT BY DRAINAGE AND DEWATERING METHODS**

**9**

Drainage methods – well points (single, multi stage, vacuum) - Sumps and interceptor ditches - Electro-osmosis - Design of dewatering systems – preloading with drains - foundation drains, vertical drains, blanket drains

### **UNIT III - EARTH REINFORCEMENT AND GROUTING TECHNIQUES**

**9**

Mechanism and concept of earth reinforcement - Geosynthetics : types, functions and applications of geogrids, geotextiles and geomembranes – Grouting – types - permeation grouting, compaction grouting, jet grouting, grouting in difficult conditions - Seepage control in soil under dams and for cut off walls-Stabilization grouting for under pinning – Case studies

### **UNIT IV - INSITU TREATMENT OF COHESIVE AND COHESIONLESS SOILS**

**9**

Consolidation of cohesive and densification of cohesionless soils – Mechanical stabilization, chemical stabilization, hydraulic modification – Stabilization with cement, lime and chemicals – Stabilization of expansive soils – Under reamed piles - Stone columns - Case studies of recent ground improvement projects on cohesive and cohesionless soils – Case studies

### **UNIT V - INSITU GROUND TREATMENT FOR SLOPES**

**9**

Problems in sloping ground, factors affecting slope stability – Importance of ground improvement in sloping ground – Drains, dewatering techniques, earth reinforcement, grouting techniques - Soil nailing, rock anchoring, micro-piles - Design methods and construction techniques – Case studies of recent ground improvement projects for sloping ground

### **COURSE OUTCOMES**

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

- CO.1 Explain the characteristics of problematic soils and understand the selection of suitable ground improvement in the construction field

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**BoS Chairman**

- CO.2 Identify the methods available in the design of dewatering and drainage process
- CO.3 Apply the knowledge on earth reinforcement (geosynthetics) and grouting techniques available and used in the current scenario
- CO.4 Demonstrate the various insitu treatment of cohesive and cohesionless soil
- CO.5 Describe the insitu treatment of soils based on the knowledge gained

**TEXT BOOKS:**

- 1. Purushothama Raj, P., "Ground Improvement Techniques", Laxmi Publications (P) Ltd., New Delhi, 2005.

**REFERENCE BOOKS:**

- 1. Coduto, D.P. "Geotechnical Engineering Principles and Practices", Pearson Publications, 2011.
- 2. Koerner, R.M., "Designing with Geosynthetics", Xlibris Corporation, 2012.
- 3. Buddhima I. and Jian J.C., "Ground Improvement: Case Histories", Elsevier Publications, 2005.

**WEB REFERENCES:**

- 1. <http://nptel.ac.in/courses/105103097/>
- 2. <http://home.iitk.ac.in/~pkbd/A%20Preview%20of%20Soil%20Behavior.pdf>
- 3. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soilmechanics-fall-2004/lecture-notes/>
- 4. <http://www.aboutcivil.org/soil-mechanics.html>

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**BoS Chairman**

<b>Course Code : 141CE9139</b>	<b>Course title : PAVEMENT ENGINEERING</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0505 Highway Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe the stress distribution and deflection in pavements.
2. Design of flexible pavement by various methods (Empirical, theoretical and IRC guidelines)
3. Design of flexible pavement by IRC guidelines and westergard approach.
4. Assess quality and serviceability conditions of road.
5. Identify the methods available for stabilization of pavements.

### **UNIT I - BASIC CONCEPTS**

**9**

Introduction - Pavement as layered structure - Pavement types –Functions and characteristics of pavements - flexible and rigid -Stress and deflections in pavements - Repetition of loads – Stresses and deflection in layer system.

### **UNIT II - DESIGN OF FLEXIBLE PAVEMENTS**

**9**

Flexible pavement design - Empirical - Semi empirical and theoretical Methods – Design procedure as per latest IRC guidelines – Design and specification of rural roads

### **UNIT III - DESIGN OF RIGID PAVEMENTS**

**9**

Cement concrete pavements - Modified Westergard approach - Design procedure as per latest IRC guidelines –Temperature stresses - Joints in rigid pavements - Concrete roads and their scope in India – Air field pavements – Design principles.

### **UNIT IV - PERFORMANCE EVALUATION AND MAINTENANCE**

**9**

Need for Highway maintenance – classification – Pavement failures – Pavement evaluation and rehabilitation – Condition and evaluation –surveys – Strengthening of existing pavement – Overlay design - Pavement maintenance. [IRC Recommendations Only]

### **UNIT V - STABILISATION OF PAVEMENTS**

**9**

Stabilisation with special reference to highway pavements - Choice of stabilisers -Testing and field control – Stabilisation for rural roads in India -use of Geosynthetics (geotextiles &geogrids) in roads.

### **COURSE OUTCOMES**

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

- CO.1 Describe the stress distribution and deflection in pavements.
- CO.2 Design of flexible pavement by various methods (Empirical, theoretical and IRC guidelines)
- CO.3 Design of flexible pavement by IRC guidelines and westergard approach.
- CO.4 Assess quality and serviceability conditions of road.
- CO.5 Identify the methods available for stabilization of pavements.

### **TEXT BOOKS:**

1. Kadiyali, L.R and N. B. Lal, "Principles and Practice of Highway Engineering" (including Expressways and Airport Engineering),Khanna tech. Publications, New Delhi, 2005.
2. Wright, P.H., "Highway Engineers", John Wiley & Sons, Inc., New York, 1996
3. Yoder R.J and Witczak M.W., "Principles of Pavement Design", John Wiley, 1975.

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**REFERENCE BOOKS:**

1. Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001
2. Guidelines for the Design of Flexible Pavements, IRC:37 - 2001, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC: 58-1998, The Indian Roads Congress, New Delhi

**WEB REFERENCES:**

1. <https://www.scribd.com/doc/119865487/Pavement-Engineering-Notes-2012>
2. <http://notescivil.blogspot.in/2013/06/pavements.html>

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**BoS Chairman**



<b>Course Code : 141CE9140</b>	<b>Course title : SOIL DYNAMICS AND MACHINE FOUNDATIONS</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

**PREREQUISITE: 141CE0503 Foundation Engineering**

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Illustrate the importance of learning soil dynamics and the theory behind vibrations
2. Explain the concept of wave propagation in soils
3. Determine the dynamic properties of soils and estimate the liquefaction potential
4. Apply basic knowledge of dynamics of porous media and to analyze the soil structure interaction.
5. Describe about machine foundations inducing soil dynamics and its importance in the design criteria.

### **UNIT I - INTRODUCTION AND VIBRATION THEORY 9**

Scope and objectives – Nature and types of loading – Introduction to soil dynamics – Vibration of elementary systems – Equation of motion for single degree of freedom – Types of vibrations – Free and forced with damping and without damping

### **UNIT II - WAVE PROPAGATION 9**

Wave propagation in an elastic homogeneous isotropic medium - Waves in semi-infinite body; Waves in layered medium; Earthquake waves – P-wave, S-wave, Rayleigh wave and Love wave; Locating earthquake's epicenter

### **UNIT III - SOIL DYNAMIC PROPERTIES 9**

Stresses in soil element - Determination of dynamic soil properties - Field tests - Laboratory tests - Model tests - Stress-strain behavior of cyclically loaded soils - Linear, equivalent-linear and non-linear models - Ranges and applications of dynamic soil tests - Cyclic plate load test - Liquefaction - Simplified procedure for liquefaction estimation-CRR correlations with SPT, CPT, SASW test values

### **UNIT IV - DYNAMICS OF POROUS MEDIA 9**

Basic differential equations – Propagation of plane waves into porous media – Analytical periodic solution – Response to a sinusoidal wave – Approximation of the solution and Numerical verification - Generalized dynamic Winkler model for non-linear soil structure interaction analysis

### **UNIT V - MACHINE FOUNDATIONS 9**

Types of machines - Basic design criteria - Methods of analysis - Mass-Spring-Dashpot model - Elastic-Half-Space theory - Types of foundations - Modes of vibrations - Vertical, sliding, torsional (yawing), rocking and pitching modes of oscillations - Simple design procedures for foundations under reciprocating machines

### **COURSE OUTCOMES**

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

- CO.1 Illustrate the importance of learning soil dynamics and the theory behind vibrations
- CO.2 Explain the concept of wave propagation in soils
- CO.3 Determine the dynamic properties of soils and estimate the liquefaction potential
- CO.4 Apply basic knowledge of dynamics of porous media and to analyse the soil structure interaction.
- CO.5 Describe about machine foundations inducing soil dynamics and its importance in the design criteria.

**TEXT BOOKS:**

1. Swami Saran, "Soil Dynamics and Machine Foundations", Galgotia Publications, 1999

**REFERENCE BOOKS:**

1. Braja M. Das and Ramana G.V., "Principles of Soil Dynamics", PWS-KENT Publishing Company, 2010
2. ShamsheerPrakash, "Soil Dynamics", McGraw-Hill Book Company, 2012
3. Steven L. Kramer, "Geotechnical Earthquake Engineering", Prentice Hall Inc., 1996
4. E. E. Richart et al. "Vibrations of Soils and Foundations", Prentice Hall Inc., 1970

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105103097/>
2. <http://home.iitk.ac.in/~pkbd/A%20Preview%20of%20Soil%20Behavior.pdf>
3. <http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soilmechanics-fall-2004/lecture-notes/>
4. <http://www.aboutcivil.org/soil-mechanics.html>

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**BoS Chairman**

## CONSTRUCTION MANAGEMENT STREAM

<b>Course Code : 141CE9141</b>	<b>Course title : ADVANCED CONSTRUCTION TECHNIQUES</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### COURSE OBJECTIVES

The course is intended to:

1. Explain the substructure construction techniques.
2. Explain the components and procedure of super structure construction.
3. Explain the construction procedure for special structures.
4. Describe the erection procedure of prefabricated & precast structures.
5. Explain various repair and demolition techniques used in construction.

#### UNIT I- SUB STRUCTURE

9

Box jacking- Pipe jacking- Diaphragm walls and basement- Tunneling techniques- Piling techniques- Caissons- types- sinking process- Cofferdam- Cable anchoring and grouting- Shoring for deep cutting- Dewatering for underground open excavation.

#### UNIT II- SUPER STRUCTURE

9

Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections- Slipform technique- Suspended formwork- Construction sequence in cooling towers, silos, chimney, sky scraper- In-situ pre-stressing in high rise structures- Post tensioning- Aerial transporting- handling and erecting lightweight components on tall structures- Erection of lattice towers- Rigging of transmission line structures.

#### UNIT III- SPECIAL STRUCTURES

9

Bow string bridges, Cable stayed bridges- Launching and pushing of box decks- Laying operations for built up offshore system- Vacuum dewatered flooring- Concrete paving technology- Large span structures- launching techniques for heavy decks- Support structure for heavy equipment and conveyor- Construction sequence and methods in domes- Erection of articulated structures and space decks.

#### UNIT IV- PRECAST AND PREFABRICATION

9

Pre-casting techniques- Handling techniques- Transportation Storage and erection of structures. Curing techniques- steam curing, hot air blowing- skeletal and large panel constructions- Pre-cast and pre-fabricating technology for low cost and mass housing schemes - Ferro-cement in housing. Quality control - Repairs and economical aspects on prefabrication.

#### UNIT V- REPAIR & DEMOLITION

9

Mud Jacking and grouting for foundation - micro piling and underpinning for strengthening floor and shallow profile- Sub grade water proofing- Repair techniques for cracks in concrete- Demolition techniques- sequence of operation- Dismantling- Safety precaution in demolition and dismantling.

### COURSE OUTCOMES

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

- CO.1 Explain the substructure construction techniques.  
 CO.2 Explain the components and procedure of super structure constructions.  
 CO.3 Explain the construction procedure for special structures.

- CO.4 Describe the erection procedure of prefabricated & precast structures.  
CO.5 Explain various repair and demolition techniques used in construction.

**TEXT BOOKS:**

1. S.K.Sankar, and S. Saraswati, "Construction Technology", Oxford University Press, New Delhi, 2008.
2. R. Chudley, Roger Greeno, "Advanced Construction Technology" Prentice Hall, 2006

**REFERENCE BOOKS:**

1. Jerry Irvine, "Advanced Construction Techniques" CA Rockers, 1984
2. Robertwade Brown, "Practical Foundation Engineering Hand Book", McGraw Hill Publications, 1995.

**WEB REFERENCES:**

1. <http://nptel.ac.in/video.php?subjectId=105102088>
2. <https://sites.google.com/a/venusict.org/actech/lecture-notes>

  
BoS Chairman

<b>Course Code : 141CE9142</b>	<b>Course title : BUILDING SERVICES</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. List the machineries installed in buildings and describe their functions
2. Illustrate the fundamentals of electrical systems in buildings
3. Apply the basic concepts of illumination and layouts
4. Explain fundamentals of refrigeration and identify air conditioning systems for different types of buildings
5. Describe the importance and systems of fire safety installation

### **UNIT I - MACHINERIES**

**9**

Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

### **UNIT II - ELECTRICAL SYSTEMS IN BUILDINGS**

**9**

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

### **UNIT III - PRINCIPLES OF ILLUMINATION & DESIGN**

**9**

Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilization factor – Depreciation factor – MSCP – MHCP – Lanes of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

### **UNIT IV - REFRIGERATION PRINCIPLES & APPLICATIONS**

**9**

Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Sub cooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems

### **UNIT V - FIRE SAFETY INSTALLATION**

**9**

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non -combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers.

### **COURSE OUTCOMES**

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

- CO.1 List the machineries installed in buildings and describe their functions  
CO.2 Illustrate the fundamentals of electrical systems in buildings

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- CO.3 Apply the basic concepts of illumination and layouts  
CO.4 Explain fundamentals of refrigeration and identify air conditioning systems for different types of buildings  
CO.5 Describe the importance and systems of fire safety installation

**TEXT BOOKS:**

1. R. Udayakumar, "A text book on Building Services", Eswar Press, Chennai, 2011.
2. E.R. Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 2008

**REFERENCE BOOKS:**

1. R.G. Hopkinson and J.D. Kay, "The Lighting of buildings", Faber and Faber, London, 1999.
2. William H. Severns and Julian R. Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 2008.
3. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 2003.

**WEB REFERENCES:**

1. <https://www.scribd.com/doc/55417572/Building-Services-Notes>
2. <http://www.arca53.dsl.pipex.com/>



**BoS Chairman**

<b>Course Code : 141CE9143</b>	<b>Course title : SAFETY IN CONSTRUCTION</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe the causes of accident, its cost and legal implications.
2. Outline the concepts of safety programmes.
3. Elucidate the safety considerations in a construction contract.
4. Depict the importance of designing safe working culture.
5. Illustrate the responsibility of owner and designer for safety.

### **UNIT I - CONSTRUCTION ACCIDENTS**

**9**

Accidents and their causes - Human factors in construction safety - Costs of construction injuries - Occupational and safety hazard assessment - Legal implications.

### **UNIT II - SAFETY PROGRAMMES**

**9**

Problem areas in construction safety - Elements of an effective safety programme - Job-site safety assessment - Safety meetings - Safety incentives.

### **UNIT III - CONTRACTUAL OBLIGATIONS**

**9**

Safety in construction contracts - Substance abuse - Safety record keeping.

### **UNIT IV - DESIGNING FOR SAFETY**

**9**

Safety culture - Safe workers - Safety and first line supervisors - Safety and middle managers - Top management practices, company activities and safety - Safety personnel – Sub contractual obligation - Project coordination and safety procedures - Workers compensation.

### **UNIT V - OWNERS' AND DESIGNERS' OUTLOOK**

**9**

Owner's responsibility for safety - Owner preparedness - Role of designer in ensuring safety - Safety clause in design document.

### **COURSE OUTCOMES**

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

- CO.1 Describe the causes of accident, its cost and legal implications.
- CO.2 Outline the concepts of safety programmes.
- CO.3 Elucidate the safety considerations in a construction contract.
- CO.4 Depict the importance of designing safe working culture.
- CO.5 Illustrate the responsibility of owner and designer for safety.

### **TEXT BOOKS:**

1. Jimmy W. Hinze, "Construction Safety", Prentice Hall Inc., 1997.
2. Amarjit Singh, Jimmie Hinze, "Implementation of Safety and Health on Construction sites" Taylor & Francis, 1999.

### **REFERENCE BOOKS:**

1. Richard J. Coble, Jimmie Hinze and Theo C. Haupt, "Construction Safety and Health Management", Prentice Hall Inc., 2001.
2. Tim Howarth, Paul Watson "Construction Safety Management" John Wiley & Sons, 2008
3. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamilnadu.

### **WEB REFERENCES:**

1. <https://www.osha.gov/video/>
2. <https://www.youtube.com/watch?v=t-P6mMp23ug>
3. <http://nptel.ac.in/courses/114106017/>



**BoS Chairman**

<b>Course Code : 141CE9144</b>	<b>Course title : QUALITY CONTROL AND ASSURANCE</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Brief the quality management principles.
2. Explain the quality system standards.
3. Illustrate the elements of quality planning and its implication.
4. Elucidate the objectives and perform failure analysis related to QA/QC.
5. Describe the quality improvement techniques.

### **UNIT I - QUALITY MANAGEMENT**

**9**

Introduction - Definitions and objectives - Factor influencing construction quality - Responsibilities and authority - Quality plan - Quality management guidelines.

### **UNIT II - QUALITY SYSTEMS**

**9**

Introduction - Quality system standard - ISO 9000 family of standards - Requirements - Preparing Quality system documents - Quality related training - Implementing a quality system - Third party certification.

### **UNIT III - QUALITY PLANNING**

**9**

Quality Policy, objectives and methods in construction industry - Consumers satisfaction, ergonomics - Time of completion - Statistical tolerance - Taguchi's concept of quality - Codes and standards - Documents - Contract and construction programming - Inspection procedures - Processes and products - Total QA / QC programme and cost implication.

### **UNIT IV - QUALITY ASSURANCE AND CONTROL**

**9**

Objectives - Regulatory agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, factors influencing construction quality - Critical, major failure aspects and failure mode analysis - Stability methods and tools - Optimum design - Reliability testing, reliability coefficient and reliability prediction.

### **UNIT V - QUALITY IMPROVEMENT TECHNIQUES**

**9**

Selection of new materials - Influence of drawings, detailing, specification, standardization - Bid preparation - Construction activity, environmental safety, social and environmental factors - Natural causes and speed of construction - Life cycle costing - Value engineering and value analysis.

### **COURSE OUTCOMES**

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

- CO.1 Brief the quality management principles.
- CO.2 Explain the quality system standards.
- CO.3 Illustrate the elements of quality planning and its implication.
- CO.4 Elucidate the objectives and perform failure analysis related to QA/QC.
- CO.5 Describe the quality improvement techniques.

### **TEXT BOOKS:**

1. Frank M. Gryna, "Quality Planning and Analysis", McGraw-Hill, 2001.
2. Ashford.J.L, "The Management of Quality in Construction", E &FN Spon, 2003.



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**REFERENCE BOOKS:**

1. Abdul RazzakRumane, "Quality Management in Construction Projects", CRC Press, 2011.
2. Steven McCabe, "Quality Improvement Techniques in Construction", Addison Wesley Longman Ltd, 1998.
3. Hutchins.G, "ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification", Viva Books Pvt. Ltd., 1994.

**WEB REFERENCES:**

1. [http://pmbook.ce.cmu.edu/13\\_Quality\\_Control\\_and\\_Safety\\_During\\_Construction.html](http://pmbook.ce.cmu.edu/13_Quality_Control_and_Safety_During_Construction.html)
2. <http://nptel.ac.in/courses/116102019/>

**BoS Chairman**

<b>Course Code : 141CE9145</b>	<b>Course title : SMART STRUCTURES AND SMART MATERIALS</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the concept of Smart materials and its properties.
2. Outline the use of smart materials in structures.
3. Illustrate the knowledge on vibration absorbers.
4. Classify Control Systems and Explain functions of various controls applied in structures.
5. Describe the Biomimetics and its essentials.

### **UNIT I - PROPERTIES OF MATERIALS**

**9**

Piezoelectric Materials, Piezoelectric properties, Actuation of structural components, Shape Memory Alloys, Constitutive modeling of the shape memory effect, vibration control, Embedded actuators, Applications of shape memory alloys.

### **UNIT II - ER AND MR FLUIDS**

**9**

Electrorheological and magnetorheological fluids, Mechanisms and Properties, Applications of ER and MR fluids, Fiber Optics, Fiber characteristics, Fiber optic strain sensors, Applications of optical fibers.

### **UNIT III - VIBRATION ABSORBERS**

**9**

Parallel damped vibration absorber, Gyroscopic vibration absorber, Active vibration, absorber, Applications, Vibration Characteristics of mistuned systems, Analytical approach

### **UNIT IV - CONTROL OF STRUCTURES**

**9**

Control modeling of structures, Control strategies and limitations, classification of control systems, Classical control, Modern control, optimal control and Digital control, Active structures in practice.

### **UNIT V - BIOMIMETICS**

**9**

Characteristics of natural structures, Biomimetic structural design, Biomimetic sensing, Challenges and opportunities for Biomimetics, Chemical and biochemical sensing in structural assessment, Absorptive chemical sensors, Spectroscopes.

### **COURSE OUTCOMES**

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

- CO.1 Explain the concept of Smart materials and its properties.
- CO.2 Outline the use of smart materials in structures.
- CO.3 Illustrate the knowledge on vibration absorbers.
- CO.4 Classify Control Systems and Explain functions of various controls applied in structures.
- CO.5 Describe the Biomimetics and its essentials.

### **TEXT BOOKS:**

1. Srinivasan. A.V., and Michael McFarland. D., "Smart Structures – Analysis and Design", Cambridge University Press, 2001.
2. M.V. Gandhi and B.S. Thompson, "Smart Materials and Structures", Chapman & Hall, London; New York, 1992

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### REFERENCE BOOKS:

1. Brian Culshaw, "Smart Structures and Materials", Artech House, Boston, 1996
2. A.J. Moulson and J.M. Herbert, "Electroceramics: Materials, Properties, Applications", 2<sup>nd</sup> Edition, John Wiley & Sons, Chichester, West Sussex; New York, 2003
3. Mel. M Schwartz, "Encyclopedia of Smart Materials", John Wiley and Sons inc. 2002.

### WEB REFERENCES:

1. [http://nptel.ac.in/courses/112104173/Mod\\_1\\_smart\\_mat\\_lec\\_1.pdf](http://nptel.ac.in/courses/112104173/Mod_1_smart_mat_lec_1.pdf)
2. <http://www.me.metu.edu.tr/courses/me493/>



BoS Chairman

<b>Course Code : 141CE9146</b>	<b>Course title : INFRASTRUCTURE ENGINEERING</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the importance in the field of Infrastructure
2. Describe the advantage of privatization of infrastructure with case study
3. Explain the finance management concept in infrastructure
4. Describe the planning and implementation of infrastructure with case study
5. Prepare report on performance in the field of infrastructure.

### **UNIT I - INFRASTRUCTURE**

**9**

Introduction to Infrastructure - Governing features - Historical overview of infrastructure development in India - power, water supply & sanitation, Road Rail Air & Port transportation sectors, Telecommunication sectors, urban infrastructure, rural infrastructure – an introduction to special economic zones- organizations and layers in the field of Infrastructure

### **UNIT II - PRIVATIZATION OF INFRASTRUCTURE**

**9**

Overview of Infrastructure Privatization - The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization - A Case Study - Challenges in Privatization of Water Supply, Power, Road Transportation Infrastructure in India

### **UNIT III - INFRASTRUCTURE FINANCE MANAGEMENT**

**9**

Infrastructure project budgeting & funding - Regulatory framework - Infrastructure laws – Sources of funding – Time value of money, Cash flow. Inflation, Depreciation, Taxes, personnel cost - Equipment cost- Over heads- Life cycle costing - Evaluation of alternatives (Value Engineering)- Cost Benefit Analysis- Feasibility studies

### **UNIT IV - INFRASTRUCTURE PLANNING AND IMPLEMENTATION**

**9**

Mapping and Facing the landscape of Risks in Infrastructure Projects -Risks in Infrastructure projects- Economic & Demand risks in infrastructure projects-Political risks, socio – economic risks & cultural risks-Case studies -Challenges in construction and maintenance of Infrastructure

### **UNIT V - INFRASTRUCTURE PERFORMANCE**

**9**

Infrastructure Inspection- Report preparation - Infrastructure Interdependencies – Sustainable Infrastructure - Performance modeling – Improving Government's role in Infrastructure performance - Future directions.

### **COURSE OUTCOMES**

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

- CO.1 Explain the importance in the field of Infrastructure
- CO.2 Describe the advantage of privatization of infrastructure with case study
- CO.3 Explain the finance management concept in infrastructure
- CO.4 Describe the planning and implementation of infrastructure with case study
- CO.5 Prepare report on performance in the field of infrastructure.

### **TEXT BOOKS:**

1. Vasant Desai, "Project Management", Himalaya Publishing, 4<sup>th</sup> Edition, 2015.
2. James C. Van Horne, John M. Wachowicz, "Fundamentals of Financial Management", PHI, 13<sup>th</sup> Edition, 2008.

  
**BoS Chairman**

3. Ronald W Hudson, "Infrastructure Management: integrating design, Construction, maintenance, rehabilitation and renovation", MGH, 1st Edition, 1997.

**REFERENCE BOOKS:**

1. The India Infrastructure Report, Ministry of Finance, Govt. of India, 2000
2. Sengupta and Guha, "Construction Management and Planning", TMH 2<sup>nd</sup> Edition, 2002
3. Erza, Solomon, "Theory of Finance Management", Columbia University Press, 2nd Edition, 1996.

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/105106115/>
2. <https://mvsrcivil1.blogspot.com/2016/02/infrastructure-engineering-notes-1st.html>



**BoS Chairman**

<b>Course Code : 141CE9147</b>	<b>Course title : PROJECT FORMULATION AND APPRAISAL</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the concepts of project formulation in construction projects
2. Identify the project costs and cash flows
3. Apply the appraisal techniques in project management
4. Explain the finance and risk analysis in construction projects
5. Describe the private sector participation in infrastructure development projects

### **UNIT I - PROJECT FORMULATION**

**9**

Project–Concepts – Capital investments – Generation and Screening of Project Ideas– Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report – Different Project Clearances required

### **UNIT II - PROJECT COSTING**

**9**

Project Cash Flows – Elements and principles – Biases in Cash Flow Estimation–Time Value of Money– Time lines, Future Value, Present Value, Intra-Year Compounding and Discounting – Cost of Capital

### **UNIT III - PROJECT APPRAISAL**

**9**

NPV–BCR–IRR –ARR–Urgency–Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal

### **UNIT IV - PROJECT FINANCING AND RISK ANALYSIS**

**9**

Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios, Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice

### **UNIT V - PRIVATE SECTOR PARTICIPATION**

**9**

Private sector participation in Infrastructure Development Projects - Variants of BOT – BOLT–BOOT, etc., -Technology Transfer and Foreign Collaboration - Scope of Technology Transfer

### **COURSE OUTCOMES**

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

- CO.1 Explain the concepts of project formulation in construction projects
- CO.2 Identify the project costs and cash flows
- CO.3 Apply the appraisal techniques in project management
- CO.4 Explain the finance and risk analysis in construction projects
- CO.5 Describe the private sector participation in infrastructure development projects

### **TEXT BOOKS:**

1. PrasannaChandra, “Projects – Planning, Analysis, Selection, Implementation Review”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
2. Joy P.K., “Total Project Management” - The Indian Context, New Delhi, Macmillan India Ltd., 1994

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**REFERENCE BOOKS:**

1. "United Nations Industrial Development Organization (UNIDO) Manual" for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987.
2. Barcus, S.W. and Wilkinson. J.W., "Hand Book of Management Consulting Services", McGraw Hill, NewYork, 1995.

**WEB REFERENCES:**

1. <https://www.youtube.com/watch?v=PgteLvYizg>
2. <https://www.youtube.com/watch?v=xluLYZrJwYk>
3. <https://www.youtube.com/watch?v=wJ8HZ7hqUs8&list=PL335191DF7E62482C>

**BoS Chairman**

<b>Course Code : 141CE9148</b>	<b>Course title : CONTRACT LAWS AND REGULATIONS</b>	
<b>Core/Elective: Elective</b>	<b>L : T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the elements of concluding, and administering contracts
2. Prepare tender documents as per the procedures and guidelines
3. Explain the importance of arbitrations
4. Describe the legal requirements in construction field.
5. Explain the labour regulations and their impact on managing of contracts.

### **UNIT I - CONSTRUCTION CONTRACTS**

**9**

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts

### **UNIT II - TENDERS**

**9**

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

### **UNIT III - ARBITRATION**

**9**

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs

### **UNIT IV - LEGAL REQUIREMENTS**

**9**

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations

### **UNIT V - LABOUR REGULATIONS**

**9**

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws

### **COURSE OUTCOMES**

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

- CO.1 Explain the elements of concluding, and administering contracts
- CO.2 Prepare tender documents as per the procedures and guidelines
- CO.3 Explain the importance of arbitrations
- CO.4 Describe the legal requirements in construction field.
- CO.5 Explain the labour regulations and their impact on managing of contracts.

### **TEXT BOOKS:**

1. Patil. B.S, "Civil Engineering Contracts and Estimates", Universities Press (India) Private Limited, 2006.
2. Jimmie Hinze, "Construction Contracts", McGraw Hill, New Delhi, 2009.

  
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**REFERENCE BOOKS:**

1. Gajaria G.T., "Laws Relating to Building and Engineering Contracts in India", M.M.Tripathi Private Ltd., Bombay, 1992.
2. Joseph T. Bockrath, "Contracts, the Legal Environment for Engineers and Architects", McGraw Hill, 2000
3. Oxley Rand Posicit, "Management Techniques applied to the Construction Industry", Granda publications, Noida, 2009.

**WEB REFERENCES:**

1. <http://study.com/academy/topic/contract-law-basics.html>
2. <https://www.youtube.com/watch?v=qIUYm8p9IYU>
3. <https://www.youtube.com/watch?v=FJ3ZJ1n1aeY>
4. <https://www.vidyarthiplus.com/vp/thread-36549.html#.WF5tNtJ97cs>

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## GENERAL ELECTIVES

Course Code : 141CE9149	Course title : INDIAN CONSTITUTION AND SOCIETY	
Core/Elective: Elective	L: T : P : C	3 : 0 : 0 : 3
Type : Theory	Total Contact hours:	45

### COURSE OBJECTIVES

The course is intended to:

1. Explain the need for a constitution
2. Describe the structure of Union Government and list the functional duties of various union executives
3. Illustrate the structure of state government and its functional duties
4. Explain Electoral Process, special provisions, powers and functions of Municipalities, Panchayats and Co-operative Societies
5. Describe the basic human rights and its implications in India.

### UNIT I - CONSTITUTION OF INDIA

9

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

### UNIT II - UNION GOVERNMENT

9

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

### UNIT III - STATE GOVERNMENT

9

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

### UNIT IV - FEDERAL SYSTEM

9

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

### UNIT V - SOCIETY AND RIGHTS

9

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

### COURSE OUTCOMES

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

- CO.1 Explain the need for a constitution
- CO.2 Describe the structure of Union Government and list the functional duties of various union executives
- CO.3 Illustrate the structure of state government and its functional duties
- CO.4 Explain Electoral Process, special provisions, powers and functions of Municipalities, Panchayats and Co-operative Societies
- CO.5 Describe the basic human rights and its implications in India.

### TEXT BOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New

Delhi, 2009.

2. R.C. Agarwal, "Indian Political System", S.Chand and Company, New Delhi, 2008.
3. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

**REFERENCE BOOKS:**

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi, 2011.
2. U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalandhar, 1998.
3. R.N. Sharma, "Indian Social Problems", Media Promoters and Publishers Pvt. Ltd.1999.
4. Yogendra Singh, "Social Stratification and Change in India", Manohar, New Delhi, 1998.

**WEB REFERENCES:**

1. <https://www.vidyarthiplus.com/vp/thread-28159.html#.WXMoCxWGPIU>



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<b>Course Code : 141CE9150</b>	<b>Course title : INTELLECTUAL PROPERTY RIGHTS</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Outline an awareness on Intellectual Property Rights (IPR)
2. Distinguish between patents and copyrights
3. Explain the application procedure of IPR
4. Describe the salient features of a national Intellectual Property Policy
5. Outline the importance of IPR in industries

### **UNIT I - INTELLECTUAL PROPERTY LAW**

**9**

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para – Legal Tasks in Intellectual Property Law – Ethical obligations in Para Legal Tasks in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual property.

### **UNIT II - COPYRIGHT PROCEDURES**

**9**

Introduction to copyright – The Rights Afforded by Copyright Law – Copy right Ownership, Transfer and duration – Right to prepare Derivative works – Rights of Distribution –Copyright Formalities and Registrations - Limitations - Copyright disputes and International copyright law.

### **UNIT III - PATENTS AND APPLICATION PROCEDURES**

**9**

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

### **UNIT IV - LEGISLATIONS AND POLICY**

**9**

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy.

### **UNIT V - CASE STUDIES**

**9**

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights –Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

### **COURSE OUTCOMES**

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

- CO.1 Outline an awareness on Intellectual Property Rights (IPR)
- CO.2 Distinguish between patents and copyrights
- CO.3 Explain the application procedure of IPR
- CO.4 Describe the salient features of a national Intellectual Property Policy
- CO.5 Outline the importance of IPR in industries

### **TEXT BOOKS:**

1. Ganguli, P., "Intellectual Property Rights", Tata Mc-Graw –Hill, New Delhi, 2004.
2. Subbaram N.R. "Handbook of Indian Patent Law and Practice ", S. Viswanathan Printers and Publishers Pvt. Ltd., 1998.

### **REFERENCE BOOKS:**

1. Gopalakrishnan, N.S., Agitha, T.G., "Principles of Intellectual Property", Eastern

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- BookCompany, Luck now, 2009.
2. Cornish, W.R., "Intellectual Property", Sweet & Maxwell, London, 2000.
  3. Jurisprudence, B., "The Philosophy and Method of the Law" Universal publishers, New Delhi, 1999.

**WEB REFERENCES:**

1. <http://www.ipindia.nic.in/>
2. <http://pfc.org.in/faqipr.pdf>
3. <http://www.giipinfo.com/>



**BoS Chairman**

<b>Course Code : 141CE9151</b>	<b>Course title : PROBABILITY AND STATISTICS</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Calculate Moment generating functions for standard probability distributions.
2. Calculate Marginal and Conditional distributions for two dimensional random variables.
3. Use different statistical approach based on mean to test the given samples.
4. Use different statistical approach based on Variance to test the given samples.
5. Plot control charts for attributes.

### **UNIT I - RANDOM VARIABLES**

**9**

Discrete and Continuous random variables – Moments – Moment generating functions  
Binomial, Poisson, and Normal distributions - Functions of a random variable.

### **UNIT II - TWO-DIMENSIONAL RANDOM VARIABLES**

**9**

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and  
Linear regression – Transformation of random variables.

### **UNIT III - TESTING OF HYPOTHESIS**

**9**

Sampling distributions - Tests for single mean, proportion, Difference of means (large and  
small samples) – Tests for single variance and equality of variances – Chi-Square test for  
goodness of fit – Independence of attributes.

### **UNIT IV - DESIGN OF EXPERIMENTS**

**9**

Completely randomized design – Randomized block design – Latin square design.

### **UNIT V - STATISTICAL QUALITY CONTROL**

**9**

Control charts for measurements (X bar and R charts) – Control charts for attributes (p, c  
and np charts) – Tolerance limits - Acceptance sampling.

### **COURSE OUTCOMES**

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

- CO.1 Calculate Moment generating functions for standard probability distributions.
- CO.2 Calculate Marginal and Conditional distributions for two dimensional random variables.
- CO.3 Use different statistical approach based on mean to test the given samples.
- CO.4 Use different statistical approach based on Variance to test the given samples.
- CO.5 Plot control charts for attributes.

### **TEXT BOOKS:**

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, (2007).
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007).

### **REFERENCE BOOKS:**

1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson Brooks/Cole, International Student Edition, 7th edition, (2008).
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th edition, (2007).

  
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3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists, 3<sup>rd</sup> edition, Elsevier, (2004).
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill edition, (2004).

**WEB REFERENCES:**

1. <http://nptel.ac.in/courses/111105041/1>
2. <https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/index.htm>

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**BoS Chairman**

<b>Course Code : 141CE9152</b>	<b>Course title : ARCHITECTURE</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### **COURSE OBJECTIVES**

**The course is intended to:**

1. Explain the concepts of architectural design
2. Describe the planning concepts
3. Design various buildings according to building rules
4. Design buildings for various climatic types
5. Explain the environmental design concepts

### **UNIT I - ARCHITECTURAL DESIGN**

**9**

The Industrial Revolution: The age of revivals, the emergence of engineer, new materials and techniques. Origin of Modern Architecture: definition and concept of modern architecture, various pioneers of modern architecture.

Architectural design – an analysis – Integration of function and aesthetics – Elements of Design: Line direction. Shape, size, texture, value and color, balance, scale and proportion. Principles of Design: Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 D compositions.

### **UNIT II - SITE PLANNING**

**9**

Surveys – Site analysis – Development control – Zoning regulations - Layout Regulations – Urban Planning standards – Layout design concepts.

### **UNIT III - BUILDING TYPES**

**9**

Planning concepts - Residential, institutional, commercial and Industrial buildings — Application of anthropometry and space standards – Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior planning

### **UNIT IV - CLIMATE RESPONSIVE DESIGN**

**9**

Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept

### **UNIT V - ENVIRONMENTAL DESIGN**

**9**

Urban renewal – Conservation – Principles of Landscape design – Case studies.

### **COURSE OUTCOMES**

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

- CO.1 Explain the concepts of architectural design
- CO.2 Describe the planning concepts
- CO.3 Design various buildings according to building rules
- CO.4 Design buildings for various climatic types
- CO.5 Explain the environmental design concepts

### **TEXT BOOKS:**

1. Francis D.K. Ching, "Architecture: Form, Space and order" 3<sup>rd</sup> edition, John Wiley & Sons, 2007
2. Givoni B., "Man Climate and architecture", Applied Science, Barking ESSEX, 1982.



**REFERENCE BOOKS:**

1. Edward D. Mills, "Planning the Architects Handbook", Butterworth London, 1995.
2. Gallian B. Arthur and Simon Eisner, "The Urban Pattern – City Planning and Design", Affiliated Press Pvt. Ltd., New Delhi, 1995.
3. Margaret Roberts, "An Introduction to Town Planning Techniques", Hutchinson, London, 1990.

**WEB REFERENCES:**

1. <http://ocw.mit.edu/courses/architecture/4-461-building-technology-i-materials-and-construction-fall-2004/lecture-notes/lect5.pdf>
2. <http://ocw.mit.edu/courses/architecture/4-461-building-technology-i-materials-and-construction-fall-2004/lecture-notes/lect6.pdf>



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## OPEN ELECTIVES

<b>Course Code : 141OE0907</b>	<b>Course title : SAFETY ENGINEERING</b>	
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>

### COURSE OBJECTIVES

The course is intended to:

1. Explain basic concepts in safety, safety policy and its techniques
2. Explain basic concepts in Health and hygiene in the occupational environment
3. Describe fire explosion control techniques in various industries
4. Explain safety standards in construction industry
5. Describe the safety materials to be used in the field of work

### UNIT I - INTRODUCTION TO CONCEPTS

9

Concept of safety - Evolution of modern safety concept- Safety policy - Safety Organization - line and staff - functions for safety- Safety Committee- budgeting for safety. Techniques- Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

### UNIT II - OCCUPATIONAL HEALTH AND HYGIENE

9

Physical hazards - Noise, noise exposure regulation, occupational damage, risk factors, and permissible exposure limit. Ionizing radiation, types, effects, monitoring instruments, control programs, control measures. Chemical hazards - Recognition of chemical hazards- dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. dose, Methods of Control. Concept and spectrum of health - functional units and activities of occupational health services, pre employment and post-employment medical examinations - occupational related diseases, levels of prevention of diseases.

### UNIT III - FIRE ENGINEERING AND EXPLOSION CONTROL

9

Fire chemistry – Dynamics of fire behavior – Fire properties of solid, liquid and gas – Fire spread – Toxicity of products of combustion. Building evaluation for fire safety – Fire load – Fire resistance materials and fire testing –Structural Fire protection – Exits and egress. Statutory Rules and Techniques of fire fighting - Indian Explosive acts and rules – Techniques of fire fighting and demonstration.

### UNIT IV - SAFETY IN CONSTRUCTION

9

General safety consideration – analyzing construction jobs for safety – Contract document –Safety certificate for statutory authorities for old building and construction. Safety in Erection and closing operation - Construction materials –Specifications – suitability – Limitations. Safety in typical civil structures – Dams-bridges-water Tanks-Retaining walls- Critical factors for failure-Regular Inspection and monitoring.

### UNIT V - SAFETY IN MATERIAL HANDLING

9

General safety consideration in material handling - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears. Selection, operation and maintenance of Industrial Trucks – Mobile Cranes – Tower crane –Checklist - Competent persons.

### COURSE OUTCOMES

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

- CO 1. Explain basic concepts in safety, safety policy and its techniques
- CO 2. Explain basic concepts in Health and hygiene in the occupational environment
- CO 3. Describe fire explosion control techniques in various industries
- CO 4. Explain safety standards in construction industry
- CO 5. Describe the safety materials to be used in the field of work

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**TEXT BOOKS:**

1. Krishnan N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997
2. Accident Prevention Manual for Industrial Operations", N.S.C.Chicago, 1982

**REFERENCE BOOKS:**

1. Handbook of Occupational Health and Safety, NSC Chicago, 1982
2. James, D., Fire Prevention Handbook, Butterworths, London, 1986.
3. Gupta R.S., Handbook of Fire Technology, Orient Longman, Bombay, 1997.
4. Fulman, J.B., Construction Safety, Security, and Loss Prevention, John Wiley and Sons, 1979
5. Alexandrov, M.P., Material Handling Equipment, Mir Publishers, Moscow, 1981
6. Rudenko N., Material Handling Equipments, Mir Publishers, Moscow, 1981.



**BoS Chairman**

<b>Course Code : 141OE0908</b>	<b>Course title : ENVIRONMENTAL IMPACT ASSESSMENT</b>		
<b>Core/Elective: Elective</b>	<b>L: T : P : C</b>	<b>3 : 0 : 0 : 3</b>	
<b>Type : Theory</b>	<b>Total Contact hours:</b>	<b>45</b>	

**PREREQUISITE: 141CE0305 Environmental Science and Engineering**

## **COURSE OBJECTIVES**

**The course is intended to:**

1. Describe the objectives, capability, and limitations of EIA.
2. Elucidate the methods of EIA with case studies.
3. Apply the knowledge of the impact of infrastructure projects on air quality, water quality, vegetation and wildlife.
4. Explain the environmental management plan.
5. Describe the EIA for various infrastructural projects.

### **UNIT I - INTRODUCTION**

**9**

Impact of development projects under Civil Engineering on environment – Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA –EIA notifications –EIA consultants.

### **UNIT II - METHODOLOGIES**

**9**

Methods of EIA- strength, weakness and applicability of EIA– Appropriate methodology – Process Screening – Baseline studies-Mitigations-Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives.

### **UNIT III - AIR QUALITY, NOISE, ENERGY, WATER QUALITY, VEGETATION AND WILDLIFE IMPACT**

**9**

Background - typical considerations and factors, Air quality impact of industry, transport systems, human settlements. Effects of noise on people, noise scales and rating methods, estimating transportation -noise impact. Energy Impact considerations, data sources, energy conservation data. Water quality criteria and standards, waste quality impacts by development projects – Vegetation impact -wild life impact - impact on flora and fauna- Socio Economic impact-Rapid EIA-Post Environmental Audit.

### **UNIT IV - ENVIRONMENTAL MANAGEMENT PLAN**

**9**

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air & land, flora and fauna; addressing the issues related to Project Affected People –ISO 14000

### **UNIT V - CASE STUDIES**

**9**

EIA for infrastructure projects – Highways and Bridges – Stadium – Railways – Dams – Multi-storey Buildings – Water Supply and Drainage Projects – Power plant.

## **COURSE OUTCOMES**

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

- CO.1 Describe the objectives, capability, and limitations of EIA.
- CO.2 Elucidate the methods of EIA with case studies.
- CO.3 Apply the knowledge of the impact of infrastructure projects on air quality, water quality, vegetation and wildlife.
- CO.4 Explain the environmental management plan.
- CO.5 Describe the EIA for various infrastructural projects.

*Page*

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3. Anjanayulu, Y., "Environmental Impact Assessment Methodologies", B.S Publications, Hyderabad, 2011.

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3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

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BoS Chairman

