

FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS

FOR

B. TECH. (CIVIL ENGINEERING)

(Under Credit Based Continuous Evaluation Grading System)

(SEMESTER: I – VIII)

SESSION: 2017–18



GURU NANAK DEV UNIVERSITY AMRITSAR

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B.Tech. (Civil Engineering) 1st Semester
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Semester – I:

S. No.	Course Code	Course Title	L	T	P	Credits
1.	PHL183	Physics	3	1	1	5
2.	MTL101	Mathematics-I	3	1	0	4
3.	ECL115	Electrical Engineering	3	1	0	4
4.	ENL101	Communicative English	2	0	0	2
5.	ARL196	Engineering Graphics & Drafting	3	1	0	4
6.		Elective-I	2	0	0	2
List of Electives						
1.	PBL121	Punjabi (Compulsory) OR	2	0	0	2
2.	PBL122	ਮੁੱਢਲੀ ਪੰਜਾਬੀ (In lieu of Punjabi Compulsory)	2	0	0	2
3. * SOA 101		Drug Abuse: Problem, Management and Prevention (Compulsory)	3	0	0	
TOTAL CREDITS:			16	4	1	21

* Credits will not be included in SGPA

B.Tech. (Civil Engineering) 2nd Semester
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Semester – II:

S. No.	Course Code	Course Title	L	T	P	Credits
1.	CYL196	Engineering Chemistry	2	1	1	4
2.	MTL102	Mathematics-II	3	1	0	4
3.	CSL125	Fundamentals of IT & Computer Programming	2	1	1	4
4.	PHL182	Material Science	3	1	0	4
5.	CEL120	Engineering Mechanics	3	1	0	4
6.		Elective-II	2	0	0	2
7.	MEP101	Workshop Practices	0	0	2	2

List of Electives

1.	PBL131	Punjabi (Compulsory) OR	2	0	0	2
2.	PBL132	ਮੁੱਢਲੀ ਪੰਜਾਬੀ (In lieu of Punjabi Compulsory)	2	0	0	2
3.	* SOA 102	Drug Abuse: Problem, Management and Prevention (Compulsory)	3	0	0	

TOTAL CREDITS 15 54 24

* Credits will not be included in SGPA

*B.Tech. (Civil Engineering) 3rd Semester
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S. No.	Semester III		Credits		
	Course Code	Course	L	T	P
1.	CEL215	Civil Engineering Materials	3	1	0
2.	CEL216	Construction Planning Management	3	1	0
3.	CEL213	Surveying	2	1	0
4.	CEL217	Fluid Mechanics	2	1	0
5.	ENL201	Written Oral Technical Communication	2	1	0
6.	MTL201	Mathematics-III	3	1	0
7.	ESL220	*Environmental Studies	3	0	0
Practical's					
1.	CEP213	Surveying Laboratory	0	0	1
2.	CEP217	Fluid Mechanics Laboratory	0	0	1
3.	ENP201	Written and Oral Technical Communication	0	0	1
Sub Total			15	6	3
Grand Total			24		

B.Tech. (Civil Engineering) 4th Semester
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S. No.	Semester IV		Credits		
	Course Code	Course	L	T	P
1.	CEL221	Strength of Materials	2	1	0
2.	CEL222	Water Supply Engineering	3	1	0
3.	CEL223	Concrete Technology	2	1	0
4.	CEL224	Soil Mechanics	3	1	0
5.	CEL225	Numerical Methods for Civil Engineering	2	1	0
6.		Department Elective-I	3	0	0
7.		Department Elective-II	3	0	0
8.		Inter Disciplinary Course – I*	3	1	0
Practical's					
1.	CEP221	Strength of Materials Laboratory	0	0	1
2.	CEP223	Concrete Technology Laboratory	0	0	1
3.	CEP224	Soil Mechanics Laboratory	0	0	1
Sub Total			21	6	3
Grand Total			30		
Department Elective-I					
1.	CEL226	Elements of Remote Sensing GIS	3	0	0
2.	CEL227	Engineering Geology Rock Mechanics	3	0	0
3.	CEL228	Town Planning	3	0	0
Department Elective-II					
1.	CEL229	Building Construction	3	0	0
2.	CEL230	Disaster Management	3	0	0
3.	CEL231	Mass Transportation System	3	0	0

B.Tech. (Civil Engineering) 5th Semester
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S. No.	Semester V		Credits		
	Course Code	Course	L	T	P
1.	CEL311	Theory of Structure-I	3	1	0
2.	CEL312	Design of Steel Structure-I	3	1	0
3.	CEL313	Waste Water Engineering	2	1	0
4.	CEL314	Highways Engineering	2	1	0
5.		Department Elective-III	3	0	0
6.		Inter Disciplinary Course – II*	3	1	0
7.	CEP318	Survey camp of 04 weeks duration after 4 th Semester	0	0	2
Practical's					
1.	CEP311	Theory of Structure-I Laboratory	0	0	1
2.	CEP312	Departmental CAD Laboratory-I (Steel-I)	0	0	2
3.	CEP313	Environmental Engineering Laboratory	0	0	1
4.	CEP314	Highways Engineering Laboratory	0	0	1
Sub Total			16	5	7
Grand Total			28		
*Department Elective-III					
1.	CEL315	Traffic Engineering	3	0	0
2.	CEL316	Construction Laws	3	0	0
3.	CEL317	Advanced Environmental Engineering	3	0	0

B.Tech. (Civil Engineering) 6th Semester
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S.No.	Course Code	Course	Credits		
			L	T	P
Semester VI					
1.	CEL321	Theory of Structure-II	3	1	0
2.	CEL322	Foundation Engineering	3	1	0
3.	CEL323	Design of Concrete Structure-I	3	1	0
5.	CEL324	Water Resources Engineering-I	3	1	0
6.	CEL325	Railways Airport Engineering	2	1	0
7.		Department Elective-IV	3	0	0
8.		Inter Disciplinary Course – III*	3	1	0
Practical's					
1.	CEP323	** Departmental CAD Laboratory-II (RCC-I)	0	0	2
Sub Total			20	6	1
Grand Total			27		
Department Elective-IV					
1.	CEL326	Ground Improvement Ground Engineering	3	0	0
2.	CEL327	Pavement Design	3	0	0
3.	CEL328	Finite Elements Method	3	0	0

** Credits of this practical will be counted as 1 credit.

B.Tech. (Civil Engineering) 7th Semester
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S. No.	Semester VII		Credits		
	Course Code	Course	L	T	P
1	CEL411	Design of Concrete Structure-II	3	1	0
2	CEL412	Design of Steel Structure-II	3	1	0
3	CEL413	Water Resources Engineering-II	3	1	0
4	CEL414	Estimation And Costing	2	1	0
5		Department Elective-IV*	3	0	0
6		Inter Disciplinary Course – IV**	3	1	0
Practical's					
1	CEP411	Departmental CAD Laboratory-III (RCC-II)	0	0	2
1	CEP412	Departmental CAD Laboratory-III (Steel-II)	0	0	2
Sub Total			17	5	2
Grand Total			24		
*Department Elective-IV					
1	CEL415	Bridge Engineering	3	0	0
2	CEL416	Earthquake Engineering	3	0	0
3	CEL417	Pre- Stressed Concrete	3	0	0

B.Tech. (Civil Engineering) 8th Semester
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S. No.	Semester VIII		Credits		
	Course Code	Course	L	T	P
1	CEP421	Software Training*	0	0	5
2	CEP422	Industrial Training	0	0	15
Sub Total			0	0	20
Grand Total			20		
<p>*List of Software for Training to be learnt during Training Period Any software that enhances professional capability in civil engineering practice a partial indicative list is mentioned below:</p>					

- 1 PRIMA VERA
- 2 AUTOCAD CIVIL 3D
- 3 MX ROAD
- 4 STAAD PRO
- 5 GT STRUDAL
- 6 GEO STUDIO PROF 2004

B.Tech. (Civil Engineering) 1st Semester
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PHL-183: PHYSICS

L T P
3 1 1

UNIT-I

Electric and magnetic fields in a medium, Susceptibility and Conductivity, Maxwell's equations, Boundary conditions; EM wave equation, Plane wave solutions, Polarization of the EM waves, Pointing vector and intensity of the EM wave; Wave packet, Phase and Group velocities; Reflection and refraction of EM waves at a dielectric interface; Brewster angle; Total internal reflection at a dielectric interface; EM waves in a conducting medium and plasma.

UNIT-II

Wave-particle duality, de-Broglie waves; Quantum mechanical operators; Schrodinger equation, Wave function, Statistical interpretation, Superposition Principle, Continuity equation for probability density; Stationary states, Bound states.

UNIT-III

Free-particle solution, 1-D infinite potential well, Expectation values and uncertainty relations; 1-D finite potential well, Quantum mechanical tunnelling and alpha-decay, Kronig-Penny model and emergence of bands

Books Recommended:-

1. Concepts of Modern Physics. Arthur Beiser, (Tata McGraw-Hill, Sixth Edition 2003).
2. Lasers & Nonlinear optics. B.B. Laud (New Delhi, India: Wiley Eastern 1991).

List of Experiments (Lab-A)

1. STUDY OF POWER SOURCE

A. *To Study the output voltage, output resistance, power dissipation in the load and source for same R_2/R_1 ratio.*

- I. Draw a graph between V_L and I_L for all the three sets of R_1 and R_2 .
- II. Find V_S and R_S from the graph and formula given in the book. Verify $R'_S = x R_S$ if R and R_2 are changed by a factor of x .
- III. Calculate the power dissipated in the load resistance R_L from $P_L = V_L I_L$ and P_S from $V_S^2/2R_S$. Find P_L/P_S and show that the maximum value of this ratio is 0.5. Plot P vs R_L .

B. To Study the reflected load resistance in a network.

- I. Calculate R'_L , from the relation
 $R'_L = V_o/(I_o - I)$
And compare it with the measured value.
- II. Plot a graph between R'_L and R_L .

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2. STUDY OF CAPACITOR

- A. *To study the voltage (V_C) across a capacitor during charging in an RC circuit.*
- I. Plot a graph between V_C and time. Find time constant of the circuit.
 - II. Verify the exponential nature of the charging process by a plot of $\log (V_0 - V)/V_0$ and time. Determine the time constant from it.
- B. *To study the energy dissipation in charging of a capacitor and to study its dependence in C and V.*
- I. Plot a graph between I_2 and time. Calculate area under the curve. Calculate the energy dissipated in the circuit which is equal to R times this area.
 - II. Show the dependence of energy dissipation on V and C using the following combinations (V_1, R_1, C_1 ; V_1, R_1, C_2 V_2, R_1, C_1)
- C. *To study the energy dissipation during adiabatic charging of a capacitor.*
- I. Plot a graph between I_2 and time for three sets (0-5 and 5-10). Calculate the energy dissipated in each case. Show that the energy dissipated in two steps charging up to 1 volts is one third that of direct charging 0-10 V.

3. STUDY OF ELECTROMAGNETIC INDUCTION

- A. *To study the emf induced as a function of the velocity of the magnet.*
- I. Plot a graph between induced emf and velocity of the magnet.
- B. *To study electromagnetic induction.*
- I. Plot a graph between induced emf, $e(t)$ and number of pulses.
 - II. Plot a graph between induced emf, $e(t)$ and $1/R$ where R is the resistance in the circuit.
 - III. Calculate maximum magnetic induction, B_{\max}
- C. *To Study the electromagnetic damping.*
- I. Study the electromagnetic damping for closed circuit, open circuit, circuit containing the resistance and circuit containing the capacitor.

4. STUDY OF RC CIRCUIT WITH AC MAINS

- A. *To study simple RC circuit*
- I. Compare the measured value of current I with the calculated one from the formula $V_R = IR$ and $V_C = I/WC$ in each case.
 - II. Plot a graph between V_C and I/C . determine the value of frequency of the source.
 - III. Determine the impedance of the circuit by formula $Z = V_0/I$ and verify theoretically.
 - IV. From the vector diagram between V_R , V_C and V_0 , show that $V_0^2 = V_R^2 + V_C^2$ in all cases.
 - V. Show that the sum of resistive voltage and the sum of capacitive voltage are in quadrature in circuit.
- B. *To study the deviation in the behavior of an actual capacitor by adding a series resistance.*
- I. With source voltage V_0 as base construct triangles for the resistance and the capacitor.
 - II. Show that phase angle reduces as more and more resistances are added to C.
- C. *To study the deviation in the behavior of an actual capacitor by adding a shunt resistance.*
- I. Draw voltage vector diagrams to evaluate the effect of increasing R on the performance of capacitor.
 - II. Draw current vector diagrams also.

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5. STUDY OF LCR CIRCUIT

- A. To determine equivalent power loss resistance (r) of an inductor.
 I. Calculate r for all the observations from vector diagrams.
 II. Draw graphs between (i) r & V_O and (ii) r & R
 B. To analyse LR and RC circuits.
 Make parallel circuits containing (i) L_1R_1 and L_2R_2 (ii) C_1R_1 and C_2R_2 & (iii) L_1R_1 and C_2R_2
 I. Draw vector diagrams and find V_{ab} for all the observations. Show that calculated and measured V_{ab} are in agreement. Determine the condition for which V_{ab} becomes minimum.
 II. To find the value of an inductor in the LCR resonance circuit.

6. PHASE MEASUREMENTS BY SUPERPOSITION

(**Note:** Verify all phase angles of voltages across each element by vector diagrams also.)

- A. *To study the relative of voltages across the resistors and capacitors in series.*

List of Experiments (LAB-B)

1. To determine the elastic constants of a solid using
 - a. Koenig's method
 - b. Maxwell's needle method
2. Measurement of wavelength of sodium light using a Fresnel Biprism.
3. a. To determine the thermal conductivity of an insulator by Lee's method.
 b. To study the behavior of coupled identical pendula and to establish a relationship between the coupling length and characteristic frequencies of the symmetric & antisymmetric modes of oscillations.
4. To study single-slit diffraction using He-Ne laser.
5. To determine the surface tension of a liquid using
 - a. Jaeger's method
 - b. Capillary-rise method
6. To obtain the Cauchy's dispersion formulae for refractive index of a prism.
7. *To determine the wavelengths of mercury vapour lamp using a diffraction grating.
8. To determine the viscosity of a liquid by the oscillating disc method (Mayer's method).
9. To determine the wavelength of sodium light by Newton's rings.

Exp 7 can be done only after doing Exp No. 6

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MTL-101: MATHEMATICS – I

L T P
3 1 0

PART – I

Calculus: Partial Derivatives, Euler's theorem on homogeneous functions, Maclaurin's and Taylor's expansions of single and two variables, Maxima and minima of functions of several variables, Lagrangian method of multipliers, Multiple integrals and their use in obtaining surface areas and volumes of solids.

PART – II

Infinite Series: Sequences and sub sequences and their convergence, Cauchy sequence, Infinite series and their convergence, Standard tests for convergence including p-test, Ratio test, Comparison test, Raabe's test, Cauchy Integral test, Cauchy root test, Gauss's test, Absolute Convergence, Alternating series and its convergence, Power Series.

PART – III

Vector Calculus: Scalar and Vector point functions, Differentiation of vectors, Gradient of a scalar field, Divergence and Curl of a vector field and their physical interpretations, Line integral of a vector field, Surface integral of vector field, Volume integral of a scalar field, Green's theorem, stokes theorem, Gauss divergence theorem (without proofs) and their applications.

Books Recommended:

1. Louis A. Pipes: Applied Mathematics for Engineers and Physicists, McGraw Hill Book Company.
2. Kreyszig: Engineering Mathematics, Wiley Eastern Ltd.
3. BS Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. Murray & Spiegel, Vector Analysis, Schaum Publication Co.

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ECL115: ELECTRICAL ENGINEERING

L T P
3 1 0

PART – I

1. **Electricity:** A brief review of various applications of electricity, difference between AC and DC, PARTs of voltage, current and resistance, concept of electromagnetic induction and production of alternating e.m.f. – single phase and poly phase, concept of 3 phase system star and delta connections, voltage and current relations (formula only).
2. **Power Supply:** A brief review of special features of the power supply system, power-station, transmission, distribution lines, service main, domestic and industrial wiring installation.
3. **Circuit Analysis:** A brief review of DC and single phase AC circuits. Three phase AC circuits, phasor representation, star–delta transformation, concept of balanced and unbalanced three phase circuits, measurement of power and power factor in three phase balanced circuits, AC circuits (L.R.C.) solution.
4. **Electrical Machinery:** Transformers, its working principle, types of transformers and their applications, performance losses, efficiency and voltage regulation open circuit and short circuit tests on a transformer, auto transformer.

PART – II

5. **DC Motors:** Force and EMF production, methods of excitation in DC machines, various types, characteristic and application of DC shunt and series motors.
6. **Phase Induction Motor:** Construction and type of three phase induction motors, equivalent circuits, application of different types of induction motors, starters and protective devices used for motors.
7. **Phase Synchronous Machines:** Principle of working and construction of alternators and synchronous motors.
8. **Single Phase Induction Motors:** Types and construction, their working principle, starting of single phase motor, application of single phase motors.

PART – III

9. **Control and Protection:** Control mechanism, principle and application of servo motors, protection devices for wiring installation and motors – fuses MCB, LCB, relays.
10. **Cables:** Types of cables, construction of LT and HT cables, laying of cables, selection of cables.
11. **Earthing and Grounding:** Need, types, Indian Electricity Rules, use of meggar and earth tester for measurement of earth resistance.

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Books Recommended:

1. Principles of Electrical Engineering by Gupta BR; S. Chand and Company, New Delhi.
2. Electrical Technology by Hughes Edward; The English Language Book Society and Longmans Group Limited, London.
3. Electrical Machines by Bhattacharya SK; Tata McGraw Hill, Delhi.
4. Experiments in Basic Electrical Engineering by Bhattacharya SK and Rastogi KM; New Age International, New Delhi.
5. Experiments in Electrical Engineering by Bhatnagar US; Asia Publishing House, Bombay.
6. Advanced Electrical Technology by Cotton H; Isaac Pitmans and Sons Limited, London.
7. Electrical Engineering – Basic Technology by Hubschar; Deutsche Gesellschaft Fur Technische Zusammenabelt (GTZ) GMBH.
8. Basic Electrical Engineering by T.K. Naggarkar& Ms. Sakhija Seventh Edition 2008, Oxford University Press.

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ENL–101: Communicative English–I

Time: 3 Hrs.

L T P
2 0 0

Objective: To introduce students to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas. This course will prepare students to read a variety of texts and also to communicate more effectively through writing. The course will also pay special attention to vocabulary building.

Prescribed Text books:

1. *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.
2. *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

Course Contents:

1. Reading and Comprehension Skills:

Students will be required to read and comprehend the essays in Unit 1 and 2 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition. They will be required to answer the questions given after each essay.

2. Developing Vocabulary and using it in the Right Context:

The students will be required to master “Word List” and “Correct Usage of Commonly Used Words and Phrases” from the Chapter “Vocabulary” in the book *The Written Word*.

3. Writing Skills

Students will be required to learn “Report Writing” and “Letter Writing” as in the book *The Written Word*.

Students will be required to write long essays based on the prescribed text book *Making Connections: A Strategic Approach to Academic Reading*.

Minor 1:

Syllabus to be covered:

1. Unit 1 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.
2. Report Writing from *The Written Word*.

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Suggested Paper Pattern:

1. Report Writing (8 marks)
2. Short answer type questions from Unit 1 of *Making Connections: A Strategic Approach to Academic Reading* (6 marks)
3. Essay type question from Unit 1 of *Making Connections: A Strategic Approach to Academic Reading* (6 marks)

Minor 2:

Syllabus to be covered:

1. “Word List” from the Chapter “Vocabulary” in the book *The Written Word*.
2. Unit-2 from the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

Suggested Paper Pattern:

1. Word List from the Chapter “Vocabulary” in the book *The Written Word* (8 marks)
2. Short answer type questions from Unit 2 of *Making Connections: A Strategic Approach to Academic Reading* (6 marks)
3. Essay type question from Unit 2 of *Making Connections: A Strategic Approach to Academic Reading* (6 marks)

Suggested Paper Pattern for Major Exam:

1. Letter Writing as prescribed in *The Written Word* /1 out of 2 (10 marks)
2. Short answer type questions from Unit 1,2 of *Making Connections: A Strategic Approach to Academic Reading* (14 marks)
3. “Word List” and “Correct Usage of Commonly Used Words and Phrases” from the Chapter “Vocabulary” present in the book *The Written Word*. (10 marks)
4. Essay type question from Unit 1,2 of *Making Connections: A Strategic Approach to Academic Reading* 1 out of 2 (8 marks)
5. Report Writing from *The Written Word* (8 marks)

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ARL196: ENGINEERING GRAPHICS & DRAFTING

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3 1 0

PART – I

Drawing Techniques: Various types of lines, principles of dimensioning, size and location of dimensions, symbols, conventions scales (plane and diagonal) and lettering as per IS Code SP-46 of practice for general engineering drawings. Practice of drawing various types of lines and dimensioning exercises. Drawing exercises pertaining to symbols, conventions. Exercise on lettering techniques: Free hand printing and numerals in 3, 5, 8 and 12 mm sizes vertical and inclined at 75 ; instrumental lettering in single stroke.

Projection of Points, Lines and Planes: First angle and third angle projections, concept of horizontal and vertical planes, Projection of points and lines, True length, Horizontal and vertical traces, Projection of Planes, Traces of Planes, Auxiliary planes. Practice exercises on projection of points, lines and planes.

Projection and Selection of Solids: Projection of solids such as Prisms, Pyramids, Cylinders, Cones, Spheres, Auxiliary View. Principles of sectioning, types of sectioning, section lines, cutting plane lines. Practice on projection of solids.

PART – II

Isometric Projection: Exercises on isometric views.

Orthographic Projections: Orthographic views, Missing views. Exercises on identification of missing views. Practice on orthographic projections.

Practice of free hand sketching of different types of objects.

PART – III

Intersection and Development of Surfaces: Intersection of cylinders, cones and Prisms, Axis of solids being vertical or horizontal. Development of surfaces of truncated cylinders, cones and prisms. Exercises on intersection of solids – cylinder and cylinder, cylinder and cone, prism and prism, prism and cone, sphere with cylinder. Exercises involving development of surfaces (Y-Piece, Hopper, Tray and truncated pieces).

Fasteners: Introduction to temporary and permanent fasteners riveted and welded joints, types screw threads, conventional symbols for internal and external threads. Exercises involving drawing of bolts, nuts, studs and locking devices.

Symbols and Conventions: Symbol and conventions pertaining to relevant engineering disciplines.

Books Recommended:

1. Engineering Drawing by PS Gill, SK Kataria and Sons, Ludhiana.
2. Engineering Drawing by NK Bhatt.
3. Text Book of Engineering Drawing by R.K. Dhawan, S. Chand & Company Ltd.
4. Engineering and Teaching Drawing by Earl D. Black.

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(Elective-I)

Punjabi (Compulsory)
PBL-121: ਪੰਜਾਬੀ ਲਿਖਤ

Credits: 2-0-0

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ ਪੁਸਤਕਾਂ

- (I) 1. ਏਕਮ ਏਨਕਮ (ਸਭ. ਵਿਏਮ ਇਠ ਸਠੁਏਯਫ. ਸਿਹਠਰਠਰ ਇਠ, ਗਰੁਨਕ ਢਯ ਵਠਵਰਿਠ, ਏਠਠਠਰ) ਏਠਠਠਰ ਏਠਠਠਰ :
(a) ਗਰੁਨਕ ਇਠ ਮਸਿਪਰ : ਗਰੁ
(E) ਸਯ ਨ ਇਠ : ਪਟਿ ਢ ਢ
(e) ਕਰੁਰ ਇਠ ਢਗੁ : ਏਠ ਏਠ ਵਿ ਠ ਗਰੁਠ
(ਖਿਲ-ਸਿਰ, ਏਠ-ਵਸੁਠ ਖਿਲ-ਕਿ, ਖਿਲਕਿਰ)

2. ਗਰੁਨਕ ਏਠਗਰੁਪਿ ਢ ਯਗੁ, (ਪਠ; ਮਨਿਰਨ; ਏਠ, ਏਠ ਯਏਠ); ਏਠ ਏਠ ਸਢਯ (SD-ESD)

- (II) 1. ਏਕਮ ਏਨਕਮ (ਸਭ. ਵਿਏਮ ਇਠ ਸਠੁਏਯਫ. ਸਿਹਠਰਠਰ ਇਠ, ਗਰੁਨਕ ਢਯ ਵਠਵਰਿਠ, ਏਠਠਠਰ) ਏਠਠਠਰ ਏਠਠਠਰ :
(a) ਸਠਕ ਇਠ ਢਰ : ਸ-ਯ ਕਠ
(E) ਕਿ ਵਠ ਇਠ ਏਰ : ਏਠ
(e) ਮਿਠਰ ਇਠ ਸਰੁ : ਯ ਠਰ ਮਕਠ ਇਠ
(ਖਿਲ-ਸਿਰ, ਏਠ-ਵਸੁਠ ਖਿਲ-ਕਿ, ਖਿਲਕਿਰ)

2. ਠ ਕਰੁ (ਯ ਲਵਨ-ਪਰ, ਸਯ ਕ ਏਯਠ ਠ ਏਠ-ਏਠ):
10 ਠ ਠ ਠ ਕਰੁ (ਕਿ ਸ ਏਯਗਰੁ ਠ ਠ ਏਠ)

- (III) 1. ਏਕਮ ਏਨਕਮ (ਸਭ. ਵਿਏਮ ਇਠ ਸਠੁਏਯਫ. ਸਿਹਠਰਠਰ ਇਠ, ਗਰੁਨਕ ਢਯ ਵਠਵਰਿਠ, ਏਠਠਠਰ) ਏਠਠਠਰ ਏਠਠਠਰ :
(a) ਪਠ ਪਕੁ : ਮ-ਠ ਠ
(E) ਗੁ ਤਿਰ ਇਠ ਸਠੁ : ਕਿ ਠਯ
(e) ਮਨ ਠਰੁ : ਗੁਠ
(s) ਵਿਏਮ ਇਠ ਸਠੁ : ਢ ਢ
(ਖਿਲ-ਸਿਰ, ਏਠ-ਵਸੁਠ ਖਿਲ-ਕਿ, ਖਿਲਕਿਰ)

2. ਪਰੁ ਪਠਕਪਠਨ-ਢਯਠ ਢਠ
(ਏਕਮ ਏਨਕਮ ਪਸੁਕ ਢਠਕਿਲ ਠ ਠ ਠ 15 ਪਰੁ-ਢਠਠ ਕਰੁਠ)

B.Tech. (Civil Engineering) 1st Semester
(Under Credit Based Continuous Evaluation Grading System)
 (Elective-I)

Mudhli Punjabi
PBL-122: ਮੁੱਢਲੀ ਪੰਜਾਬੀ
 (In lieu of Punjabi Compulsory)

2-0-0

ਪਾਠ-ਕ੍ਰਮ

1. ਪੰਜਾਬੀ ਭਾਸ਼ਾ,
ਗੁਰਮੁਖੀ ਲਿਪੀ
ਗੁਰਮੁਖੀ ਲਿਪੀ : ਬਣਤਰ ਅਤੇ ਤਰਤੀਬ
2. ਗੁਰਮੁਖੀ ਆਰਥੋਗ੍ਰਾਫੀ
ਸੂਰ ਬਣਤਰ ਅਤੇ ਉਚਾਰਨ
ਵਿਅੰਜਨ ਬਣਤਰ ਅਤੇ ਉਚਾਰਨ
3. ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ
ਸਾਧਾਰਨ ਸ਼ਬਦ
ਇਕ ਉਚਾਰਥੰਡੀ ਸ਼ਬਦ

ਯੂਨਿਟ ਅਤੇ ਥੀਮ

1. ਪੰਜਾਬੀ ਭਾਸ਼ਾ : ਨਾਮਕਰਣ ਅਤੇ ਸੰਖੇਪ ਜਾਣ ਪਛਾਣ, ਗੁਰਮੁਖੀ ਲਿਪੀ : ਨਾਮਕਰਣ, ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ; ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ, ਸੂਰ ਵਾਹਕ (ਓ ਅ ਏ), ਲਗਾਂ ਮਾਤਰਾਂ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ।
2. ਗੁਰਮੁਖੀ ਆਰਥੋਗ੍ਰਾਫੀ ਅਤੇ ਉਚਾਰਨ; ਸੂਰਾਂ ਦੀ ਬਣਤਰ ਅਤੇ ਉਚਾਰਨ (ਲਘੂ-ਦੀਰਘ ਸੂਰ); ਸੂਰ ਅਤੇ ਲਗਾਂ ਮਾਤਰਾਂ; ਵਿਅੰਜਨਾਂ ਦੀ ਬਣਤਰ ਅਤੇ ਉਚਾਰਨ; ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣਾਂ (ਹ, ਰ, ਵ) ਦਾ ਉਚਾਰਨ ; ਲ ਅਤੇ ਲ਼ ਦਾ ਉਚਾਰਨ; ਭ, ਧ, ਢ, ਝ, ਞ ਦਾ ਉਚਾਰਨ; ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣਾਂ ਦਾ ਉਚਾਰਨ।
3. ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ : ਸਾਧਾਰਨ ਸ਼ਬਦ; ਇਕੱਲਾ ਸੂਰ (ਜਿਵੇਂ ਆ); ਸੂਰ ਅਤੇ ਵਿਅੰਜਨ (ਜਿਵੇਂ ਆਰ); ਵਿਅੰਜਨ ਅਤੇ ਸੂਰ (ਜਿਵੇਂ ਪਾ); ਵਿਅੰਜਨ ਸੂਰ ਵਿਅੰਜਨ (ਜਿਵੇਂ ਪਾਰ); ਕੋਸ਼ਗਤ ਸ਼ਬਦ (ਜਿਵੇਂ ਘਰ, ਪੀ); ਵਿਆਕਰਣਕ ਸ਼ਬਦ (ਜਿਵੇਂ ਨੂੰ, ਨੇ); ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ-1; ਲਿੰਗ-ਪੁਲਿੰਗ, ਇਕ ਵਚਨ-ਬਹੁ ਵਚਨ; ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ-1: ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ ਆਦਿ ਨਾਲ ਸੰਬੰਧਿਤ।

B.Tech. (Civil Engineering) 1st Semester
(Under Credit Based Continuous Evaluation Grading System)
 (Elective-I)

SOA 101: Drug Abuse: Problem, Management and Prevention
(Compulsory Paper)

PROBLEM OF DRUG ABUSE

Time: 3 Hours

Credit 3-0-0

- 1) **Meaning of Drug Abuse:** Concept and Overview, Historical Perspective of Drug Abuse, Drug Dependence, Drug Addiction, Physical and Psychological Dependence: Drug Tolerance and withdrawal symptoms.
- 2) **Types of Abused Drugs and their Effects.**
 - 1) Stimulants: Amphetamines – Benzedrine, Dexedrine, Cocaine.
 - 2) Depressants: Alcohol Barbiturates: Nembutal, Seconal, Phenobarbital and Rohypnol.
 - 3) Narcotics: Heroin, Morphine, Oxycodone.
 - 4) Hallucinogens: Cannabis, Marijuana, Hashish, Hash Oil, MDMA, LSD.
 - 5) Steroids.
- 3) **Nature and Extent of the Problem:** Magnitude or prevalence of the menace of Drug Abuse in India and Punjab, Vulnerable groups by age, gender and economic status, Signs and Symptoms of Drug Abuse: Physical, Academic, Behavioural and Psychological Indicators.

References:

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
6. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
7. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
8. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
9. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
10. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.
11. World Drug Report 2010, United Nations office of Drug and Crime.
12. World Drug Report 2011, United Nations office of Drug and Crime.

B.Tech. (Civil Engineering) 2nd Semester
(Under Credit Based Continuous Evaluation Grading System)

CYL-196: ENGINEERING CHEMISTRY

L-T-P

2-1-1

(30 hrs.)

- 1 Concept of entropy; thermodynamic scale of temperature; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible reactions. Introduction to enthalpy, enthalpy change of reactions, effect of temperature and pressure on enthalpy of reaction.

(6 hrs.)

Free Energy Functions: Gibbs and Helmholtz energy; Variation of S,G,A with T,V and P. Free energy Change and spontaneity.

(4 hrs.)

- 2 Phase Equilibria: Concept of phases, components and degrees of freedom, Derivation of Gibb's phase rule for reactive and non reactive systems; Clausius Clapeyron equation and its application to solid-liquid, liquid vapour and solid vapour equilibria.

(5 hrs.)

- 3 Physical basis of atomic and molecular structure: Valence band and molecular orbital approaches, LCAO-NO treatment of H_2^+ , bonding and antibonding orbitals, Qualitative extension to H_2 . Comparison of MO & VB approaches.

(4 hrs.)

- 4 Organometallic compounds

Introduction, Metal carbonyl complexes: binding mode and the structures of representative mono-, di-, tri- and tetra-nuclear complexes. Applications of organometallic compounds in catalysis (Hydroformylation, Monsanto acetic acid process, Ziegler-Natta catalyst in polymerisation reaction of alkenes, Alkene hydrogenation)

(3 hrs.)

- 5 Coordination compounds

Bonding in coordination compounds (valence bond theory, crystal field theory and molecular orbital theory with representative examples). Discussion on the colors of Hexaquo complexes of Cr^{2+} , Cr^{3+} , Co^{2+} and Ni^{2+} , considering their electronic transitions.

Magnetic properties: Paramagnetism, diamagnetism, ferro- and antiferromagnetism with examples. Spin only magnetic moments of 1st row transition elements and reasons for deviations observed in some cases.

Tetragonal distortions in the regular octahedral complexes (Jahn-Teller distortions)

(4 hrs.)

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- 6 Metal ions in biological systems
Introduction, energy sources for life, non-photosynthetic processes Essential and trace elements on biological processes, Biological role of alkali and alkaline earth metal ions with special reference of Na⁺-K⁺ Pump. (2 hrs.)
- 7 Silicone based compounds
Introduction, Preparation of silicones, cross linked silicones, Silicon fluids or oils, Silicon elastomers, Silicon resins and their applications. (2 hrs.)

Reference Books:

1. Casetllan, G.W. Physical Chemistry 4th edition Narosa 2004.
2. Peter A. and Paula, J.de Physical Chemistry 10th edition Oxford University Press (2014).
3. Mcquarrie, D.A. and Simon, J.D. Molecular Thermodynamics, Viva Books Pvt. Ltd. New Delhi.
4. Chanda A.K. Introductory Quantum Chemistry Tata McGraw Hill.
5. Anautharaman R. Fundamentals of Quantum Chemistry Mcmilan India Ltd.
6. Concise Inorganic Chemistry by J. D. Lee, fifth edition
7. Inorganic Chemistry by J. E. Huhey , fourth edition.
8. James E. Mark, Harry R. Allcock, Robert West, Inorganic Polymers, Second Edition, Oxford University Press (2005)

List of Practicals

1. Preparation of benzimidazole.
2. Synthesis of p-nitroacetanilide from acetanilide.
3. Quantitative estimation of given glucose solution.
4. Find the strength of KMnO₄ solution.
5. Determine number of water molecules in Mohr salt by titration method.
6. Determine percentage of sodium carbonate in given sample of washing soda.
7. Determination of total Hardness of Water.
8. Determine the percentage of Ca²⁺ and Mg²⁺ in the given sample of water.
9. To determine the strength of strong and weak acid conductometrically.
10. Determination of coefficient of viscosity of a given liquid by viscometer.
11. Determination of hydrogen ion concentration and pH of a given solution using potentiometric titration.
12. To find the mol. wt. of high polymer by using viscosity measurements.
13. Determination of surface tension of a given liquid by drop number method by stalagmometer.
14. To determine the critical micelle concentration of a soap (sodium laurate) by surface tension measurements.
15. Chemical Kinetics- Acid hydrolysis of ethylacetate.

Books Recommended:

1. Findlay's Practical Physical Chemistry.
2. Advanced Practical Physical Chemistry by J.B. Jadav.
3. Quantitative Organic Analysis by Vogel.

B.Tech. (Civil Engineering) 2nd Semester
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MTL102: MATHEMATICS – II

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PART – I

Differential Equations: Exact differential Equation, Higher order linear Differential equations, ODE's with constant coefficients.

Laplace Transforms: Laplace transforms, Properties of Laplace transforms, Laplace transform of derivatives and differentiation theorem, Integration theorem, Laplace transform of Integrals, Inverse Laplace transform, Formulas for obtaining inverse Laplace transforms, Convolution theorem, The second shifting property.

PART – II

Fourier Series and Fourier Transform: Fourier Series expansion, Fourier series for even and odd functions, half range series, harmonic functions, Modulation theorem, Shifting properties, convolution theorems, sine and cosine transforms, Fourier transform of derivatives and integrals, inverse Fourier transform, Applications to PDE's and ODE's.

PART – III

Complex Analysis: De Moivre's theorem with applications, Analytic functions, Cauchy-Riemann equations, Laplace equation, Cauchy's integral theorem, Cauchy's integral formula (without proofs), Taylor series and Laurent series (without proofs), Residues and their application in evaluating real improper integrals.

Books Recommended:

1. Louis A. Pipes: Applied Mathematics for Engineers and Physicists, McGraw Hill Book Company.
2. Kreyszig: Engineering Mathematics, Wiley Eastern Ltd.
3. BS Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi.

B.Tech. (Civil Engineering) 2nd Semester
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CSL125: FUNDAMENTALS OF IT AND COMPUTER PROGRAMMING

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2 1 1

PART – I

Block diagram of Computer, Associated peripherals, Memories – RAM, ROM, Secondary Storage Devices, Classification of Computers and Languages, Introduction to Compilers, Interpreter and Assemblers, Introduction of various operating system with their file system, Features of DOS, Internal and External commands of DOS, Introduction to Windows and Linux.

PART – II

Algorithm and Flowchart, Introduction to C language, Various Data Types- Basic, Derived, user defined and void, Operators, Expressions, Variable, Constant, Header files, Formatted and unformatted input and output statements, Control and conditional statements. Arrays.

PART – III

String Handling, Functions- call by value and call by references, Structures and Unions, Array of structure, Pointers, Dynamic memory allocation using malloc and calloc functions, File Handling, Modes of file handling, File handling Input and Output statements.

PRACTICALS

- Looking for directories and files under DOS.
- Changing drives, searching for files, looking at files extensions and size of files.
- Deleting and saving files, protecting and unprotecting file.
- Familiarizing with windows, closing, maximizing, shifting icons, ordering icons, changing the size of windows, moving windows.
- File manager to view the files, transfer files from directories/devices.
- Exercises (at least fifteen) involving assignment, looping, functions, arrays, structure, string, pointers and files in C.

Recommended Books:

1. Computers Today by Sanders.
2. Fundamentals of Computers TTTI Publication.
3. DOS Instant Reference by Harvey and Nelson.
4. Programming with ANSI and Turbo C 2nd edition – Kamthane, Pearson Publication
5. Let US C 8th edition – Yashwant Kanetkar- Infiniti Science Press
6. Mastering Turbo C by Brottell Stan Kelly.

B.Tech. (Civil Engineering) 2nd Semester
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PHL182: MATERIAL SCIENCE

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PART-I

Structure-property relationship; crystal system, close packing, crystal planes and directions; Miller indices; Determination of crystal structure using X-Ray diffraction.

PART-II

Phase diagram; Unary and binary; Lever rule; solid solutions; steel types; non-ferrous materials and alloys.

PART-III

Elastic and Plastic deformation; Effect of temperature, impurity and grain size on strength of materials; Ferroelectric, dielectric, piezoelectric and pyroelectric materials.

Recommended Books:

1. Materials Science and Engineering by WD Callister Jr. (John Wiley & Sons Inc., Eighth Edition)
2. Materials Science and Engineering: A First Course by V Raghvan (Prentice-Hall of India Pvt. Ltd.).

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CEL120: ENGINEERING MECHANICS

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PART – I

Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application
Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varignon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.

PART – II

Truss and Frames: Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.
Centroid , Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects, Problems.

Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, principle axis, problem based on composite figures and solid objects.
Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems.

PART – III

Particle Dynamics: Energy methods and momentum methods, Newton's laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem. Shear Force and Bending Moment Diagram for statically determinant beams
Classification of beams, types of loads, shear force and bending moment calculation and their graphical presentation, point of inflection, problem.

Books Recommended:

1. Engineering Mechanics – Irving H. Shames, PHI Publication
2. Engineering Mechanics – U.C.Jindal, Galgotia Publication

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MEP101: Workshop Practices

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1. Carpentry Shop:

- a) Study of tools & operations and carpentry joints.
- b) Simple exercise using jack plane.
- c) To prepare half-lap corner joint, mortise & tenon joints.
- d) Simple exercise on wood working lathe.

2. Fitting (Bench Working) Shop:

- a) Study of tools & operations
- b) Simple exercises involving fitting work.
- c) Make perfect male-female joint.
- d) Simple exercises involving drilling / tapping / dieing.

3. Black Smithy Shop:

- a) Study of tools & operations
- b) Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop:

- a) Study of tools & operations of Gas welding & Arc welding.
- b) Simple butt and Lap welded joints.
- c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

- a) Study of tools & operations.
- b) Making Funnel complete with soldering.
- c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

- a) Study of Single point cutting tool, machine tools and operations.
- b) Plane turning.
- c) Step turning.
- d) Taper turning.
- e) Threading.

7. Foundry Shop:

- a) Study of tools & operations
- b) Pattern making.
- c) Mould making with the use of a core.
- d) Casting

8. Electrical and Electronics Shop:

- a) Study of tools & operations

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Punjabi (Compulsory) PBL-131: ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ

PBL 131 ਪੰਜਾਬੀ – II (ਲਾਜ਼ਮੀ)
ਪੰਜਾਬੀ ਆਧੁਨਿਕ ਆਧੁਨਿਕ-
(kivq'-s'r, ivS'-vsqll k'iv-kl', kvl)

Credits: 2-0-0

- (I) 1. ਏਕਮ ਏਕਮ (ਸ਼ਬ. ਵਿਰਏਮ ਏਕ ਸ਼ਬੁਏਕਫ. ਸਿਹਫ਼ਰਬਲ ਏਕ, ਗਰੁਨੰਕ ਫ਼ਯ ਵਫ਼ਿਰਿਸਟਲ, ਏਕਮਕਸਰ) ਏਕਮ ਏਕਮ- ਏਕ ਕਯਕਵਲ :
- (a) ਏਕ ਵਲ ਏਕ
(E) ਪਲ ਪਲ ਏਕ
(e) ਪਲ ਮਨ ਏਕ
(kivq'-s'r, ivS'-vsqll k'iv-kl', kvl)
2. ਪੰਜਾਬੀ ਸ਼ਬ ਏਕਮ: ਏਕਮ, ਏਕਮ (ਏਕਮ, ਏਕਮ, ਏਕਮ ਏਕਮ-ਕਮ), ਸਮੰਸ |
- (II) 1. ਏਕਮ ਏਕਮ (ਸ਼ਬ. ਵਿਰਏਮ ਏਕ ਸ਼ਬੁਏਕਫ. ਸਿਹਫ਼ਰਬਲ ਏਕ, ਗਰੁਨੰਕ ਫ਼ਯ ਵਫ਼ਿਰਿਸਟਲ, ਏਕਮਕਸਰ) ਏਕਮ ਏਕਮ- ਏਕ ਕਯਕਵਲ :
- (a) ਏਕਮ ਪਲਕਮ
(E) ਫ. ਏਕਮ ਏਕ
(e) ਏਕਮ ਏਕਮ
(kivq'-s'r, ivS'-vsqll k'iv-kl', kvl)
2. ਪੰਜਾਬੀ : ਕਲੰਸ ਏਕ 10 ਏਕਮ- (ਏਕਮਕ, ਏਕਮ ਏਕਮ ਕਮ) ਏਕਮ ਏਕਮ ਏਕਮ ਏਕਮ ਏਕਮ ਕਮ
- (III) 1. ਏਕਮ ਏਕਮ (ਸ਼ਬ. ਵਿਰਏਮ ਏਕ ਸ਼ਬੁਏਕਫ. ਸਿਹਫ਼ਰਬਲ ਏਕ, ਗਰੁਨੰਕ ਫ਼ਯ ਵਫ਼ਿਰਿਸਟਲ, ਏਕਮਕਸਰ) ਏਕਮ ਏਕਮ- ਏਕ ਕਯਕਵਲ :
- (a) ਫ. ਏਕਮ ਏਕਮ
(E) ਫ. ਏਕਮ
(e) ਫ. ਏਕਮ ਕਮ
(s) ਪੰਸ
(kivq'-s'r, ivS'-vsqll k'iv-kl', kvl)
2. ਮਨੰਵਯਕਏਕਮ (ਏਕਮ ਕਮਮੰਵਰੰ ਕਮ ਏਕ) 200 ਮਨੰਵਯਕਏਕਮ- ਏਕਮ 100 ਏਕਮ- ਨਮੰਵਕ- ਏਕਮ ਵਕਮ ਏਕਮ ਏਕਮ (ਕਲੰਸ ਏਕ ਕਮਮੰਵਰੰ ਕਮ)

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(Under Credit Based Continuous Evaluation Grading System)*

Mudhli Punjabi
PBL-132: ਮੁੱਢਲੀ ਪੰਜਾਬੀ
(In lieu of Punjabi Compulsory)

2-0-0

ਪਾਠ-ਕ੍ਰਮ

1. ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ
ਸੰਯੁਕਤ ਅਤੇ ਮਿਸ਼ਰਤ ਸ਼ਬਦ
ਬਹੁ-ਉਚਾਰਖੰਡੀ ਸ਼ਬਦ
2. ਪੰਜਾਬੀ ਵਾਕ-ਬਣਤਰ
ਸਾਧਾਰਨ-ਵਾਕ : ਕਿਸਮਾਂ
ਸੰਯੁਕਤ-ਵਾਕ : ਕਿਸਮਾਂ
ਮਿਸ਼ਰਤ-ਵਾਕ : ਕਿਸਮਾਂ
3. ਪ੍ਰਕਾਰਜੀ ਪੰਜਾਬੀ
ਚਿੱਠੀ ਪੱਤਰ
ਪੈਰਾ ਰਚਨਾ
ਸੰਖੇਪ ਰਚਨਾ
ਅਖਾਣ ਅਤੇ ਮੁਹਾਵਰੇ

ਯੂਨਿਟ ਅਤੇ ਥੀਮ

1. ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ : ਸੰਯੁਕਤ ਸ਼ਬਦ; ਸਮਾਸੀ ਸ਼ਬਦ (ਜਿਵੇਂ ਲੋਕ ਸਭਾ); ਦੋਜਾਤੀ ਸ਼ਬਦ (ਜਿਵੇਂ ਕਾਲਾ ਸਿਆਹ); ਦੋਹਰੇ ਸ਼ਬਦ/ਦੁਹਰਰੁਕਤੀ (ਜਿਵੇਂ ਪੂੜ੍ਹ ਧਾੜ੍ਹ/ਭਰ ਭਰ), ਮਿਸ਼ਰਤ ਸ਼ਬਦਾਂ ਦੀ ਬਣਤਰ/ਸਿਰਜਨਾ; ਅਗੇਤਰਾਂ ਰਾਹੀਂ (ਜਿਵੇਂ ਉਪ ਭਾਸ਼ਾ), ਪਿਛੇਤਰਾਂ ਰਾਹੀਂ (ਜਿਵੇਂ ਰੰਗਲਾ), ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ-2: ਪੜਨਾਵੀ ਰੂਪ, ਕਿਰਿਆ/ਸਹਾਇਕ ਕਿਰਿਆ ਦੇ ਰੂਪ; ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ-2: ਮਾਰਕੀਟ/ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਧੰਦਿਆਂ ਨਾਲ ਸੰਬੰਧਿਤ।
2. ਪੰਜਾਬੀ ਵਾਕ-ਬਣਤਰ : ਕਰਤਾ ਕਰਮ ਕਿਰਿਆ; ਸਾਧਾਰਨ ਵਾਕ, ਬਿਆਨੀਆ, ਪ੍ਰਸ਼ਨਵਾਚਕ, ਆਗਿਆਵਾਚਕ, ਸੰਯੁਕਤ ਅਤੇ ਮਿਸ਼ਰਤ ਵਾਕਾਂ ਦੀਆਂ ਕਿਸਮਾਂ; ਸੁਤੰਤਰ ਅਤੇ ਅਧੀਨ ਉਪਵਾਕ; ਸਮਾਨ (ਤੇ/ਅਤੇ) ਅਤੇ ਅਧੀਨ (ਜੋ/ਕਿ) ਯੋਜਕਾਂ ਦੀ ਵਰਤੋਂ; ਪੰਜਾਬੀ ਵਾਕਾਂ ਦੀ ਵਰਤੋਂ : ਵਿਭਿੰਨ ਸਮਾਜਕ/ਸਭਿਆਚਾਰਕ ਪ੍ਰਸਥਿਤੀਆਂ ਦੇ ਅੰਤਰਗਤ; ਘਰ ਵਿਚ, ਬਾਜ਼ਾਰ ਵਿਚ, ਮੇਲੇ ਵਿਚ, ਸੋਪਿੰਗ ਮਾਲ/ਸਿਨੇਮੇ ਵਿਚ, ਵਿਆਹ ਵਿਚ, ਧਾਰਮਿਕ ਸਥਾਨਾਂ ਵਿਚ, ਦੋਸਤਾਂ ਨਾਲ ਆਦਿ।
3. ਇਸ ਯੂਨਿਟ ਵਿਚ ਚਿੱਠੀ ਪੱਤਰ (ਨਿੱਜੀ/ਦਫ਼ਤਰੀ/ਵਪਾਰਕ), ਪੈਰਾ ਰਚਨਾਂ, ਸੰਖੇਪ ਰਚਨਾ ਅਤੇ ਅਖਾਣ ਮੁਹਾਵਰਿਆਂ ਦੀ ਵਰਤੋਂ ਰਾਹੀਂ ਵਿਦਿਆਰਥੀ ਦੀ ਭਾਸ਼ਾਈ ਯੋਗਤਾ ਨੂੰ ਪਰਖਿਆ ਜਾਵੇਗਾ।

B.Tech. (Civil Engineering) 2nd Semester
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SOA 102: Drug Abuse: Problem, Management and Prevention
(Compulsory Paper)

DRUG ABUSE: MANAGEMENT AND PREVENTION

Time: 3 Hours

Credit 3-0-0

Consequences of Drug Abuse for:

- 1) Individual – Education, employment and income issues.
- 2) Family – Violence
- 3) Society – Crime.
- 4) Nation – Law and order problem.

2) Management of Drug abuse:

- 1) Medical Management: Medication for treatment and to reduce withdrawal effects, Drug De-addiction clinics, Relapse management.
- 2) Psycho-Social Management: Counselling, family and group therapy, behavioural and cognitive therapy, Environmental Intervention.

3) Prevention of Drug Abuse:

- 1) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
- 2) School
Counselling, Teacher as role-model. Parent-Teacher-Health Professional Coordination, Random testing on students.
- 3) Media:
Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
- 4) Legislaion: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

1. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
2. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
3. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
4. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
5. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
6. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
7. World Drug Report 2011, United Nations office of Drug and Crime.
8. World Drug Report 2010, United Nations office of Drug and Crime.

B.Tech. (Civil Engineering) 3rd Semester
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CEL215: CIVIL ENGINEERING MATERIALS

L T P
3 1 0

Unit-I

Building Stones Bricks: General, characteristics of a good building stone, deterioration preservation of stones, artificial stones, composition of good brick earth, qualities of good bricks, classification of bricks, tests on bricks, varieties of fire bricks.

Cement: Composition of cement, raw materials, manufacturing process, varieties of cement, hydration of cement, properties, testing of cement.

Concrete: Introduction, constituents of concrete, batching of materials, manufacturing process of cement concrete, workability factors affecting it, methods to determine workability, segregation bleeding of concrete, strength of concrete factors affecting it.

Timber: Structure of a tree, classification of trees, defects in timber, qualities of good a timber, seasoning of timber, decay of timber, preservation of timber.

Miscellaneous Materials: Paints, distempering, glass, plastics.

Unit-II

Foundation Walls: Definition, types of foundations, causes of failures of foundation remedial measures, types of walls thickness considerations.

Brick Stone Masonry: Terms used, types of bonds their merits demerits, rubble ashlar joints in stone masonry, cement concrete hollow blocks their advantages disadvantage.

Damp Proofing: Sources, causes bad effects of dampness, preventive measures for dampness in buildings.

Roofs: Terms used, classification of roofs roof trusses, different roof covering materials.

Plastering Pointing: Objects, methods of plastering, materials types, defects in plastering, special material for plastered surface, distempering white washing colour washing.

Floors: General, types of floors used in building their suitability, factors for selecting suitable floor for building.

Unit-III

Miscellaneous Topics: Building services – plumbing service, electrical services, air conditioning, accoustics sound insulation, fire protection measures, lift.

Recycling of Materials: Uses benefits of recycling of materials such as Fly ash, Lime stone powder, Metakaolin, Silica fume, Blast furnace slag etc. in concrete. Introduction to use of recycled aggregates in concrete.

Suggested

Books:

1. Rangwala, S. C., "Engineering Materials" Charotar Publishing House, (2000).
2. Ghose, D. N., "Materials of Construction" Tata McGraw Hill, New Delhi, (2003).
3. Varghese, "Building Materials" Prentice Hall of India, New Delhi, (2005).
4. Neville, A. M., "Properties of Concrete" Pearson Publishers, New Delhi, (2004).
5. Singh, S., "Engineering Materials", Konark Publishers Pvt. Ltd.
6. Arora, D.S., "Text Book of Engineering Materials", Kalyani Publishers.
7. Punmia, B.C., "Building Construction" Laxmi Publications Pvt. Ltd.
8. Kumar, S., "Building Construction", Standard Publishers, Delhi.

B.Tech. (Civil Engineering) 3rd Semester
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CEL 216: CONSTRUCTION PLANNING MANAGEMENT

L T P
3 1 0

Unit-I

Introduction: Need of project planning management, value engineering, time value of money, construction schedule activity event, bar chart, milestone chart, uses draw backs.

PERT: Construction of PERT network, time estimate network analysis, forward pass backward pass, event slack, critical path, data reduction.

CPM: Definitions, network construction, fundamental rules determination of project schedule, activity time estimates, float types, their significance in project control, critical path.

Unit-II

Three Phase Application of CPM: Planning scheduling controlling, updating an arrow diagram, time grid diagram, resource scheduling.

Cost Analysis Contract: Types of project cost, cost time relationships cost slopes, conducting a crash programme, determining the minimum total cost of a project.

Factor Affecting Selection of Equipment: Type of equipment, depreciation cost, operating cost, economic life of equipment, maintenance repair cost.

Unit-III

Earth Moving Machinery: Tractors related equipment, bulldozers, scrapers, power shovels, dragline, hoes etc.

Construction Equipment: Grading / proportioning, batching mixing, types of mixers, concrete pumps, placing compacting concrete.

Hoisting Transporting Equipment: Hoists, winches, cranes, belt conveyors, truck etc.

Suggested Books:

1. Srinath, L. R., "PERT CPM" Affiliated East-West press (P) Ltd., New Delhi, (1999).
2. Modi, P. N., "PERT CPM" Standard Book House Delhi, (1995).
3. Wiest, J. D., "A Management Guide to PERT CPM" Prentice Hall of India (P) Ltd, New Delhi, (1997).
4. Peurify, R. L., "Construction, Planning Equipment Management" McGraw Hill Book Company, New Delhi, (1996).
5. Sharma, S. C., "Construction Equipment its Management" Khanna Publishers, Delhi, (1990).

B.Tech. (Civil Engineering) 3rd Semester
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CEL213: SURVEYING

L T P
2 1 0

Unit - I

Introduction: Definition, classification of surveys, principle, distorted or shrunk scales, precision in surveying.

Chain Surveying: Instruments for measuring distances, chains, tapes, ranging – direct indirect, methods of chaining, folding opening of chain, chaining on sloping ground, errors in chaining, corrections for linear measurements, obstacle in chaining, reconnaissance, station selection, triangulation, base line measurement, limiting length of offsets, field notes.

Compass Surveying: Instruments used in traversing, bearings, meridians, declination, dip of magnetic needle, bearing of lines from included angles, local attraction, closing error its removal.

Unit-II

Plane Table Surveying: Introduction to plane table surveying, principle, instruments, working operations, setting up the plane table, centring, levelling, orientation, methods of plane table survey, two three point problems, Lehmann's Rules, errors.

Levelling: Definitions of terms used in levelling, different types of levels, parallax, adjustments, bench marks, classification of levelling, booking reducing the levels, rise fall method, line of collimation method, errors in levelling, permanent adjustments, corrections to curvature refraction, setting out grades, longitudinal levelling, profile levelling. Automatic levels.

Unit-III

Contouring: Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, interpolation of contours, uses of contour maps.

Theodolite: Types of theodolites, measurement of angles, temporary permanent adjustments, closed open traverse, consecutive independent co-ordinates, advantages disadvantages of traversing, latitudes departures, closing error, Bowditch transit rules, Gales traverse table, different cases of omitted measurements.

Suggested Books:

1. Punmia, B.C., "Surveying: Vol - I II".
2. Subramanian, R., "Surveying Leveling" (OXFORD).
3. Kanetkar, T.P. Kulkarni , "Surveying Leveling Vol. - I (Part I II)"
4. Duggal, S.K., "Surveying: Vol. - I II".
5. Ghosh, J.K., "Fundamental of Engineering Survey" Stadium Press, Roorkee.
6. Roy, S. K, " Fundamental of Surveying"
7. Saikia Das, " Surveying" PHI
8. Basak, N. N., "Surveying Levelling" Tata McGraw Hill, New Delhi, (2000).

B.Tech. (Civil Engineering) 3rd Semester
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CEP 213: SURVEYING LABORATORY

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0 0 2

List of Experiments

1. To range a line between two stations.
2. Plotting of details in chain survey.
3. Plotting of traverse with a compass.
4. To determine the reduced levels of stations by height of instrument rise fall method.
5. Plotting of details using plane table by method of intersection method of radiation.
6. Temporary permanent adjustments of a theodilite.
7. Measurement of horizontal angles using a theodilite by method of repetition method of reiteration.
8. Traverse adjustment using Gales' traverse table.

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CEL217: FLUID MECHANICS

L T P
2 1 0

Unit-I

Laminar Flow: Navier-Stokes equations in Cartesian coordinates (no derivation), meaning of terms, flow between parallel plates, stokes law, Flow through porous media, transition from laminar to turbulent flow.

Boundary Layer Analysis: Assumptions concept of boundary layer theory, boundary layer thickness, displacement momentum energy thickness, laminar turbulent boundary layers on a flat plate, laminar sub-layer, smooth rough boundaries, local average friction coefficients, separation control.

Turbulent Flow: Definition of turbulence, scale intensity, effects of turbulent flow in pipes, equation for velocity distribution in smooth rough pipes (no derivation), resistance diagram.

Unit-II

Flow Past Immersed Bodies: Drag lift, deformation drag pressure drag, Drag on a sphere, cylinder airfoil, lift-magnus effect circulation, lift on a circular cylinder.

Uniform Flow in Open Channels: Flow classifications, basic resistance, equation for open channel flow, Chezy, Manning, Bazin Kutter formulae, variation of roughness coefficient, conveyance normal depth, velocity distribution, most efficient flow sections- rectangular, trapezoidal circular.

Energy Momentum Principles Critical Flow: Energy specific energy in an open channel, critical depth for rectangular trapezoidal channels. Alternate depths, applications of specific Energy to transitions broad crested weirs. Momentum specific force in open channel flow.

Unit-III

Gradually Varied Flow: Differential equation of water surface profile; limitation, properties classification of water surface profiles with examples. Computation of water surface profile by graphical, numerical analytical approaches.

Hydraulic Jump Surges: Theory of jump, elements of jump in a rectangular channel, length height of jump, location of jump, energy dissipation other uses. Surge as a moving hydraulic jump. positive negative surges.

Suggested Books:

1. Massey, B. S., "Mechanics of Fluids" ELBS, Van Nostr Reinhold Co. Ltd., U. K., (1998).
2. Streeter, V. L., Wylie, E. B. Bedford, K. W., "Fluid Mechanics" McGraw Hill, New York, (2001).
3. Kumar, D. S., "Fluid Mechanics", S. K. Kataria and Sons Publishers, New Delhi, (1998).
4. Subramanya, K., "Theory Application of Fluid Mechanics" Tata McGraw Hill, New Delhi,(2001).
5. White, F. M., "Fluid Mechanics" McGraw Hill, New York, (1997).

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CEP217: FLUID MECHANICS LABORATORY

L T P
0 0 2

List of Experiments

1. To study the transition from laminar to turbulent flow in a pipe.
2. Verification of Stokes law
3. To draw flow net by electrical analogy method
4. Determination of elements of hydraulic jump.
5. Discharge flow profile of a broad crested weir.
6. To determine the viscosity of a given liquid by capillary-tube-viscometer.
7. To determine Manning's co-efficient of roughness for the bed of a given flume.
8. To measure the velocity distribution in a rectangular flume to determine the energy momentum correction factors.
9. To calibrate a current meter.
10. To study the flow over a hump placed in an open channel.
11. Demonstration of surges in an open channel.
12. Demonstration of forced vortex.

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ENL201: WRITTEN and ORAL TECHNICAL COMMUNICATION

L T P
2 1 0

Communication Skills for Scientists Engineers

Note taking from lectures reference material [10%]

Essay precis writing [30%]

Slide preparation oral presentation principles [10%]

Written presentation of technical material [20%]

Preparation of bibliography [10%]

Basics of official correspondence [15%]

Preparation of bio-data [5%]

Students should be asked to prepare present Seminars during the practice session

Suggested Books:

1. The Chicago Manual of Style, 13th Edition, Prentice Hall of India (1989).
2. Gowers Ernest, "The Complete Plan in Words" Penguin, (1973).
3. Menzel, D.H., Jones H.M. Boyd, L.G., "Writing a Technical Paper", McGraw Hill, (1961).
4. Strunk, W., and White E.B., "The Elements of Style: 3rd Edition, McMillan, (1979).
5. Turbian, K.L., "A Manual for Writers of Term Papers, Thesis Dissertations" Univ. of Chicago Press, (1973).
6. IEEE Transactions on "Written Oral Communication" has many papers.

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ENP201: WRITTEN and ORAL TECHNICAL COMMUNICATION

L T P
0 0 2

Practical:

Students should be asked to prepare technical presentation on the emerging areas of information technology present the same to the group of students.

Suggested Books:

1. The Chicago Manual of Style, 13th Edition, Prentice Hall of India, (1989).
2. Gowers Ernest, "The Complete Plain in Words" Penguin, (1973).
3. Menzel, D.H., Jones H.M. Boyd, LG., "Writing a Technical Paper", McGraw Hill, (1961).
4. Strunk, W. White E.B., "The Elements of Style" 3rd Edition, McMillan, (1979).
5. Turbrian, K.L., "A Manual for Writers of Term Papers, Thesis Dissertations" Univ. of Chicago Press, (1973).
6. IEEE Transactions on "Written Oral Communication" has many papers.

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MTL201: MATHEMATICS–III

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Unit–I

Probability: Classical axiomatic approach to the theory of probability, additive multiplicative law of probability, conditional probability Bayes theorem. Rom Variables: Rom variable, probability mass function, probability density function, cumulative distribution function, function of rom variable. Two higher dimensional rom variables, joint distribution, marginal conditional distributions, Stochastic independence.

Unit–II

Expectation: Mathematical expectations moments, moment generating function its properties. Probability Distributions: Binomial, Poisson, Uniform, Exponential, Gamma, Normal distribution, t–distribution, Chi– square distribution, F–distribution.

Unit–III

Uniform Pseudo rom number generation rom variable generation, Generating rom variate from stard statistical distribution (discrete continuous distribution), Monte – Carlointegration

Suggested Books:

1. Hogg, R.V., Mckean, J.W. Craig, A.T., “Introduction to Mathematical Statistics”.
2. Gupta, S. C. Kapoor, K., “Fundamentals of Mathematical Statistics”, Sultan Ch and Co.3.
3. Rubinotein, R.Y., “Simulation The Monte Carlo Method” John Viley.
4. Trivedi, K.S., “Probability Statistics with Reliability” Prentice Hall.

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ESL 220: ENVIRONMENTAL STUDIES

Credit 3-0-0

1. **The Multidisciplinary Nature of Environmental Studies:** Definition, scope & its importance, Need for public awareness.
2. **Natural Resources:** Natural resources and associated problems.
 - a) **Forest Resources:** Use of over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
 - b) **Water Resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
 - c) **Mineral Resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
 - d) **Food Resources:** World food problems, change caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problem, salinity, case studies.
 - e) **Energy Resources:** Growing of energy needs, renewable and non-renewable energy resources, use of alternate energy sources, case studies.
 - f) **Land Resources:** Land as a resource, land degradation, soil erosion and desertification.
 - g) Role of an individual in conservation of natural resources, Equitable use of resources for sustainable lifestyles.
3. **Ecosystem:**
 Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.
 Introduction, types, characteristic features, structure and function of the following ecosystems:
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).
4. **Biodiversity and its Conservation:**
Definition: Genetic, species and ecosystem diversity, Biogeographical classification of India.
Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and option values.
 Biodiversity of global, National and local levels, India as mega-diversity nation "Hot-spots of biodiversity."
Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts
 Endangered and endemic species of India.
Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity.
5. **Environmental Pollution:**
 Definition, Causes, effects and control measures of:
 - a) Air Pollution
 - b) Water Pollution
 - c) Soil Pollution

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- d) Marine Pollution
- e) Noise Pollution
- f) Thermal Pollution
- g) Nuclear Hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Pollution case studies Disaster Management: Floods, Earthquake, Cyclone and Landslides

6. Social Issues and Environment:

- * 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
- * Environmental Protection Act
- * Air (prevention and Control of Pollution) Act
- * Water (prevention and Control of Pollution) Act
- * Wildlife Protection Act
- * Forest Conservation Act
- * Issues involved in enforcement of environmental legislation
- * Public awareness

7. Human Population and the Environment

- * Population growth, variation among nations
- * Population explosion-Family welfare programme
- * Environment and human health
- * Human rights
- * Value education
- * HIV / AIDS
- * Women and child welfare
- * Role of information technology in environment: and human health
- * Case studies
- * **Road Safety Rules & Regulations:** Use of Safety Devices while Driving, Do's and Don'ts while Driving, Role of Citizens or Public Participation, Responsibilities of Public under Motor Vehicle Act, 1988, General Traffic Signs
- * **Accident & First Aid:** First Aid to Road Accident Victims, Calling Patrolling Police & Ambulance

8. National Service Scheme

- **Introduction and Basic Concepts of NSS:** History, philosophy, aims & objectives of NSS: Emblem, flag, motto, song, badge etc.; Organization structure, roles and responsibilities of various NSS functionaries.

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- **Health, Hygiene & Sanitation:** Definition, needs and scope of health education; Food and Nutrition; Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan); National Health Programme; Reproductive health.
- **Civil/Self Defense:** Civil defense services, aims and objectives of civil defense; Needs for self defense training.

9. Field Work: Visit to a local area to document environmental assets—river / forest / grassland / hill / mountain. Visit to a local polluted site—Urban / Rural / Industrial / Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc. (Field work equal to 5 lecture hours)

References:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.
2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
3. Bharucha, E. 2004. The Biodiversity of India, Mapin Publishing Pvt. Ltd. Ahmedabad.
4. Brunner, R. C. 1989. Hazardous Waste Incineration, McGraw Hill Inc. New York.
5. Clark, R. S. 2000. Marine Pollution, Clarendon Press Oxford.
6. Cunningham, W. P., Cooper, T. H., Gorhani, E. & Hepworth, M. T. 2001. Environmental Encyclopedia, Jaico Publications House, Mumbai.
7. De, A. K. 1989. Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment, New Delhi.
9. Hawkins, R. E. 2000. Encyclopedia of Indian Natural History, Bombay Natural History Society.
10. Heywood, V. H & Waston, R. T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
11. Jadhav, H. & Bhosale, V. M. 1995. Environmental Protection and Laws. Himalaya Pub.
12. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
13. Kaushik, A. & Kaushik, C. P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
14. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.

B.Tech. (Civil Engineering) 3rd Semester
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15. Odum, E. P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA.
16. Rajagopalan, R. 2005. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
17. Sharma, B. K. 2001. Environmental Chemistry. Geol Publishing House, Meerut.
18. Sharma, J. P. 2004. Comprehensive Environmental Studies, Laxmi Publications (P) Ltd, New Delhi.
19. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.
20. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi.
21. Survey of the Environment. 2005. The Hindu.
22. Tiwari, S. C. 2003. Concepts of Modern Ecology, Bishen Singh Mahendra Pal Singh, Dehra Dun.
23. Townsend, C., Harper, J. and Michael, B. 2001. Essentials of Ecology, Blackwell Science.
24. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex, Amritsar

B.Tech. (Civil Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL221: STRENGTH OF MATERIALS

L T P
2 1 0

Unit-I

Concept of Equilibrium: Load, reaction; general equilibrium equations; equilibrium of a point in space; equilibrium of a member; concept of free body diagrams; displacements; concept of displacement-constraints/ supports; statical-determinacy of a problem.

Simple Stress Strains: Introduction; concept of stress strain; stress-strain curves for ductile, brittle materials; generalized Hooke's law, stress-strain diagram of ductile brittle material, statically determinate indeterminate problems, compound composite bars, thermal stresses. Elastic constants, relations between various elastic constants its use; lateral strain, volumetric strain, Poisson's ratio; stress strains in thin cylinders, spherical shells; thin vessels subjected to internal pressures.

Unit-II

Complex Stress Strains: Introduction; normal stress, tangential stress; rectangular block subjected to normal stress along across two planes, combination of normal tangential stress; concept of principal stress its computation; Mohr circle; principal strains, computation of principal stresses from the principal strains.

Shear Force Bending Moment Diagrams: Introduction to the concept of reaction diagrams—shear force bending moment; role of sign conventions; types of load, beams, supports; shear force bending moment diagrams: simply supported, overhang cantilever beams subjected to any combination of point loads, uniformly distributed varying load, moment; relationship between load, shear force bending moment; different methods for plotting a bending moment shear force diagrams.

Unit-III

Bending Shear Stresses: Introduction; assumptions derivation of flexural formula for straight beams; centroid of simple built up section, second moment of area; bending stress calculation for beams of simple built up section, composite sections (flitched sections); shear stress; variation of bending shear stress along the depth of section.

Columns Struts: Stability of columns; buckling load of an axially loaded columns with various end conditions; Euler's Rankine's formula; columns under eccentric load, lateral load.

Torsion of Circular Shafts: Torsion, basic assumptions, derivation of torsion equation; power transmitted by shafts; analysis design of solid hollow shafts based on strength stiffness; sections under combined bending torsion, equivalent bending torsion.

Failure Theories: Maximum principal stress theory, maximum shear stress theory, distortion energy theory, strain energy theory, constant analysis of thin cylinder

Suggested Books:

1. Ramamrutham, S., "Strength of Material"
2. Popov, E., "Mechanics of Material"
3. Rajput, "Strength of Material"
4. Singh, S., "Strength of Materials"

B.Tech. (Civil Engineering) 4th Semester
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CEP 221: STRENGTH OF MATERIALS LABORATORY

L T P
0 0 2

List of Experiments

1. Draw stress strain curve for ductile brittle material in tension.
2. Draw stress strain curve for ductile brittle material in compression.
3. Draw shear stress, shear strain curve for ductile brittle material in torsion strength testing
4. Draw load deflection curve for spring in loading unloading conditions.
5. To determine the hardness of the given material by Rockwell Brinell hardness testing machine.
6. To determine the fatigue strength of the material.
7. To determine the impact strength by Izod Charpy test.
8. To determine the load carrying capacity of the leaf spring.
9. To test a mild steel cast iron specimen in double shear.

B.Tech. (Civil Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 222: WATER SUPPLY ENGINEERING

L T P
3 1 0

Unit-I

Public Water Supply: Beneficial uses of water, water demand, per capita demand, variation in demand, causes detection prevention of wastage of water, population forecasting.

Sources of Water Supply: Surface underground sources, relation development of source in r/o quality quantity of water, development of wells. Storage reservoir balancing service storage, capacity determination by mass curves method. Intake transmission system: distribution systems: network design. Hydrology principles, zones of under-ground water.

Unit-II

Quality Examination of Water: Necessity for examination of water impurities in water. Sampling of water, physical, chemical and bacteriological quality for domestic water supply. Drinking water quality standards criteria.

Water Supply Drainage of Buildings: System of water supply house connections, metering, internal distribution, sanitary fittings, pipe joints, different types of pipes pipes materials.

Unit-III

Water Treatment: Unit operations in water treatment, screening, plain sedimentation tank its theory, sedimentation, aided with coagulation, design of sedimentation tank, flocculation s filtration, rapid gravity filter, pressure filters, disinfections; necessary; requirements of a disinfectant, methods, of disinfecting, different practices of chlorination.

Miscellaneous Methods of Water Treatment: Aerial colour, odours taster from water, control, removal of iron manganese from water softening processes, baseexchange process, swimming pool water treatment.

Suggested Books:

1. Garg, S. K., "Water Supply Engineering" Vol. I, Khanna Publishers, New Delhi, (2003).
2. Raju, B. S. N., "Waste Wastewater" Tata McGraw Hill, New Delhi, (1997).
3. Peavy, H. S. Rove D R, "Environmental Engineering" McGraw Hill, New Delhi, (2003).
4. Punmia, B. C., "Water Supply Engineering" Laxmi Publication, New Delhi, (2002).
5. Birdie, G. S., "Water Supply and Sanitary Engineering" Dhanpat Rai Publications, New Delhi, (2003).

B.Tech. (Civil Engineering) 4th Semester
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CEL 223: CONCRETE TECHNOLOGY

L T P
2 1 0

Unit-I

Introduction: Concrete as a structural material, constituent materials of concrete.

Cement: Types of cements, basic chemistry, heat of hydration, testing of cement: fineness, consistency, setting times, strength, types of Portland cements, expansive cements, pozzolanas.

Aggregates: Classification of aggregates, mechanical properties: bond, strength, toughness, hardness, physical properties, specific gravity, bulk density, porosity absorption, moisture content, bulking of s, sieve analysis, fineness modulus, grading of aggregate, maximum aggregate size.

Unit-II

Mix Design: Factors to be considered: water/cement ratio, durability, workability, cement aggregate content, design of mix by IS Code method.

Physical Properties of Fresh Concrete: Workability: factors affecting, methods of determination of workability, density of fresh concrete.

Unit-III

Mixing, Hling, Placing Compaction of Concrete: Mixers, mixing time, ready mixed concrete, pumped concrete, vibration of concrete, internal external vibrators, revibration, shotcrete.

Strength of Concrete: Porosity, gel/space ratio, total voids in concrete, factors affecting strength: water/cement ratio, relation between tensile compressive strengths; bond to reinforcement.

Permeability Durability: Permeability, sulphate attack, action of frost, frost resistance concrete.

Suggested Books:

1. Neville, A. M. Brookes, J. J., "Concrete Technology" Pearson Publishers, New Delhi, (1994).
2. Neville, A. M., "Properties of Concrete" Pearson Publishers, New Delhi, (2004).
3. Gambhir, M. L., "Concrete Technology" Tata McGraw Hill, New Delhi, (1995).
4. Shetty, M. S., "Concrete Technology" S. Ch and Company, New Delhi, (2002).
5. Mehta, P. K., "Microstructure of Concrete" Indian Concrete Institute ACC, Bombay, (1997).

B.Tech. (Civil Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEP 223: CONCRETE TECHNOLOGY LABORATORY

L T P
0 0 2

List of Experiments

1. Standard consistency of cement.
2. Initial and final setting time of cement.
3. Soundness of cement.
4. Specific gravity of cement.
5. Compressive strength of cement.
6. Water absorption, specific gravity of fine aggregates.
7. Water absorption, specific gravity of coarse aggregates.
8. Workability of concrete by slump cone method.
9. Workability of concrete by compaction factor method.
10. Workability of concrete by Vee-Bee consistometer
11. Compressive, flexural strength of concrete.

B.Tech. (Civil Engineering) 4th Semester
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CEL 224: SOIL MECHANICS

L T P
3 1 0

Unit-I

Basic Concepts: Definition of soil, soil mechanics common soil problem in civil engineering field. Principal types of soils. Important properties of very fine soil i. e. adsorbed water, base exchange soil structure. Characteristics of main clay mineral groups. Basic definitions in soil mechanics. Weight volume relationship physical properties of soils.

Index Properties: Determination of index properties, classification of coarse grained soils fine grained soils.

Unit-II

Permeability Seepage: Concept of effective stress principle. Seepage pressure, critical hydraulic gradient quick s condition, phreatic line. Capillary phenomenon in soil. Darcy's law its validity seepage velocity. Co-efficient of permeability its determination average permeability of striated soil mass Factors affecting 'K' brief discussion.

Compaction: Definition object of compaction concept of O.M.C. zero air void line. Modified proctor test. Factors affecting compaction. Effect of compaction on soil properties their discussion. Field compaction methods their comparison of performance relative suitability. Field compactive effort. Field control of compaction by proctor needle.

Unit-III

Consolidation: Definition object of consolidation difference between compaction consolidation. Concept of various consolidation characteristics i.e. a_v , m_v C_v primary secondary consolidation. Terzaghi's method for one-dimensional consolidation. Consolidation test. Determination of C_v from curve fitting methods. Normally consolidated over consolidated clays importance of consolidation settlement in the design of structures.

Shear Strength: Stress analysis of a two - dimensional stress system by Mohr circle. Concept of pole. Coulomb's law of shear strength Coulomb - Mohr strength theory. Relations between principle stresses at failure Shear strength tests. Derivation of Skempton's pore pressure parameters. Stress strain volume change characteristics of ss.

Suggested Books:

1. Terzaghi, K. Peck, R. B., "Soil Mechanics in Engineering Practice" John Wiley Sons, New York, (1995).
2. Terzaghi, K., "Theoretical Soil Mechanics", John Wiley Sons, New York, (1943).
3. Ranjan, G. Rao, A.S.R., "Basic Applied Soil Mechanics" New Age International Pvt. Ltd., Publishers, New Delhi, (2000).
4. Murthy, V. N. S., Principles of Soil Mechanics Foundation Engineering ", UBSPD, (2001).
5. Donald, P., Coduto, "Geotechnical Engineering: Principles Practices", Pearson Education, Eastern Economy Edition, (2000).

B.Tech. (Civil Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEP 224: SOIL MECHANICS LABORATORY

L T P
0 0 2

List of Experiments

1. Visual examination of soil samples. Field identification tests. Classification as per IS Code.
2. Determination of water content of soil:
 - a) By oven drying method
 - b) Pycnometer method
 - c) Calcium carbide method
3. Determination of in- situ density by core cutter method s replacement method.
4. Determination of liquid limit plastic Limit by Casagrade apparatus pycnometer method.
5. Determination of specific gravity of soil solids by pycnometer method.
6. Hydrometer analysis.
7. Direct shear test on a given soil sample.
8. Unconfined compression test for fine-grained soil.
9. Triaxial shear test.
10. Lab vane shear test
11. Determination of permeability by constant head methods variable head method.
12. Compaction test (Proctor) Modified proctor test. Plot of zero air voids line.
13. Consolidation test

B.Tech. (Civil Engineering) 4th Semester
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CEL225: NUMERICAL METHODS FOR CIVIL ENGINEERING

L T P
2 1 0

Unit-I

Approximation in Numerical Computation: Truncation rounding errors, fixed floating-point arithmetic, Propagation of errors.

Interpolation: Newton forward/backward interpolation, Lagrange's Newton's divided difference Interpolation.

Unit-II

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.

Numerical Solution of a System of Linear Equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.

Unit-III

Numerical Solution of Algebraic Equation: Bisection method, Regula-Falsimethod, Newton-Raphson method.

Numerical Solution of Ordinary Differential Equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods Finite Difference method.

Text Books:

1. C.Xavier, "C Language Numerical Methods".
2. Dutta Jana, "Introductory Numerical Analysis".
3. Scarborough, J.B., "Numerical Mathematical Analysis".
4. Iyengar, J., Jain "Numerical Methods (Problems Solution)".

Suggested Books:

1. Balagurusamy, "Numerical Methods", Scitech.
2. Baburam, "Numerical Methods", Pearson Education.
3. Dutta, N., "Computer Programming Numerical Analysis", Universities Press.
4. Guha, Soumen Srivastava, Rajesh, "Numerical Methods", OUP.
5. Pal, Srimanta, "Numerical Methods", OUP.

B.Tech. (Civil Engineering) 4th Semester
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 (Department Elective–I)

CEL 226: ELEMENTS OF REMOTE SENSING GIS

L T P
3 0 0

Unit-I

Introduction to Geographic Information System: Definitions related terminology, evolution of GIS, components of GIS, approaches to the study of GIS.

Maps GIS: Introduction, map scale classes of maps, the mapping process, plane coordinate systems transformations, geographic coordinate system of earth, map projection, geo referencing topographic mapping.

Unit-II

Digital Representation of Geographic Data: Introduction, database management systems, raster geographic data representation, vector data representation, data representation data analysis in GIS.

Raster Basic GIS Data Processing: Introduction, acquiring hling raster geographic data, raster based GIS data analysis, cartographic modelling.

Unit-III

Vector Based GIS Data Processing: Introduction, Characteristics of vector based GIS data processing, topological non-topological functions.

Remote Sensing GIS: Introduction, Principles of electromagnetic remote sensing, remote sensing system classifications, imaging characteristics, extraction of metric information from remotely sensed images, integration of remote sensing GIS.

Suggested Books:

1. Lo, C. P. Young, K. W., “Concepts Techniques of Geographic Information Systems” PHI Pvt. Ltd, New Delhi, (2002).
2. Campbell, J. B., “Introduction to Remote Sensing” CBS Publishers and Distributors, New Delhi, (2003).
3. Burrough, P. A., “Principles of Geographic Information Systems for L Resources Assessment” Oxford University Press, (2003).
4. Duggal, S. K., “Surveying Volume 2” Tata McGraw Hill, New Delhi, (2004).
5. Donnay, J. P., “Remote Sensing Urban Analysis” CBS Publishers and Distributors, New Delhi, (2003).

B.Tech. (Civil Engineering) 4th Semester
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 (Department Elective–I)

CEL 227: ENGINEERING GEOLOGY ROCK MECHANICS

L T P
3 0 0

Unit-I

General Geology: Importance of engineering Geology applied to Civil Engineering practices. Weathering, definition, types effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation deposition.

Rocks Minerals: Minerals, their identification, igneous, sedimentary and metamorphic rocks. Classification of rocks for engineering purposes. Rock quality designation (RQD).

Structural Geology: Brief idea about stratification, apparent dip, true dip, strike in conformities. Folds, faults joints: definition, classification relation to engineering operations.

Unit-II

Engineering Geology: Geological considerations in the engineering. Projects like tunnels, highways, foundation, dams, reservoirs. Earthquake: Definition, terminology, earthquake waves, intensity, recording of earthquake.

Engineering Properties of Rocks Laboratory Measurement: Uniaxial compression test, tensile tests, permeability test, shear tests, size shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact fissured rocks, effect of anisotropy, effect of saturation temperature

Unit-III

In-situ Determination of Engineering Properties of Rock Masses: Necessity of in-situ tests, uniaxial load tests in tunnels open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses, bore hole test.

Improvement in Properties of Rock Masses: Pressure grouting for dams tunnels, rock reinforcement rock bolting.

Suggested Books:

1. Goodman, R.E., "Introduction to Rock Mechanics".
2. Farmar, I.W., "Engineering Behaviour of Rocks".
3. Jaeger Cook, "Fundamentals of Rock Mechanics".
4. Arora, D.S., "Engineering Geology".
5. Singh, P., "Engineering Geology".
6. Verma, B.P. "Rock Mechanics for Engineering".
7. C, Jaager, "Rock Mechanics Engg".

B.Tech. (Civil Engineering) 4th Semester
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(Department Elective–I)

CEL 228: TOWN PLANNING

L T P
3 0 0

Unit-I

Town Planning: Definition meaning, age of planning, scope motives of planning, brief history of town planning – its origin growth, historically development of town planning in ancient valley civilizations. Indus Nile Tigris Euphrates, Greek Roman, Medieval Renaissance town planning

Unit-II

New Concepts: Garden city movement, Linear city concentric city concepts, Neighbourhood Radburn, La-cite industrial, Radiant city to present day planning.

Planning Principles: Types of town their functions, types of town planning – Grid Iron, Radial, Spider webs, Irregular mixed, their advantages disadvantages.

Unit-III

Planning Practice Techniques: Zoning – its definition, procedure districts, height bulk zoning, F. A. R., Master Plan – Meaning, preparation realization, the scope of city planning – city rehabilitation slum clearance.

Suggested Books:

1. Cherry Gordon, “Urban Planning Problems” Board Hill, London, (1974).
2. Sundaram, K.V., “Urban Regional Planning in India” Vikas Publishing House (P) Ltd., New Delhi, (2000).
3. Gallion, A. B, Eisner S, “The Urban Pattern” Van Nostr Reinhold, New York, (1993).
4. Jon, Lang, “A Concise History of Modern Architecture in India” Permanent Black Publishers, New York, (1998).
5. Taurus, Parke, “A City with Views Florence” I.B. Taurus Publishers, New York, (1994).

B.Tech. (Civil Engineering) 4th Semester
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(Department Elective-II)

CEL 229: BUILDING CONSTRUCTION

L T P
3 0 0

Unit-I

Brick Masonry: Definitions of various terms used, bond – definition, need scope, type of bonds – stretcher bond, header bond, English bond Flemish bonds, their merits demerits.

Stone Masonry: Rubble ashlar work.

Hollow Block Masonry: Hollow cement concrete block masonry hollow clay block masonry.

Walls: Types

- (i) Load bearing
- (ii) Non-load bearing walls, Thickness considerations.

Damp Proofing: Causes ill – effects, preventive measures

Unit-II

Arches Lintels: Definitions of various terms used in arches, types – flat, segmental, semi – circular horse – shoe, brick stone arches, types of lintels, their merits demerits.

Floors: Constituents, various types of floors commonly used their suitability for different buildings, constructional details of concrete terrazzo floors.

Doors Windows: Location sizes, types of doors windows, method of fixing door window frame in walls, ventilators.

Unit-III

Sloping roofs: Definitions of terms used, wooden trusses – king post queen post truss, steel trusses – fink, fan north light truss roofs, Jack arch roofs.

Stairs Staircases: Definition of terms used, essential requirements, proportioning of steps, types – straight flight, quarter turn, half turn spiral staircases, ramps, escalators lifts.

Footings: Types details

Miscellaneous Topics (to be covered briefly): Plastering pointing. White washing, colour washing, distempering painting, Scaffolding, underpinning shoring, building bye-laws.

Suggested Books:

1. Rangwala, S. C., “Engineering materials” Charotar Publishing House, An,(2000).
2. Bindra Arora, “Building Construction” Dhanpat Rai Publications (P) Ltd, New Delhi, (2003).
3. Sinha, S. K. Jha, J., “Building Construction” Khanna Publishers, New Delhi, (2001).
4. Rangawala, S C, “Building Construction” Charotar Publishing House, An, (1993).
5. Ghose, D. N., “Materials of Construction” Tata McGraw Hill, New Delhi, (2003).

B.Tech. (Civil Engineering) 4th Semester
(Under Credit Based Continuous Evaluation Grading System)
(Department Elective–II)

CEL 230: DISASTER MANAGEMENT

L T P
3 0 0

Unit-I

Introduction to Disaster Management: Define describe disaster, hazard, emergency, vulnerability, risk disaster management; Identify describe the types of natural non-natural disasters. Important phases of Disaster Management Cycle.

Disaster Mitigation Preparedness: Natural hazards: causes, distribution pattern, consequences mitigation measures for earth quake, tsunami, cyclone, flood, slide drought etc. Man-made hazards: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas.

Hazard Risk Assessment: Assessment of capacity, vulnerability risk, vulnerability risk mapping, stages in disaster recovery associated problems.

Unit-II

Emergency Management Systems (EMS): Emergency medical essential public health services, response recovery operations, reconstruction rehabilitation.

Capacity Building: Gender sensitive disaster management approach inculcate new skills sharpen existing skills of government officials, voluntary activists, development of professional elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA other International agencies, organizational structure, role of insurance sector, DM act NDMA guidelines..

Unit-III

Application of Geoinformatics Advanced Techniques: Use of Remote Sensing Systems (RSS) GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems.

Integration of public policy: Planning design of infrastructure for disaster management, community based approach in disaster management, methods for effective dissemination of information, ecological sustainable development models for disaster management.

Case Studies: Lessons experiences from various important disasters with specific reference to civil engineering.

Suggested Books:

1. Iyengar, C.B.R.I “Natural Hazards in The Urban Habitat” Tata McGraw Hill.Pub.
2. Leicester, T. R., “Natural Disaster Management” Jon Ingleton (Ed), Published.
3. Singh, R.B., “Disaster Management”, Rawat Publications.
4. ESCAP: Asian The Pacific Report on Natural Hazards Natural Disaster Reduction.
5. [www.http//ndma.gov,in](http://ndma.gov.in)
6. Singh, J. “Disaster Management–Future Challenges Opportunities” I.K. International Publishing House.

B.Tech. (Civil Engineering) 4th Semester
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(Department Elective-II)

CEL 231: MASS TRANSPORTATION SYSTEM

L T P
3 0 0

Unit-I

History role of transit, recent trends in transit. Mass transportation characteristics. Urban mass transportation planning, dem projection, mass transportation system performance.

Unit-II

Economic evaluation methods, terminals their functions, design, typical requirement, scheduling vehicle dispatch policy, spacing of bus stops, route spacing performance, reserved bus lanes,

Unit-III

Operational management issues in transit planning, rail transit systems, underground transportation

Suggested Books:

1. Hutchinson, B.G., "Introduction to Urban Transportation Systems Planning", McGraw Hill. New York, (1974).
2. Kadiyali, L.R., "Traffic Engineering Transport Planning," Khanna Publishers, (1997).
3. Vukan R. Vuchic, "Urban Public Transportation Systems Technology" Prentice Hall Inc., N.J., (1981).

B.Tech. (Civil Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 311: THEORY OF STRUCTURE-I

L T P
3 1 0

Unit-I

Introduction: Need of analysis, techniques of structural idealization, basic tools of analysis, reactions in structure, notations sign conventions, free – body diagrams, static determinacy, stability of structures, principle of superposition, loads on structures.

Plane Trusses: Introduction, member arrangement in a truss, stability determinacy, roof bridge trusses, analysis of trusses, notations sign conventions, equations of condition, zero load test, classification of trusses.

Deflection of Beams: Introduction, direct integration method, moment – area method, conjugate beam method, Principle of virtual work, unit load method, Betti’s law, Maxwell’s law, Castigliano’s theorem.

Unit-II

Combined Bending Axial Loads: Introduction, limit of eccentricity for no tension in the section, core of the section, middle third rule, wind pressure on chimneys, forces on dams.

Rolling Loads Introduction to rolling loads influence lines, determination of shear force, bending moment at a section absolute shear force bending moment due to single point load, uniformly distributed load, several point loads etc.

Influence Lines: Introduction, moving loads, influence lines, influence lines for reactions, shear force bending moment, influence lines for beams, girders with floor beams, trusses arches, absolute maximum B. M. and S. F, Muller Breslau Principle.

Unit-III

Arches: Introduction, curved beams, arch versus a beam, three hinged arch, moment, shears normal thrust in three hinged arches

Cables Suspension Bridges: Introduction, shape of a loaded cable, cable carrying point loads UDL, cables with ends at different level, cable subjected to temperature stresses, suspension bridge with two hinged three hinged stiffening girders, influence lines.

Statically Determinate Space Trusses: Concurrent forces in space, moment of force, constraint of point in space, tension coefficient method, simple space trusses, method of sections.

Suggested Books:

1. Utku, S., Norris, C. H. Wilbur, J. B., “Elementary Structural Analysis, McGraw Hill, New York, (1990).
2. Jain, A. K., “Elementary Structural Analysis” Nem Chand Brothers, Roorkee, (1990).
3. Reddy, C. S., “Basic Structural Analysis” Tata McGraw Hill, New Delhi, (2003).
4. Hibbeler, C., “Structural Analysis” Pearson Publishers, New Delhi, (2002).
5. Punmia, B. C., Jain, A. K. Jain, A. K. “Theory of Structures” Luxmi Publications, (2000).
6. Ramamrutham, S. Narayan, R., “Theory of Structures:” Dhanpat Rai Sons, New Delhi, (1996).

B.Tech. (Civil Engineering) 5th Semester
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CEP 311: THEORY OF STRUCTURE-I LABORATORY

L T P
0 0 2

List of Experiments

1. Deflection of a simply supported beam verification of Clark-Maxwell's theorem.
2. To determine the flexural rigidity of a given beam.
3. To verify the moment- area theorem for slope deflection of a given beam.
4. Deflection of a fixed beam influence line for reactions.
5. Deflection studies for a continuous beam influence line for reactions.
6. Study of behaviour of columns struts with different end conditions.
7. Experiment on three-hinged arch.
8. Experiment on two-hinged arch.
9. Deflection of a statically determinate pin jointed truss.
10. Forces in members of redundant frames.
11. Experiment on curved beams.
12. Unsymmetrical bending of a cantilever beam.

B.Tech. (Civil Engineering) 5th Semester
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CEL 312: DESIGN OF STEEL STRUCTURES-I

L T P
3 1 0

Unit-I

Riveted Welded Joints: Rivets riveting, stresses in rivets, strength failure of riveted joints, riveted joints in framed structures, types of welds welded joints, stresses in welds, design of welds, eccentrically loaded welded joints

Tension Members: Types of tension members, net gross areas, permissible stresses. Design of members subjected to axial loads, combined bending moments axial loads, lug angles. Tension splice.

Unit-II

Compression Members: Failure modes of columns, end conditions effective length of columns, various empirical formulae. IS code formula, General codal provisions for design of compression members, built up compression members, lacing battening of compression members, splicing of compression members.

Column Bases Foundations: Types of column bases, design of slab base, Gusseted base grillage foundations.

Unit-III

Design of Flexural Members: Failure modes permissible stresses, design of laterally supported unsupported beams, web crippling, web buckling, compound beams.

Design of Plate Girders: Components of a plate girder, basic design assumptions, stiffeners in plate girders, design of various components of a welded riveted plate girder.

Roof Trusses: Types of roof trusses loads on roof trusses, calculation of forces due to combination of different loads, Design of members joints.

Suggested Books:

1. Chra, R., "Design of Steel Structures" Standard Publishing House, (1999).
2. Raghupathi, M., "Design of Steel Structures" Tata McGraw-Hill, New Delhi, (1998).
3. Arya, A. S. Ajmani J L, "Design of Steel Structures" Nem Ch Bros. Roorkee, (2000).
4. Kazimi, S. M. A. Jindal, R. S., "Design of Steel Structures" Prentice Hall of India, New Delhi, (1999).
5. Dayaratnam, P., "Design of Steel Structures" Wheeler Publishers, New Delhi, (1999).

B.Tech. (Civil Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEP 312: DEPARTMENTAL CAD LABORATORY-I (STEEL –I)

L T P
0 0 3

Structural Drawings of Steel Elements:

1. Connections
2. Tension Members
3. Compression Members
4. Beams
5. Column Base
6. Roof Trusses.

B.Tech. (Civil Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 313: WASTE WATER ENGINEERING

L T P
2 1 0

Unit-I

Introduction: Terms definitions, systems of sanitation their merits demerits, system of sewerage, choice of sewerage system suitability to Indian conditions. Design planning of a sewage system.

Design of Sewers: Quantity of sanitary storm sewage flow, forms of sewers, conditions of flow in sewers, sewers of equivalent section, self cleansing limiting velocity, hydraulic formulas for flow of sewerage in sewers their design.

Construction Maintenance of Sewers: Sewer appurtenances, Materials for sewers, laying of sewers, joints in sewers, testing of sewers pipes, Maintenance operations precaution before entering a sewer. Excavating trenches.

Unit-II

House Drainage: Principles of house drainage, traps, Inspection chamber Indian European type W. C., Flushing Cisterns soil waste anti-siphonage pipes, plumbing systems.

Characteristics Testing of Sewage: Composition of sewage, sampling, physical and chemical analysis of sewerage, biological decomposition of sewage, kinetics of organic waste stabilization. Populating equivalent relative stability.

Unit-III

Treatment of Sewage: Unit processes of waste water treatment, screens, grit chambers, detritus tank, skimming tank, grease traps, sedimentation, chemical treatment, aerobic biological treatment, trickling filter (LRTF and HRTF), activated sludge processes, anaerobic treatment, units-sludge digesters biogas plants.

Low Cost Waste Water Treatment Units: Oxidations ponds, lagoons, ditches, septic tanks inhoff tanks, theory, design, advantages disadvantages.

Sewage Disposal: Dilution, self-purification of streams, oxygen deficiency of polluted streams, oxygen sag curve, de-oxygenation deoxy- genation. Dilution in seawater, disposal by treatment. Effluent irrigation sewage farming. Sickness its preventive measures.

Suggested Books:

1. Peavy, H. S. Rowe, D. R., "Environmental Engineering" McGraw Hill, New Delhi (2002).
2. Garg, S. K., "Environmental Engineering-Vol. II", Khanna Publishers, New Delhi, (2003).
3. Birdie, G. S., "Water Supply and Sanitation Engineering" Dhanpat Rai Publisher (P) Ltd., New Delhi, (2003).
4. Fair, G. M. Geyer, J. C., "Water Supply and Waste Water Disposal" (2002).
5. Nathanson, J. A., "Basic Environmental Technology" Prentice Hall of India, New Delhi. (1999).

B.Tech. (Civil Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEP 313: ENVIRONMENTAL ENGINEERING LABORATORY

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List of Experiments

1. Determination of total, suspended, dissolved volatile and fixed residue in a sewage/water sample.
2. Determination of turbidity.
3. Estimation of the pH-Value.
4. Determination of the carbonate, bicarbonate hydroxide alkalinity.
5. Determination of the type extend of acidity.
6. Estimation of the hardness of water (EDTA Method).
7. Estimation of the chloride concentration.
8. Determination of the dissolved oxygen percentage saturation.
9. Determination of biochemical oxygen dem (BOD) of wastewater.
10. Estimation of chemical oxygen dem (COD).

B.Tech. (Civil Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 314: HIGHWAYS ENGINEERING

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Unit-I

Introduction: Importance role of transportation systems; different modes of transportation, historical development of road construction, highway economics.

Highway Planning Project Preparation: Planning surveys, highway alignment, highway location surveys, soil material surveys. Highway projects: drawing report.

Highway Geometric Design: Cross-sectional elements, camber, sight distance-definition analysis of stopping sight passing sight distances, passing zones. Design of horizontal alignment-super elevation. Extra widening on curves, transition curves. Design of vertical alignment, gradients, types of vertical curves their design.

Unit-II

Highway Materials Construction: Desirable properties of soil, road aggregates, bitumen, cement concrete as highway materials. Various types of roads their construction-earth roads, gravel roads, W.B.M., bituminous, surface treatment, penetration macadam, premix carpet, bituminous concrete, sheet asphalt quality control during construction.

Pavement Design: Design of flexible rigid pavements.

Unit-III

Highway Drainage Maintenance: Importance of drainage maintenance, surface drainage subsoil drainage, construction in Water-logged areas, pavement failures, pavement evaluation, maintenance strengthening measures.

Highway Economics Financing: Total transportation cost, economic analysis, sources of highway financing.

Suggested Books:

1. Khanna, S.K., Justo, C.E.G. "Highway Engineering", Nem Chand Brothers, Roorkee, (2002).
2. Kadiyali, L.R. "Principles Practice of Highway Engineering", Khanna Publishers, New Delhi, (1997).
3. Flaherty, C.A.O. "Highway Engineering", Volume 2, Edward Arnold, London, (1986).
4. Sharma, S.K. "Principles, Practice and Design of Highway Engineering", S. Ch and Company Ltd., New Delhi, (1985)
5. Mannering, "Principles of Highway Engineering and Traffic Analysis", Wiley Publishers, New Delhi.
6. Rao, G. V., "Principles of Transportation Highway Engineering" Tata McGraw- Hill, New Delhi, (1996).
7. Bhanot, K. L., Highway Engineering, S. Ch and Company (P) Ltd. New Delhi, (1990).
8. Ahuja, T. D., "Highway Engineering" Standard Book House Delhi, (1995).

B.Tech. (Civil Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEP 314: HIGHWAYS ENGINEERING LABORATORY

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List of experiments

1. Aggregate crushing value test.
2. Aggregate attrition test.
3. Impact value test.
4. Abrasion test (Dorry's Los Angeles)
5. Soundness test.
6. Flakiness test.
7. Water absorption specific gravity test.
8. Laboratory C. B. R. test.
9. North Dakota cone test.
10. Penetration test on bitumen.
11. Softening point test for bitumen.
12. Ductility test.
13. Specific gravity Test.
14. Viscosity test.
15. Flash point fire point test.
16. Marshall Stability test.

B.Tech. (Civil Engineering) 5th Semester
 (Under Credit Based Continuous Evaluation Grading System)
 (Department Elective–III)

CEL 315: TRAFFIC ENGINEERING

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Unit-I

Introduction: Elements of traffic engineering, components of traffic system – road users, vehicles, highways control devices.

Vehicle Characteristics: IRC standards, design speed, volume, highway capacity levels of service, capacity of urban rural roads, PCU concept its limitations.

Traffic Stream Characteristics: Traffic stream parameters, characteristics of interrupted uninterrupted flows.

Unit-II

Traffic Studies: Traffic volume studies, origin destination studies, speed studies, travel time delay studies, parking studies, accident studies.

Traffic Regulation Control: Signs markings, traffic System management, At-grade intersections, channelization, roundabouts.

Traffic Signals: Pre-timed traffic actuated. Design of signal setting, phase diagrams, timing diagram, signal co-ordination.

Unit-III

Grade Separated Intersections: Geometric elements for divided access controlled highways expressways.

Traffic Safety: Principles practices, road safety audit.

Intelligent Transportation System: Applications in traffic engineering

Suggested Books:

1. William, R.M. Roger, P.R., “Traffic Engineering”, Prentice Hall.
2. Hobbs, F.D., “Traffic Planning Engineering”, Pergamon Press.
3. Khisty, C.J. Kent, B.L., “Transportation Engineering – An Introduction”, Prentice Hall of India Pvt. Ltd.
4. Kadiyali, L.R., “Traffic Engineering and Transport Planning”, Khanna Publishers, New Delhi.
5. Mannering, “Principles of Highway Engineering and Traffic Analysis”, Wiley Publishers, New Delhi.

B.Tech. (Civil Engineering) 5th Semester
(Under Credit Based Continuous Evaluation Grading System)
(Department Elective–III)

CEL 316: CONSTRUCTION LAWS

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Unit-I

Indian Contract Act 1972 – Valid contract, voidable contract, void – sections related to these. Definitions, interpretation.

Arbitration conciliation Act of 1996- Arbitration agreement, arbitrator tribunal, qualifications of arbitrator, arbitration proceedings award. Conciliation agreement, proceedings, settlement.

Unit-II

Provisions of various labour laws-Workmen's compensation Act 1923; disablement, total permanent disablement, temporary disablement, formula for compensation; minimum wages act, 1948; payment of bonus Act, 1965; weekly holidays Act, 1942; payment of wages Act, 1936; Inter-state migrant labour act, 1979; employees insurance Act, 1948.

Unit-III

The building other construction workers (regulation of employment conditions of service) Act, 1996 rules 1998.

Suggested Books:

1. Patil, B.S. "Legal Aspects of Building Engineering Contracts", (1974).
2. Bare Acts referred to above.

B.Tech. (Civil Engineering) 5th Semester
 (Under Credit Based Continuous Evaluation Grading System)
 (Department Elective–III)

CEL 317: ADVANCED ENVIRONMENTAL ENGINEERING

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Unit-I

Water Pollution: Water borne disease, chlorination of water on small scale, examination of water and health criteria for water supplies, fluoridation of water. Swimming pool sanitation health education. Hosrock's apparatus and sampling.

Ecology: Introduction, biosphere, scope, ecosystem, population regulation, national cycles. Energy flow forests and wild life, human activity, green house effect.

Air Pollution: Composition, air of occupied rooms, discomfort, indices of thermal comfort, comfort zones, air pollution sources, pollutant, metrological conditions, indications of air pollution, health and other aspects of air pollution, prevention and control disinfections of air.

Unit-II

Ventilation: Concept, start of ventilation, types of ventilation.

Lighting: Requirements of good lighting, measurement of light, natural lighting, light measurement units, measurement of day light, artificial lighting, method of artificial illumination, lighting standards.

Noise Pollution: Definition, effect of noise, exposure, noise control.

Radiation: Source of radiation exposure, type of radiation, radiation units, biological effect of radiation, radiation protection.

Unit-III

Metrological Environment: Atmosphere pressure, measurement effects of atmospheric pressure on health.

Air Temperature: Effects of heat-stress, preventive measures effect of cold stress.

Housing: Criteria for good housing, house standards, rural housing, housing and health overcrowding.

Excreta Disposal: Public health, importance, extent of problem how diseases is carried from excreta sanitation barrier, method of excreta disposal, excreta disposal in un-sewered area.

Suggested Books:

1. Garg, S. K., "Environmental Engineering", Khanna publishers New Delhi, (2003).
2. Rao, C. S., "Environmental Engineering", McGraw Hill Book Company, (2001).
3. Metcalf, Eddy, "Waste Water Engineering- Treatment Disposal Reuse", Tata- McGraw Hill Publishing Company limited, New Delhi, (2003).
4. Masters, G. M., "Introduction to Environmental Engineering Science" Prentice Hall of India, New Delhi.
5. Eckenfelder, W W, "Industrial Water Pollution control" McGraw Hill, New Delhi, (1989).

B.Tech. (Civil Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 321: THEORY OF STRUCTURE-II

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Unit-I

Statically Indeterminate Beams Frames: Introduction, types of supports-reaction components, external redundancy, statically indeterminate beams frames, degree of redundancy.

Fixed Continuous Beams: Bending moment diagrams for fixed beams with different loadings, effect of sinking of supports, degree of fixity at supports, advantages disadvantages of fixed beams, continuous beams, Clayperons theorem of three moments, various cases of load geometry of continuous beams.

Slope Deflection Method: Fundamental equations, applications to continuous beams portal frames, side sway in portal frames.

Unit-II

Moment Distribution Method: Basic propositions, stiffness of a member, distribution theorem, carry-over theorem, relative stiffness, distribution factors, applications to continuous beams, portal frames with without side sway, analysis of multi-storeyed frames, method of substitute frame.

Rotation Contribution method: Basic concepts, rotation factor, application to continuous beams, portal frames multistoried frames, story shear.

Approximate Methods of Structural Analysis: Portal method, cantilever method, substitute frame method.

Unit-III

Strain Energy: General principles, strain energy due to axial loading bending, law of reciprocal deflections, Castigliano's first theorem, beam deflections using Castigliano's first theorem, minimum strain energy, Castigliano's second theorem, analysis of statically indeterminate beams portal frames.

Redundant Frames: Order of redundancy, frames with one two redundant members. Stresses due to lack of fit, the trussed beam, portal frames.

Analysis of two Hinged Arches

Influence Lines for Indeterminate Structures: Muller Breslau Principle, Influence lines for shear force, bending moment reactions in continuous beams, balanced cantilevers rigid Frames.

Suggested Books:

1. Reddy, C. S., "Basic Structural Analysis" Tata McGraw Hill, New Delhi, (2003).
2. Wang, C. K., "Intermediate Structural Analysis" McGraw Hill, (1998).
3. Punmia, B. C., "Theory of Structures" Luxmi Publications, New Delhi, (1996).
4. Sinha, N. C., "Advanced Theory of Structures" Dhanpat Rai Publications, New Delhi, (2000).
5. Ramamrutham, S. Narayan, R., "Theory of Structures:" Dhanpat Rai and Sons, New Delhi, (1996).

B.Tech. (Civil Engineering) 6th Semester
 (Under Credit Based Continuous Evaluation Grading System)

CEL 322: FOUNDATION ENGINEERING

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Unit-I

Earth Pressure: Terms symbols used for a retaining wall. Movement of wall the lateral earth pressure. Rankine's Coulomb's theory for lateral earth pressure. Culmann's graphical construction Rebhan's graphical construction.

Arching in Soil Braced Cuts: Theory of arching, braced excavations, deep cuts in saturated soft to medium clay.

Soil Investigation: Object of soil investigation for new existing structures. Depth of exploration for different structures. Spacing of bore holes. Methods of soil exploration relative merits demerits.

Stress Distribution: Boussinesq's equation for a point load, uniformly loaded circular rectangular area, pressure distribution diagrams. New marks chart its construction. Two- to – one method of load distribution. comparison of Bossinesq Westerguard analysis for a point load. Limitations of elastic formula.

Unit-II

Shallow Foundation: Types of shallow foundations, definitions Terzaghis analysis. Types of failures. Factors affecting bearing capacity. Skemptions equation. B. I. S. recommendations for shape, depth inclination factors. Plate load test, stand penetration test, Contact pressure distribution. Causes of settlement of structures comparison of immediate consolidation settlement Calculation of settlement by plate load test. Static cone penetration test data. Allowable settlement of various structures according to IS Code. Situation most suitable for provision of rafts. Proportioning of rafts in s clays. Various methods of designing raft. floating foundation.

Pile Foundation: Necessity uses of piles, classification of piles. Merits demerits of different types based on composition. Types of pile driving hammers and their comparison. Effect of pile driving on adjacent ground. Use of Engineering news formula Hiley's formula for determination of allowable load. Pile Load Test, separation of skin friction point resistance using cyclic pile load test data related numerical problems. determination of point resistance frictional resistance of a single pile by static formula. Piles in clay, safe load on a friction point bearing pile. Pile in s spacing of piles in a group, factors affecting capacity of a pile group. Efficiency of pile group bearing capacity of a pile group in clay. Settlement of pile groups in clay Negative skin friction.

B.Tech. (Civil Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

Unit-III

Stability of Slopes: Necessity, causes of failure of slopes. Stability analysis of infinite finite slopes in s clay. Taylor's stability number its utility.

Caissons Wells: Major area of use of caissons Advantages disadvantages of open box pneumatic caissons. Essential part of a pneumatic caisson. Components of a well. Calculation of allowable bearing pressure. conditions for stability of a well. Terzagh's analysis for lateral stability of a well, embedded in s. Forces acting on a well foundation. Computation of scour depth Tilts and Shifts.

Machine Foundations: Theory of vibrations, foundations subjected to vibrations, determination of dynamic properties of soil, Dynamic analysis of block foundations.

Suggested Books:

1. Peck, R. B., Hanson, W. B. Thorn, T. H., "Foundation Engineering" Jonh Wiley Sons Inc, New York. (1974).
2. Das, B. M., "Principles of Foundation Engineering" Thomson Asia Pte Ltd, Singapore, (2003).
3. Bowles, J. E., "Foundation Analysis Design" McGraw Hill, New York, (1988).
4. Ranjan, G., Rao A. S.R, "Basic Applied Soil Mechanics" New Age International, New Delhi, (2000).
5. Murthy, V. N.S., "Principles of Soil Mechanics of Foundation Engineering" UBSPD, (2001).

B.Tech. (Civil Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 323: DESIGN OF CONCRETE STRUCTURE-I

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Unit-I

Introduction: Plain reinforced concrete, objectives of design. Structural systems. Introduction to design philosophies.

Analysis of Beams: Working stress method, Assumptions made in theory of reinforced concrete construction, moment of resistance of singly, doubly reinforced flanged beams.

Limit State Method: Assumptions in analysis, Analysis of singly doubly reinforced rectangular sections, analysis of singly reinforced flanged sections.

Design of Beams for flexure: Codal provisions for design as per IS 456:2000 according to working stress limit state method, design of singly doubly reinforced sections, design of flanged sections.

Unit-II

Design for Shear, Bond and Torsion: Shear Stresses in homogeneous rectangular beams, critical sections, design shear strength of plain concrete, design of shear reinforcement, bond stress, anchorage development length, bond failure and bond strength, Introduction to torsion in R. C. C. beams, General behaviour in torsion, design of sections subjected to torsion, shear flexure.

Design of Slabs: Introduction to flat slabs. One-way two-way slabs. Design of slab sections using IS method.

Design of Continuous Beams Slabs: Analysis of continuous systems General guidelines and Codal provisions design detailed drawings of continuous beams slabs.

Unit-III

Design of Columns: Classification effective length of columns, codal requirements, analysis design of sections subjected to axial loading axial loading combined with bending moment.

Design of Isolated Footings: Types of footings, soil pressure under footings, General design considerations Codal provisions. Design of isolated, square, rectangular circular footings. Design of footings subjected to eccentric loads.

Staircases: Types of staircases, loads on stairs, Design of different types of staircases.

Suggested Books:

1. Pillai, U. and Menon, D., "Reinforced Concrete Design" Tata McGraw Hill, New Delhi (2003).
2. Jain, A.K., "Limit State Design of R. C. C. Structures" Nem Ch and Sons, Roorkee (2002).
3. Varghese, "Limit State Design of Reinforced Concrete" Prentice Hall of India, New Delhi (2003).
4. Dayaratnam, P., "Design of Reinforced Concrete" Oxford and IBH Publishers, New Delhi (2002).
5. Chra, R., "Limit State Design of Reinforced Concrete" Stard Book House, New Delhi (2002).

B.Tech. (Civil Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEP 323: DEPARTMENTAL CAD LABORATORY-II (RCC-I)

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Structural Drawings/ Reinforcement detailing of:

1. R.C.C. Footings
2. Beams
3. Staircases
4. Columns

B.Tech. (Civil Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 324: WATER RESOURCES ENGINEERING-I

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Unit-I

Introduction: Importance of irrigation engineering, purposes of irrigation, objectives of irrigation, benefits of irrigation, advantages of various techniques of irrigation- - Furrow irrigation, boarder strip Irrigation, basin irrigation, sprinkler irrigation , drip irrigation.

Methods of Irrigation: Advantages disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta, duty of water, base period, relation between delta, duty base period, and soil crop relation-ship soil fertility.

Canal Irrigation: Classifications of canals, canal alignment, inundation canals, Bhara irrigation, advantages disadvantages, silt theories-Kennedy's theory, Lacey's theory, drawbacks in Kennedy's and Lacey's theories, comparison of Lacey's Kennedy's theories, design of unlined canals based on Kennedy and Lacey's theories.

Unit-II

Lined Canals: Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

Losses In Canals, Water Logging Drainage: Losses in canals- evaporation seepage, water logging, causes ill effects of water logging anti water logging measures. Drainage, classification of drains - surface subsurface drains, design considerations for surface drains, advantages maintenance of tile drains.

Investigation Preparation of Irrigation Projects:

Classification of project, project preparation-investigations, design of works drawings, concept of multi - purpose projects, major, medium miner projects, planning of an irrigation project, economics and financing of irrigation works. Documentation of project report.

Unit-III

Tubewell Irrigation: Types of tube wells - strainer type, cavity type slotted type. Type of strainers, aquifer, porosity, uniformity coefficient, specific yield and specific retention, coefficients of permeability, transmissibility storage. Yield or discharge of a tube well, assumptions, Theim's and Dupuit's formulae, Limitations of Theim's Dupuit's formulae. Interference of tube wells with canal or adjoining tube-wells, causes of failure of tube wells, optimum capacity, duty delta of a tube well. Rehabilitation of tube well.

River Training Works: Objectives, classification of river-training works, design of guide banks. Groynes or spurs - Their design classification ISI. Recommendations of approach embankments afflux embankments, pitched Isls, Natural cut-offs Artificial cut-offs design Considerations.

Suggested Books:

1. Sharma, S.K., "Principles and practice of Irrigation Enginnering". S. Ch, Limited.
2. Punmia, B.C. "Irrigation and Water Power Enginnring", Pe B.B.Lal; Laxmi Publications (p) Ltd
3. Singh, B., "Fundamentals of Irrigation Engineering" Nem Ch and Bros.
4. Sahasrabudhe, S.R. "Irrigation Engineering and Hydraulic Structure" S. K. Kataria and Sons.
5. Varshney, Gupta and Gupta, "Irrigation Engineering and Hydraulic Structure" Nem Ch Brothers.
6. Garg, S. K. "Irrigation Engineering and Hydraulic Structure" Khanna Publishers.

B.Tech. (Civil Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 325: RAILWAYS AIRPORT ENGINEERING

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Unit-I

(Railway Engineering)

Introduction to Railway Engineering: History of Railways, development of Indian Railway, organisation of Indian Railway, important statistics of Indian Railways. Railway gauges: Definition, gauges on world Railways, choice of gauge, uniformity of gauge, loading gauge, construction gauge.

Railway Track: Requirements of a good track, track specifications on Indian Railways, detailed cross-section of single/double track on Indian Railways. Components of Railway Track: Rails, sleepers, ballast, sub grade formation, track fixtures and fastenings, coning of wheels, tilting of rails, adzing of sleepers, rail joints, creep of rails.

Geometric Design of Railway Track: Alignment, gradients, horizontal curve, super elevation, equilibrium cant, cant deficiency, transition curves.

Points Crossings: Functions, working of turnout, various types of track junctions their layouts, level-crossing.

Unit-II

Railway Stations and Yards: Site selection, classification and layout of stations, Marshalling yard, locomotive yard, equipment at Railway Stations and yards

Signalling Interlocking: Objectives, classification of signals, types of signals in stations yards, automatic signalling, principal of interlocking.

Modernization of Railway Tracks: High speed tracks, improvement in existing track for high speed, Ballastless Track, MAGLEV, TACV track.

(Airport Engineering)

Introduction to Airport Engineering: Air transport scenario in India stages of development, national international organizations.

Unit-III

Airport Planning: Aircraft characteristics, factors for site selection, airport classification, general layout of an airport. Obstructions zoning laws, imaginary surfaces, approach zones turning zones.

Runway Orientation Design: Head wind, cross wind, wind rose diagram, basic runway length, Corrections, geometric design elements, runway configuration.

Taxiway Aircraft Parking: Aircraft parking system. Main taxiway, exit taxiway, separation clearance, holding aprons.

Visual Aids: Marking lighting of runway taxiway, ling direction indicator, wind direction indicator, IFR/VFR.

Suggested Books:

1. Chra, S., Aggarwal, "Railway Engineering", M.M. Oxford University Press, New Delhi, (2007).
2. Saxena, S.C. and Arora, S.P., "A Text Book of Railway Engineering", Dhanpat Rai Sons, Delhi, (1997).
3. Mundrey, J. S., "Railway Track Engineering", McGraw Hill Publishing Co., (2009).
4. Khanna, S.K., Arora, M.G. and Jain, S.S., "Airport Planning Design", Nem Ch and Bros. Roorkee, (1999).
5. Horenjeff, R. and McKelvey, F., "Planning Design of Airports", McGraw Hill Company, New York, (1994).
6. Norman, J., Ashford, S.M. and Paul, H.W., "Airport Engineering".

B.Tech. (Civil Engineering) 6th Semester
(Under Credit Based Continuous Evaluation Grading System)
(Department Elective–IV)

CEL 326: GROUND IMPROVEMENT GROUND ENGINEERING

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Unit-I

Introduction: The mechanics of soil stabilization, principles techniques.

Shallow Stabilization with Additives: Lime, flyash, cement other chemicals bitumen.

Unit-II

Deep Stabilization: Stone column, prefabricated drains, electro-osmosis, lime column. soil-lime column. Grouting: permeation, compaction jet. Vibro-floatation, dynamic compaction, thermal, freezing. Dewatering systems.

Unit-III

Geosynthetics Reinforced Soil Structures: Types functions; materials manufacturing processes; testing evaluations; principles of soil reinforcement; design construction of geosynthetic reinforced soil retaining structures – walls slopes; Codal provisions; bearing capacity improvement; embankments on soft soils; Indian experiences.

Suggested Books:

1. Swami, S., “Reinforced Soil its Engineering Applications” I K International, (2006).
2. Shukla, S. K. and Yin, J. H., “Fundamentals of Geosynthetics Engineering” Taylor Francis, (2006).
3. Koerner, R. M., “Designing with Geosynthetics” Prentice-Hall, N.J., U. S. A, (2005).
4. Rao, V. G. and Raju, N. S., “Engineering with Geosynthetics” Tata McGraw Hill Publications Co. Ltd. New Delhi, (1999).
5. Shukla, S. K., (Edited) “Geosynthetics their Applications” Thomson Telford, (2002).

B.Tech. (Civil Engineering) 6th Semester
 (Under Credit Based Continuous Evaluation Grading System)
 (Department Elective–IV)

CEL 327: PAVEMENT DESIGN

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Unit-I

Introduction: Types of pavement structure. Functions of pavement components, factors affecting pavement design, design wheel load, strength characteristics of pavement materials. Comparison of flexible rigid pavements.

Design of Flexible Pavements: General design considerations, methods for design of flexible pavements – group index method, triaxial test method, Hveem stable meter method, McLeod's method, Indian Roads congress method.

Unit-II

Design of Bituminous Mixes: Mix design approaches, Marshall method of bituminous mix design, super pavement.

Design of Rigid Pavements: General design considerations, Westergard's analysis, methods for design of rigid pavements - PCA method, AASHTO method, Indian Roads Congress method, types design of joints in cement concrete pavements.

Unit-III

Modern Design Concepts: Reinforced concrete pavement, airport pavement design, bituminous pavement with cemented base, interlocking concrete block pavement, full depth bituminous pavement, ultrathin white topping, perpetual pavement, pavement overlays.

Suggested Books:

1. Yoder, E. J. and M. W. Witczak, "Principals of Pavement Design", Wiley Publication.
2. Khanna, S. K. and C. E. G. Justo, "Highway Engineering", Nem Ch and Bros., Roorkee.
3. Sharma, S. K., "Principles, Practice Design of Highway Engineering", S. Ch and Co.
4. Chakraborty, P. and A. Das, "Principles of Transportation Engineering", Prentice Hall India.
5. Yang, H. H, "Pavement Analysis Design", Prentice Hall.

****Note: Use of IRC: 37-2012 IRC: 58-2011 shall be allowed in the examination. ****

B.Tech. (Civil Engineering) 6th Semester
 (Under Credit Based Continuous Evaluation Grading System)
 (Department Elective–IV)

CEL 328: FINITE ELEMENTS METHOD

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Unit-I

Introduction: Background applications, general description of the method, summary of the analysis procedure, matrix theory, differential equations.

Review of Solid mechanics: Equations of equilibrium, stresses strains, strain displacement relations, linear constitutive relations, two – dimensional elasticity, non-linear material behaviour, material characterization.

Unit-II

One – Dimensional Finite Elements: The concept of an element, various element shapes, displacement models, finite element modelling, coordinates shape functions, stiffness matrix, the finite element equations treatment of boundary conditions.

Two-Dimensional Finite Elements: Introduction, two-dimensional boundary value problems, various element shapes, constant strain triangular elements, quadrilateral elements, natural coordinates, connectivity nodal coordinates, problem modelling boundary conditions.

Unit-III

Two-Dimensional Isoperimetric Elements: Introduction, the four-nodded quadrilateral element, numerical integration, interpolation formulas shape function formulas, computations of element stiffness matrix.

Beams Frames: Introduction, finite element formulation, load vector, boundary conditions, displacement method for beam analysis, beam finite elements, shear force bending moment, plane frames.

Suggested Books:

1. Desai, C. S. and Abel, J. F., “Introduction to The Finite Element Method” CBS Publishers Distributions, Delhi, (2004).
2. Buchanan, G. R., “Schaum’s Outline Series, Theory Problems of Finite Element Analysis” McGraw Hill International Edition/Tata McGraw Hill, New Delhi, (2004).
3. Chrupa, T. R. Belegundu, A. D., “Introduction to Finite Elements in Engineering” PHI, New Delhi, (1997).
4. Krishnamoorthy, C. S., “Finite Element Analysis – Theory Programming” TMH Publishing Co. Ltd. New Delhi, (2002).
5. Bathe, K. J., “Finite Element Procedures” Prentice Hall of India, New Delhi, (1997).

B.Tech. (Civil Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 411: DESIGN OF CONCRETE STRUCTURE-II

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Unit-I

R. C. C. Footings: Design of combined footings (Trapezoidal and rectangular) Design of Strap footing and raft foundations. Design of piles and pile footings.

Unit-II

Beams curved in plan: Design of semicircular beams supported on three supports. Design of circular beam supported on symmetrically placed columns.

Domes: Introduction to different types of domes and shells. Design of spherical and conical domes. Design of cylindrical shells supported on edge beams.

Unit-III

Retaining Walls: Design of cantilever and counter fort retaining walls. Design of basement walls.

Water Tanks: Introduction, Design of tanks resting on ground, underground tanks and elevated tanks.

Suggested Books:

1. Raju N K, "Advanced Design of Structures" Tata McGraw Hill, New Delhi, 2000.
2. Varghese P C, "Advanced Reinforced Concrete Design" Prentice Hall of India, New Delhi, 2001.
3. Dayaratnam, P," Advanced Design of Concrete Structures" Oxford and IBH Publishing Co, Pvt. Ltd., New Delhi, 2002.
4. Syal I C, "Behavior, Analysis and Design of Reinforced Concrete structural Elements" S. Chand & company, New Delhi, 2003.
5. MacGregor J G,"Reinforced Concrete- Mechanics and Design", Prentice Hall, N.J., New York, 1997.

B.Tech. (Civil Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEP411: DEPARTMENTAL CAD LABORATORY-III (RCC- II)

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Structural Drawings of Reinforced Concrete Elements as per CEL411

B.Tech. (Civil Engineering) 7th Semester
(Under Credit Based Continuous Evaluation Grading System)

CEL 412: DESIGN OF STEEL STRUCTURES-II

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Unit-I

Design of Round Tubular Structures: Introduction, round tubular sections, permissible stresses, tube columns and compression members, tube tension members, tubular roof trusses, Design of tubular beams, Design of tubular purlins.

Design of steel foot bridge: Introduction, design of flooring, cross girders, analysis of N- type truss, design of various members of truss, design of joints, design of bearings.

Unit-II

Design of complete industrial building with design of:

- a) Gantry Girder
- b) Column bracket.
- c) Mill bent with constant moment of inertia
- d) Lateral and longitudinal bracing for column bent etc.

Unit-III

Design of a single track through type Railway Bridge with lattice girders having parallel chords (for B. G):

- b) Design of stringer and stringer bracing
- c) Design of cross girders
- d) Design of connection between stringer and cross girder
- e) Design of main girders – various members and their joints
- f) Design of bottom lateral bracing and top lateral bracing
- g) Design of portal bracing and sway bracing
- h) Design of bearings – rocker and rollers

Suggested Books:

1. Arya A S and Ajmani J L, “Design of Steel Structures” Nem Chand & Bros, Roorkee,1996.
2. Chandra R, “Design of Steel Structures” Vol. I & II Standard Book House, Delhi,1991
3. Raz S A, “Structural Design in Steel” New Age International (P) Ltd., New Delhi, 2002
4. Raghupathi M, “Design of Steel Structures” Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1999.
5. Dayaratnam P, “Design of Steel Structures” Wheeler Publishers, New Delhi, 2000.

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CEP412: DEPARTMENTAL CAD LABORATORY-III (Steel II)

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Structural Drawings

- Detailed working drawings for
- Industrial buildings
- Steel Foot Bridge and Through Type Railway Bridge

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CEL 413: WATER RESOURCES ENGINEERING-II

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Unit-I

Head Works: Types of head works, Functions and investigations of a diversion head work : component parts of a diversion head work and their design considerations, silt control devices.

Theories of Seepage: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.

Unit-II

Design of Weirs: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.

Energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

Canal Regulators: Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape.

Unit-III

Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls.

Cross-Drainage works : Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.

Canal Out-lets: Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of nonmodular, semi-modular and modular outlets.

Suggested Books:

1. Irrigation Engg. & Hydraulic Structure by Santosh Kumar Garg, Khanna Publishers
2. Design of Irrigation Structures by R.K. Sharma, Oxford IBH Pub
3. Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe, . Katson Publishing
4. Irrigation Practice and Design Vol. I to VII by K.B. Khushlani. Oxford IBH Pub
5. P.N. Modi; Irrigation with Resources and with Power Engineering, Standard Book House
6. Irrigation Engg. Vol. I & II by Ivan E. Houk, John Wiley and sons

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CEL 414: ESTIMATION AND COSTING

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Unit-I

Estimates: Types, complete set of estimate, working drawings, site plan, layout plan, index plan, plinth area, administrative approval and Technical Sanction.

- a) Estimate of buildings
- b) Estimate of R. C.C. works
- c) Estimate of sloped roof and steel structures
- d) Estimate of water supply and sanitary works
- e) Estimates of roads (a) Earthwork (b) Bridges and culverts c) Pavement
- f) Estimate of Irrigation works.

Unit-II

Analysis of Rates: For earthwork, concrete works, D. P. C., Brickwork, stone masonry, plastering, pointing, road work, carriage of materials.

Specifications: General specification for different classes of building, detailed specifications for various Civil Engineering Works.

Unit-III

Contracts: Types of contracts, tender, tender notice, tender form, submission and opening of tender, earnest money, security money, measurement book, muster roll, piecework agreement and work order

Accounts: Division of accounts, cash, receipts of money, cashbook, temporary advance, imprest and accounting procedure.

Arbitration: Arbitration, arbitrator and arbitration act, powers of arbitrator, arbitration awards.

Suggested Books:

1. Estimating and Costing by B.N. Datta, UBSPD, New Delhi
2. Estimating and Costing by G.S. Birdie, Dhanpat Rai Publication New Delhi .
3. Estimating and Costing by V.N. Chakravorty, Calcutta
4. Civil Engg. Contracts & Estimates by B.S. Patil, Orient-Longman Ltd., New Delhi.
5. Estimating and Costing, Kohli D. D., Kohli and R.C., S.Chand & Company, New Delhi, 2004
6. Building and Public Works Administration, Estimating and Costing Spence Gedder, Newnes Publishers, London, UK, 1950.

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 (Department Elective–IV)

CEL 415: BRIDGE ENGINEERING

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Unit-I

Introduction: Definition, components of a bridge, classifications, importance of bridge Investigation of Bridges: Need for investigations, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above HFL, scour depth, choice of bridge type.

Standard Specifications: For road bridges, I.R.C. loadings, code provisions on width of carriage way, clearances, loads considered etc. Standard specifications for railway bridges, Railway bridge code.

Unit-II

Reinforced Concrete Bridges: Slab culverts, T-beam Bridge, Courbon's theory for load distribution, Balanced cantilever bridges, illustrative examples, pre-stressed concrete bridges, (General discussions).

Unit-III

Sub Structure: Types of piers and abutments, design forces, design of piers and abutments.

Bearing and Joints: Various types of expansion bearing and fixed bearings, elastomeric bearings, joints and their types. Introduction to construction, inspection and maintenance of bridges.

Suggested Books:

1. Victor D J, "Essentials of Bridge Engineering" Oxford and IBH Publishers, New Delhi, 2003.
2. Ratwani V and Aswani M G, "Design of Concrete Bridges, Khanna Publishers, New Delhi, 1986.
3. Bindra S P, "Principles and Practice of Bridge Engineering" Dhanpat Rai & Sons, New Delhi, 1999.
4. Ponnuswamy S, "Bridge Engineering" Tata McGraw Hill, New Delhi, 2003.
5. Punmia B C , Jain A K , "RCC Designs" Laxmi Pub.(P) Ltd.,2003.

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CEL 416: ELEMENTS OF EARTHQUAKE ENGINEERING

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Unit-I

Un-damped free vibrations of single degree of freedom systems: Introduction, definitions, characteristics of a dynamic problem, degrees of freedom, Newton's law of motion, De Alembert's Principal, free body diagram, derivations of differential equation of motion, solution of differential equation of motion, equivalent stiffness of spring combinations, springs in series, springs in parallel.

Damped free vibrations of single degree of freedom systems: Introduction, types of damping, free vibrations with viscous damping, over-damped, critically- damped and under- damped systems, logarithmic decrement, structural damping.

Unit-II

Earthquake Resistant Design Philosophy: Introduction, criteria for earthquake resistant design, principles of reliable seismic behavior, structural forms for earthquake resistance, earthquake forces versus other forces.

Lateral Load Analysis: Idealization of structures and selection of analysis, equivalent lateral force concepts, response spectrum analysis, seismic forces as per IS: 1893 – 1984 and IS : 1893 – 2002.

Unit-III

Behavior and Design of Concrete Structures: Characteristics of concrete and reinforcing steel, influence of bond and anchorage and confinement of concrete, Seismic design and detailing of reinforced concrete and masonry buildings (IS 13920; IS 13827; IS 13828; IS 4326) and flexural strength and ductility of RC members.

Suggested Books:

1. Paz M, "Structural Dynamics – Theory and Computation" CBS Publishers and Disributors, New Delhi, 2003.
2. Chopra A K, "Structural Dynamics" John Wiley & Sons, New Delhi, 2002.
3. Dowrick D J, "Earthquake Resistant Design for Engineers and Architects" John Wiley & Sons, New York, 2000.
4. Paulay and Priestley, "Seismic Design of Reinforced Concrete and Masonry Buildings" John Wiley and sons, New York, 1992.
5. Rao S S,"Mechanical Vibrations" Pearson Education Publishers, 2004.

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(Under Credit Based Continuous Evaluation Grading System)

CEL 417: PRE- STRESSED CONCRETE DESIGN

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Unit-I

Introduction: Basis concepts, Materials used, advantages of prestressed Concrete, Applications of prestressed concrete.

Materials for prestressed Concrete: High strength concrete, strength requirements permissible stresses in concrete, creep & shrinkage, deformation characteristics, high strength steel, strength requirements, permissible stress in steel.

Prestressing Systems: Introduction, prestensioning systems, post-tensioning systems, chemical prestressing.

Unit-II

Losses of Prestress: Nature of losses, different types of losses and their assessment.

Analysis of Prestress & Bending Stress: Basic assumptions, Resistant stresses at a section, pressure line, and concept of land balancing, stresses in grading moment.

Flexural Shear Strength of Prestressed Concrete Sections: Types of flexural failure, strain compatibility method, code procedures, shear and principal stresses, ultimate shear resistance of pressed concrete members, prestressed concrete members in torsion.

Unit-III

Transfers of Prestress in Pre-tensioned and Post-tensioned members:

Transmission Length, bond structures, Transverse tensile stress End-zone reinforcement, stress distribution in end block.

Design Prestressed Concrete Sections: Design of section for flexure, Axial tension compression & bending, shear, bond and torsion.

Design of concrete Pipes & Tanks: Circular prestressing type of prestressed concrete pipes, design of prestressed concrete pipes, Analysis and design of prestressed concrete tanks.

Suggested Books:

1. Raju N K, "Prestressed Concrete" Tata McGraw Hill, New Delhi, 2001.
2. Rajagopalan N, "Prestressed Concrete" Narosa, New Delhi, 2001.
3. Dayaratnam P, "Prestressed Concrete" Oxford & IBH, New Delhi, 1999.
4. Lin T Y, "Prestressed Concrete" McGraw Hill, New York, 1985.
5. Edward G Nawy, "Prestressed Concrete-A Fundamental Approach" Prentice Hall Publishers, NY, 2000.