Department of Civil Engineering

Curriculum Structure (2022 – 2026)

For each theory course the detailed assessment is shown in Table-1:

Internal Assessment		**University Examination**	
Component	**Maximum Marks**	**Component**	**Maximum Marks**
Sessional Test-I	10	Written Examination of 3-Hour duration	60
Sessional Test-II	10		
Assignment-I	05		
Assignment -II	05		
Attendance*	10		
Total	**40**		**60**

Table 1: Detailed weightage of Marks for theory courses, each of 100 marks.

*The marks of Attendance awarded to the student in theory course should be given as per table 2:

S No.	**Percentage of Attendance**	**Marks to be Awarded**	**Remarks**
01	<75%	-Nil-	Student is detained & has to repeat the course
02	75%<80.5%	6	
03	80.5%<-85.5%	7	
04	85.5%<90.5%	8	
05	90.5%<95.5%	9	
03	95.5%≤100%	10	

Table 2: Detailed weightage of Marks for the attendance in theory courses.

For laboratory course the detailed marks distribution is shown in table 3:

Continuous Assessment		**University Examination**	
Component	**Maximum Marks**	**Component**	**Maximum Marks**
Continuous assessment of practical work, timely submission of lab records.	15	Lab experiment/procedure/ writing/tabulation/innovation as applicable	20
Test	05	Viva Voce	05
Attendance**	05		
Total	**25**		**25**

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Table 3: Detailed weightage of Marks for laboratory courses, each of 50 marks.

**The marks of Attendance awarded to the student in Laboratory course should be given as per table 4:

S No.	Percentage of Attendance	Marks to be Awarded	Remarks
01	< 75%	-Nil-	Student is detained & has to repeat the Lab. course
02	75%<90.5%	4	
03	90.5%≤100%	5	

Table 4: Detailed weightage of Marks for the attendance in laboratory courses.

At the end of semester VI students are required to attend an Industrial Training of 4-6 weeks duration, during summer vacations. After the completion of training each student is required to prepare a detailed report of the training work which he/she has attended in an Organization/Industry/Company. The examination of Industrial Training shall be conducted during semester VII examination.

After the university Exam of semester VII every student shall be allotted a Major Project-II pertaining to his/her stream under the supervision of an allotted mentor. Students have to complete their literature-survey and all other requirements and complete the Major Project-II during semester VIII. Depending upon the infrastructure, computing and other laboratories facilities the students shall be offered in house project on campus or they can complete their project work in any organization/institute/industry outside the campus. Major Project-II shall be evaluated externally as per university statues.

Distribution of marks for Major Project are given in below table:

Internal Component	Weightage		External Component	Weightage
Quality of work	100		Dissertation	100
Presentation	50		Presentation	50
Viva Voce	100		Viva Voce	50
Total	**250**			**200**

For evaluation of internal component of Major Project-II a committee consisting of following members be framed:

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(i) Head of the Department
(ii) One/two member(s) nominated by Head
(iii) One member nominated by Principal
(iv) Coordinator of major project/semester

Elective Papers:

- Students have to opt for one departmental elective paper, each from PEC –I and from PEC –I in 6th semester.
- Students have to opt for one departmental elective paper, from each of PEC –III, PEC –IV and from PEC –V in 7th semester.
- They have to opt for one departmental elective paper, from each PEC –VI and other from PEC – VII in 8th semester
- Students have to opt for one open electives from Open Elective-I in 6th Semester and one open electives Open Elective-II in 7thsemester .
- They have to opt for two open elective from any branch of engineering (SOET) in 8th semester.

Major Project-I shall be evaluated internally by a committee framed by the Head of the Department consisting of three to six members

The distribution of marks of Industrial Training of 50 marks is as follow:

Component	Weightage
Industrial Training	10
Practical Work/Fabrication of Model/Drawing/report	10
Response in Viva of the committee	30
Total	**50**

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Department of Civil Engineering

Semester–I

Theory Courses:

Course Code	Title	Marks Distribution			Hours/ week			Credits
		IA	UE	Total Marks	L	T	P	
BSC-CE-121	Mathematics-I	40	60	100	3	1	0	4
ESC-CE-121	Basic Electrical Engineering	40	60	100	3	0	0	3
BSC-CE-122	Engineering Chemistry	40	60	100	3	1	0	4
BSC-CE-123	Engineering Physics	40	60	100	3	1	0	4
MC-CE-121	Environmental Science*	40	60	100	2	0	0	0
ESC-CE-122	Computer Fundamental	40	60	100	3	1	0	4
Total		**200**	**300**	**600**				**19**

Lab Courses:

ESC-CE-131	Basic Electrical Engineering Lab	25	25	50	0	0	2	1
BSC-CE-131	Engineering Chemistry Lab	25	25	50	0	0	2	1
BSC-CE-132	Engineering Physics Lab	25	25	50	0	0	2	1
ESC-CE-132	Engineering Graphics**	40	60	100	3	0	1	3
MC-CE-131	Induction Program***	0	0	0	0	0	0	0
ESC-CE-133	Computer Fundamental Lab	0	0	0	1	0	0	1
Total		**115**	**135**	**250**				**7**
Total (Theory + Lab)		**315**	**435**	**850**				**26**

N.B:* Environmental science course is non-credits and the student has to get at-least minimum pass marks to qualify the subject. Non-credits course marks are not included in total marks.

** The examination pattern of engineering graphics shall be same as of other theory courses.

*** Induction programme is also non-credits and the student has to get at-least minimum pass marks to qualify the subject. The student has to qualify this course by attending the training which will be verified by concerned teacher.

Semester–II

Theory Courses:

Course Code	Title	Marks Distribution			Hours/ week			Credits
		IA	UE	Total Marks	L	T	P	

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BSC-CE-221	Mathematics-II	40	60	100	3	1	0	4
ESC-CE-221	Basic Electronics Engineering	40	60	100	3	0	0	3
ESC-CE-222	Mechanics of Materials	40	60	100	3	0	0	3
HSMC-CE-222	Communication Skills	40	60	100	2	0	0	2
ESC-CE-223	C-Programming	40	60	100	3	1	0	3
MC-CE-221	Indian Constitution*	40	60	100	2	0	0	0
Total		**200**	**300**	**500**				**15**

Lab Courses:

ESC-CE-232	Mechanics of Materials Lab	25	25	50	0	0	2	1
HSMC-CE-231	Communication Skills Lab	25	25	50	0	0	2	1
ESC-CE-231	Basic Electronics Lab	25	25	50	0	0	2	1
ESC-CE-233	C-Programming Lab	25	25	50	0	0	2	1
ESC-CE-234	Workshop Practice	50	0	50	0	0	4	1
Total		**150**	**100**	**250**				**5**
Total (Theory + Lab)		**350**	**400**	**750**				**20**

* N.B: 1. * Indian constitution course is non-credits and the student has to get at-least minimum pass marks to qualify the subject. Non-credits course marks are not included in total marks.

Semester–III

Theory Courses:

Course Code	**Title**	**Marks Distribution**			**Hours/ week**			**Credits**
		IA	**UE**	**Total Marks**	**L**	**T**	**P**	
BSC-CE-321	Mathematics-III	40	60	100	3	1	0	3
PCC-CE-322	Introduction to Solid Mechanics	40	60	100	2	1	0	3
PCC-CE-323	Introduction to Fluid Mechanics	40	60	100	2	1	0	3
PCC-CE-324	Surveying-I	40	60	100	2	1	0	3
PCC-CE-325	Disaster Preparedness & Planning	40	60	100	2	1	0	3
BSC-CE-326	Biology & Life Sciences	40	60	100	2	1	0	3
Total		**240**	**360**	**600**				**18**

Lab Courses:

PCC-CE-331	Solid Mechanics Lab	25	25	50	0	0	2	1

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PCC-CE-332	Fluid Mechanics Lab	25	25	50	0	0	2	1
PCC-CE-333	Surveying-I Lab	25	25	50	0	0	2	1
Total		**75**	**75**	**150**				**3**
Total (Theory + Lab)		**315**	**435**	**750**				**21**

Semester–IV

Theory Courses:

Course Code	Title	Marks Distribution			Hours/ week			Credits
		IA	UE	Total Marks	L	T	P	
BSC-CE -421	Numerical Techniques	40	60	100	3	1	0	3
PCC-CE-422	Theory of Structures	40	60	100	2	1	0	3
PCC-CE-423	Hydraulic Engineering	40	60	100	2	1	0	3
PCC-CE-424	Surveying-II	40	60	100	2	1	0	3
PCC-CE-425	Building Materials & Construction	40	60	100	2	1	0	3
PCC-CE-426	Estimation and Costing	40	60	100	2	1	0	3
Total		**240**	**360**	**600**				**18**

Lab Courses:

PCC-CE-431	Hydraulic Engineering Lab	25	25	50	0	0	2	1
PCC-CE-432	Structural Analysis Lab	25	25	50	0	0	2	1
PCC-CE-433	Surveying-II Lab	25	25	50	0	0	2	1
Total		**75**	**75**	**150**				**3**
Total (Theory + Lab)		**315**	**435**	**750**				**21**

Semester–V

Theory Courses:

Course Code	Title	Marks Distribution			Hours/ week			Credits
		IA	UE	Total Marks	L	T	P	
PCC-CE-521	Geo-technical Engineering	40	60	100	2	1	0	3
PCC-CE-522	Environmental Engineering	40	60	100	2	1	0	3
PCC-CE-523	Design of Concrete Structures	40	60	100	2	1	0	3
PCC-CE-524	Concrete Technology	40	60	100	2	1	0	3

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PCC-CE-525	Hydrology & Water Resources Engineering	40	60	100	2	1	0	3
OEC-CE	OEC-I	40	60	100	2	1	0	3
Total		**240**	**360**	**600**				**18**

Lab Courses:

PCC-CE-531	Industrial Training	25	-	25	0	0	0	1
PCC-CE-532	Geo-technical Engineering Lab	25	25	50	0	0	2	1
PCC-CE-533	Environmental Engineering Lab	25	25	50	0	0	2	1
PCC-CE-534	Civil Engineering Material Lab	25	25	50	0	0	2	1
Total		**100**	**75**	**175**				**4**
Total (Theory + Lab)		**340**	**435**	**775**				**22**

List of courses in Open Elective Course-I (OEC-I)	
OEC-CE-581/PCC-ITE-322	Operating System
OEC-CE-582/PCC-ITE-324	Object Oriented programming System using java
OEC-CE-583PCC-EE-521	Power System-I
OEC-CE-584/PEC-ECE-522	Electronic multimedia Engineering
OEC-CE-585/PCC-CSE-321	Data Structure using c

Semester–VI

Theory Courses:

Course Code	**Title**	**Marks Distribution**			**Hours/ week**			**Credits**
		IA	**UE**	**Total Marks**	**L**	**T**	**P**	
PCC-CE-621	Transportation Engineering	40	60	100	2	1	0	3
PCC-CE-622	Irrigation Engineering	40	60	100	2	1	0	3
PCC-CE-623	Advance Structure Design	40	60	100	2	1	0	3
PEC–CE	PEC-I	40	60	100	2	1	0	3
PEC-CE	PEC-II	40	60	100	2	1	0	3
OEC-CE	OEC-II	40	60	100	2	1	0	3
Total		**240**	**360**	**600**				**18**

Lab Courses:

PCC-CE-631	Transportation Engineering Lab	25	25	50	0	0	2	1

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PCC-CE-632	Survey Camp	50	50	100	0	0	4	2
Total		**75**	**75**	**150**				**3**
Total (Theory + Lab)		**315**	**435**	**750**				**21**

List of courses in Professional Elective Course-I (PEC-I)	
Course Code	**Course Title**
PEC-CE-661	Construction Engineering and Management
PEC-CE-662	Pavement Material and Geometric Design of Highway
PEC-CE-663	Advance Soil Mechanics
PEC-CE-664	Design of Hydraulic Structures
PEC-CE-665	Rural Water supply
PEC-CE-666	Remote sensing & GIS
List of courses in Professional Elective Course-II (PEC-II)	
Course Code	**Course Title**
PEC-CE-667	Engineering Geology
PEC-CE-668	Professional Practice Law and Ethics
PEC-CE-669	Construction Practice and Project Planning
PEC-CE-670	Industrial Waste Treatment
PEC-CE-671	Highway Construction and Pavement Design
PEC-CE-672	Tunnel Engineering
List of courses in Open Elective Course-II (OEC-II)	
Course Code	**Course Title**
OEC-CE-681/PCC-IT-421	Data Base Management System
OEC-CE-683/PCC-EE-423	Electrical Measurement-I
OEC-CE-684/PCC-CSE-622	Computer Graphics &Multimedia
OEC-CE-685/PCC-EE-421	Renewable Energy Sources
OEC-CE-686/PEC-EE-622	Energy Audit & Management
OEC-CE-687/PCC-ECE-423	Analog Communication system
OEC-CE-688/PCC-ECE-627	Non-Conventional Energy Sources

Semester–VII

Theory Courses:

Course Code		**Marks Distribution**	**Hours/ week**	**Credits**

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	Title	IA	UE	Total Marks	L	T	P	
PROJ-CE-721	Major Project-I	40	60	100	0	0	3	3
PCC-CE-722	Design of Steel Structure	40	60	100	2	1	0	3
HSMC-CE-723	EDM	40	60	100	2	1	0	3
PEC-CE	PEC Elective-III	40	60	100	2	1	0	3
PEC-CE	PEC Elective-IV	40	60	100	2	1	0	3
OEC-CE	Open Elective-III	40	60	100	2	1	0	3
Total		**240**	**360**	**600**				**18**

Lab Courses:

PCC-CE-731	Industrial Training	25	-	25	0	0	2	1
PCC-CE-732	STAAD Pro /CAD Lab	25	25	50	0	0	2	1
PCC-CE-733	Seminar	50		50				1
Total		**100**	**-**	**125**				**3**
Total (Theory + Lab)		**340**	**385**	**725**				**21**

List of courses in Professional Elective Course-III (PEC-III)	
Course Code	**Course Title**
PEC-CE-761	Foundation Engineering
PEC-CE-762	Construction Equipment and Automation
PEC-CE-763	Open channel Flow
PEC-CE-764	Rural Construction Technology
PEC-CE-765	Structural Dynamics
PEC-CE-766	Port and Harbour Engineering
PEC-CE-767	Ground Improvement Techniques

List of courses in Professional Elective Course-IV (PEC-IV)	
Course Code	**Course Title**
PEC-CE-768	Prestressed Concrete and Bridge Design
PEC-CE-769	Traffic Engineering and Management
PEC-CE-770	Air and Noise Pollution and Control
PEC-CE-771	Rock Mechanics

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PEC-CE-772	Flood Control and River Engineering
PEC-CE-773	Transport Planning and Management
PEC-CE-774	Solid and Hazardous Management
List of courses in Open Elective Course-III (OEC-III)	
OEC-CE-781/PEC-ECE-727	Optical Communication
OEC-CE-782/PCC-CSE-325	Digital Logic Design
OEC-CE-783/PCC-CSE-523	Java Programming
OEC-CE-784/PEC-CSE-521	Data warehousing & Data Mining
OEC-CE-785/PCC-EE-324	Electrical Engineering Material

Semester–VIII

Theory Courses:

Course Code	Title	Marks Distribution			Hours/ week			Credits
		IA	UE	Total Marks	L	T	P	
PROJ-CE-821	Major Project-II	250	200	450	0	0	12	6
PEC-CE	PEC Elective-V	40	60	100	2	1	0	3
PEC-CE	PEC Elective-VI	40	60	100	2	1	0	3
Total		**330**	**320**	**650**				**12**

List of courses in Professional Elective Course-V (PEC-VI)	
Course Code	**Course Title**
PEC-CE-861	Advance Structure Design
PEC-CE-862	Earthquake Engineering
PEC-CE-863	Ground Water Hydrology
PEC-CE-864	Architecture and Town Planning
List of courses in Professional Elective Course-VI (PEC-VII)	
Course Code	**Course Title**
PEC-CE-865	Geographical Information System and Science
PEC-CE-866	Structural Geology
PEC-CE-867	Water Resources Field Methods
PEC-CE-868	Environmental Impact Assessment

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Department of Civil Engineering

Semester-I

Course Title: Mathematics-I **Max. Marks: 100**
Course Code: BSC-CE-121 **University Exam: 60**
Duration of Exam: 3 Hours **Internal Assessment: 40**
Credits: 4 [3-1-0]

COURSE OBJECTIVE: The course is designed to impart elementary knowledge of theory of calculus, linear algebra and sequence & series to engineering students that will serve them to solve various engineering problems.

UNIT-I DIFFERENTIAL CALCULUS: Rolle's Theorem, Mean value theorems, indeterminate forms and L'Hospital's rule; Successive differentiation and Leibnitz's theorem, Taylor's and Maclaurin's series of function of single variable, Expansion of functions of single variable.

UNIT-II

MULTIVARIABLE CALCULUS (DIFFERENTIATION): Limit, continuity and partial derivatives, physical significance of partial derivative, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, directional derivatives, curl and divergence.

UNIT-III

INTEGRAL CALCULUS: Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

UNIT-IV

SEQUENCES AND SERIES: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT-V

MATRICES: Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigen values and Eigen vectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

COURSE OUTCOMES: Upon the successful completion of the course, the student will be able to:

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1. Understand the significance of Rolle's Theorem, Mean Value theorem, Taylor's and Maclaurin's series for differentiable functions.
2. Identify the extreme of a function on an interval and classify them as minima, maxima or saddles using the first derivative test.
3. Use basic the integral rules to evaluate both definite and indefinite integrals and apply the same to find areas and volume of revolutions. Apart from these, they have a basic understanding of Beta and Gamma functions.
4. Apply the tools of power series and Fourier series to deal with functions of several variables that are essentials in most branches of engineering.
5. Learn the essential tools of matrices and linear algebra in a comprehensive manner.

TEXT BOOKS

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 2.
D. Zill, Advanced Engineering Mathematics, Jones & Bartlett
3. N. Piskunov, Differential & Integral calculus, Vol-I & II.
4. Jain &Iyengar, Advanced Engineering Mathematics, Narosa Publishers

REFERENCE BOOKS

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The student has to attempt five questions, selecting one from each Unit.

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Semester-I

Course Title: Basic Electrical Engineering **Max. Marks: 100**
Course Code: ESC-EE-121 **University Exam: 60**
Duration of Exam: 3 Hours **Internal Assessment: 40**
Credits: 4 [3-1-0]

Course Objective: The course has been designed to provide basic knowledge to the students about the principles of electric circuit analysis, electromagnetism and transformers.

Detailed Contents:

Unit-I

Review of Electric Circuits: Basic Electrical circuit terminology, concept of charge and energy, circuit parameters (resistance, inductance. Capacitance), ohm's law, Kirchhoff's current law (KCL), Kirchhoff's voltage law (KVL), series and parallel combinations of resistance, inductance & capacitance. Ideal and practical voltage & current sources and their transformations, dependent voltage and current sources.

Unit-II

D.C Circuit Analysis: Power & energy relations, analysis of series parallel DC circuits, Star-Delta transformations (ΔϒY), Loop & Nodal methods, Network Theorems: Thevenin's, Norton's, Maximum Power Transfer and Superposition Theorems (D.D Analysis only).

Unit-III

A.C. Circuit Analysis: Basic terminology and definitions, phasor and complex number representations, power energy relations in AC circuits, application of Network Theorems to AC circuits ,Resonance in series and parallel circuits, Concepts of active & reactive powers, Introduction to 3 phase circuits.

Unit-IV

Electromagnetism: Review of Fundamentals of Electromagnetism, Ampere's Law, analogies between electric circuits and magnetic circuits, Faraday's laws of electromagnetic induction, direction of induced emf, Lenz's law, magnetic saturation and leakage fluxes.

Unit-V

Basic Electrical Installations: Transformers: Concept of Inductance, Self & Mutual Inductance, Conventions for magnetically coupled circuits, Transformers: introduction, classification & construction of single phase transformer, emf equation and phasor diagrams.

Course Outcome:

At the end of this course, students will demonstrate the ability

1. To understand the concepts and applications of different laws used in the networks and circuits.
2. To study and analyze the D.C. Circuit and A.C. Circuit with different theorem.
3. To study the concepts related to electromagnetism.

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4. To understand the principle and working of transformers.
5. To study and understand different types of electrical installations.

Text Books/ References:

1. **V. D. Toro**, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
2. **L. S. Bobrow**, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. **E. Hughes**, "Electrical and Electronics Technology", Pearson, 2010.
4. **D. P. Kothari and I. J. Nagrath**, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
5. **D. C. Kulshreshtha**, "Basic Electrical Engineering", McGraw Hill, 2009.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

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Semester-I

Course Title: Engineering Chemistry **Maximum Marks: 100**
Course Code: BSC-CE-122 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 4 [3-1-0]

COURSE OBJECTIVE: The course is designed to familiarizing the students of engineering with Water treatment, polymerization, photochemistry, corrosion and transition metal chemistry.

UNIT-1
WATER TREATMENT: Water quality measurement, Hardness of water, Estimation of hardness of water, Disadvantages of hard water ,Scale and sludge formation; disadvantages, prevention and treatment, Desalination method, reverse osmosis ,Electro dialysis, Domestic water treatment.

UNIT-2
POLYMERISATION: Basic concept of polymerisation, Broad classification and industrial applications (Buna-N, Buna-S, Polyester, Polyethene, Polypropene, Polystyrene,), Thermosetting plastic and its softening, Biodegradable and non-biodegradable wastes.

UNIT 3
PHOTOCHEMISTRY: Photo excitation, Luminescence and types, Norrish-I and Norrish-II reactions, Application examples of photolysis, Photosynthesis Z –Diagram, Chemistry of vision, MRI equipment and procedure of working.

UNIT-4
TRANSITION METAL CHEMISTRY: Structure of organic compounds up to coordination no 6, Isomerism (geometrical, optical, ionisation, linkage and coordination isomerism, bonding in coordination compounds by CFT, VBT. Application of coordination compounds in organic synthesis and Medical fields.

UNIT 5
CEMENT AND LIME: Introduction and types of cement, Manufacture of Portland Cement, Setting and hardening of cement, Introduction and properties of Lime, Setting and hardening of lime.

COURSE OUTCOME: At the end of course, the student will be able to

1. Apply the methods to produce soft water for industrial use and potable water at cheaper cost.
2. Substitute metals with conducting polymers and also produce cheaper bio-degradable polymers to reduce environmental pollution,
3. Apply knowledge about photochemical and photo physical processes and the reactivity of excited states to explain applications in photochemical energy conversion.
4. Understand structure of organic compounds and transition metal compound synthesis,
5. Understand the manufacturing process of cement and lime.

BOOKS RECOMMENDED:

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HoD CE

Mr. Vaseem Shahnaz
A.P CE

Mr. Zishan Aslam
A.P CE

Prof. Asif Hussain
Dean SoET

1. Odion G.G-Principles of Polymerisation, John Wiley and sons.
2. S.S Dara-A Text Book of Engg. Chemistry.
3. B.Sivasankar-Engineering Chemistry, Tata Mc Graw Hill Publication.
4. S.Chand-Practical Manual for Engineering Chemistry.

Note for Paper Setter: The Question paper shall comprise of 10 questions. Two questions will be set from each Unit .The student has to attempt five questions
stations at least one from each Unit

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Semester-I

Course Title: Engineering Physics **Maximum Marks: 100**
Course Code: BSC-CE-123 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 4 [3-1-0]

COURSE OBJECTIVE: To acquaint students with the fundamentals of vibrations, acoustics and ultrasonic and how they help in mankind by using engineering skills.

UNIT-I

WAVES, OSCILLATIONS AND INTRODUCTION TO ACOUSTICS: Wave motion, its types, Equations of wave motion, Energy and Intensity of a progressive wave, Introduction to ultrasonic waves, magnetostriction and piezoelectric effect, productions of ultrasonic waves, their detections and applications. A brief introduction to the acoustics of a hall, factors affecting the acoustics of the buildings, Reverberation Period, Sabine's Formula for calculating Reverberation Time.

UNIT-II

ELECTROSTATICS IN A LINEAR DIELECTRIC MEDIUM & MAGNETOSTATICS: Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field. Magnetostatics: Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

UNIT-III

QUANTUM MECHANICS FOR ENGINEERS: Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets.

UNIT-IV

APPLYING THE SCHRODINGER EQUATION: Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator.

UNIT-V

OPTICS: Interference: Introduction, Interference due to division of wave front: Fresnel's Biprism, Interference due to division of amplitude: wedge shaped film, Newton's rings. Diffraction: Introduction, Difference between Fresnel and Fraunhofer diffraction, Single slit diffraction, Transmission diffraction grating, Absent spectra. Spontaneous and stimulated emissions, Einstein's coefficients, Laser and its principle, He-Ne laser.

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COURSE OUTCOMES: At the end of course, the student will be able to

1. Understand the importance of Applied Physics in describing the technology we are using today in different engineering fields
2. Acquired knowledge of Waves, Vibration and acoustics.
3. It helps the students to develop the acoustically good hall.
4. Knowledge of basic Quantum Mechanics can help the students for further research applications as they can be applied to any quantum, mechanical situation to find energy, momentum etc.
5. Acquired knowledge of Optics help the students to know more about propagation of light and wave optics.

SUGGESTED REFERENCE BOOKS:

1. **Pathania K. S. &Khera S. K.,** Waves and Vibration, 2.
Beiser, **Arthur**, Concepts of Modern physics, TMH.
3. **Rangwala** and **Mahajan**, "Electricity and Magnetism", Tata McGraw Hill, 1998
4. **Ghatak A. K., Dass P.,** Laser theory & application of ultrasonic waves,
5. **David J. & Cheek**, Fundamentals and application of ultrasonic waves,
6. **Avadhanulu M. N. &Khsirsagar P. G.,** Engineering Physics (S. Chand & Co.)
7. **Vijaya K. K., Chandralingam S.,** Modern Physics, S. Chand & Co. Ltd, New Delhi
8. **Mani and Mehta**, G.K. "Modern Physics", Affiliated East-West Press Pvt. Ltd., 1998.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student must attempt five questions at least one from each unit.

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Department of Civil Engineering

Semester-I

Course Title: Environmental Science

Maximum Marks: 100

Course Code: MC-CE-121
University Examination: 60

Duration of Exam: 3 hours
Internal Assessment: 40

Credits: 0 [0-0-0]

COURSE OBJECTIVE: This course is designed to make the engineering students to understand the significance of environment and ecology in human survival and growth. It also aims to connect the budding engineers to nature.

UNIT-I

ELEMENTS OF ECOLOGY: Definition, Scope and basic principles of ecology and environment. Biological levels of organization, population, community, ecosystem and biosphere. Climatic factors - Solar radiations, temperature, water and precipitation.

UNIT-II

ENVIRONMENTAL POLLUTION: Types of pollution, Air pollution, Noise pollution, Water pollution, Soil pollution, Thermal pollution, Radiation pollution

UNIT-III

BIOGEOCHEMICAL CYCLES: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Global Oxygen Cycles. Hydrological cycles.

UNIT-IV

SUCCESSION: Concepts of succession, Types of Succession, Trends in succession, Climax and stability, Co-evolution and group selection.

UNIT-V

MAJOR BIOMES OF THE WORLD: Characteristics of terrestrial fresh water and marine ecosystems; Forests, grasslands, lake, river and marine ecosystems of India.

COURSE OUTCOMES: Upon the completion of the course, students will able to:

1. Learn about the environment and ecology.

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2. Understand different types of pollution. Air, Noise, Water, Soil, Thermal and Radiation pollution.
3. Understand biogeochemical cycles and human contribution in it.
4. Learn succession and various types of succession.
5. Demonstrate the ability to understand the biomes of world and its importance in human survival.

Books Suggested:

1. J.S.Singh, S.P. Singh and S.R. Gupta. 2008. Ecology, Environment and Resource Conservation. Anamaya Publications (New Delhi).
2. S.C. Santra. 2011. Environmental Science. New Central Book Agency.
3. M.H. Rao and H.V.H. Rao. 1998. Air Pollution. Tata McGraw Hill Publication.
4. V.P. Kudesia. 1997. Air Pollution. PragatiPrakashan.

Note for Paper Setter: The Question paper shall comprise of 10 questions. Two questions will be set from each Unit .The student has to attempt five questions at least one from each Unit.

Department of Civil Engineering

Semester-I

Course Title: Computer Fundamental **Maximum Marks: 100**

Course Code: ESC-CE-122 **University Examination: 60**

Duration of Exam: 3 hours **Internal Assessment: 40**

Credits: 4 [3-1-0]

Course Objective: This course is provided aiming to achieve a basic knowledge of computer and its programming among engineering students.

Unit-I

Introduction:

History and Generations of Computers, Classification and Applications of Computers. Computer Hardware: Components of a computer system, Input and Output devices, Memory Hierarchy, Primary and Secondary memory. Computer Software, System and Application Software, Utility Programs.

Unit-II

Operating systems:

Functions and types of O/S, DOS commands, BIOS, POST, Booting Process, Computer Virus, Types of Viruses, Use of Antivirus software.

Computer Languages (Machine, Assembly and High level languages), Translators (Assembler, Compiler and Interpreter). Introduction to algorithm and Flow chart:

Unit-III

Number System:

Data Representation, Binary, Decimal, Octal and Hexadecimal number systems, Inter conversion of number system, 1's compliment, 2's compliment, 9's compliment, n's compliment. Logic Gates, Boolean algebra, alphanumeric representation, fixed point representation.

Unit-IV

Networking: Introduction to networking, Applications, types of computer networks, Network Topology, LAN, MAN, WAN. Networking devices: Hub, switch, router, repeater, and gateway. History of Internet, Internet, extranet and intranet, WWW, E-mail, ISPs, surfing, phishing.

Unit-V

Introduction to HTML: Introduction to HTML. Working of HTML, Creating and loading HTML page, tags, Structure of HTML, Document, Stand Alone Tags, Formatting text, Adding Images, Creating hyper Links, Tables, Sending E-mails through Web Page, Sample web pages.

Course Outcomes:

1. Know the basic components of the computer and working of each device.
2. Understand the functions of Operating System, softwares and DoS Commands.
3. Understand the representation of data in computer.
4. Know the fundamentals of Computer Networking.
5. Know the basics of HTML.

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Text Books:

1. **Peter Norton**, Introduction to Computers, TMH.
2. **Sanjay Toledo Mata**, A First Course in Computers, TMH.

Reference Books:

1. **Rajaraman,** Introduction to Digital Computer Design, Prentice Hall India.
2. **Bartee, Thomas,** Digital Computer Fundamentals, TMH.

Note for Paper Setter: -The Question paper shall comprise of 10 questions. Two questions will be set from each Unit .The student has to attempt five questions at least one from each Unit.

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Department of Civil Engineering

Semester-I

Course Title: Basic Electrical Engineering Lab
Course Code: ESC-CE-131
Duration of Exam: 2 hours

Maximum Marks: 50
University Examination: 25
Internal Assessment: 25
Credits: 1 [0-0-2]

Course Objective: The lab has been designed to provide and implement basic knowledge about the principles of electric circuit analysis, electromagnetism and transformers to the students.

List of experiments:

1. Introduction to Circuit Elements.
2. Verification of Ohms Law.
3. Verification of Kirchhoff's Current and Voltage Law (KCL & KVL)
4. Verification of Thevenin's Theorem & Norton's Theorem.
5. Transformation of Star & Delta Networks.
6. Measurement of Power using 2-Wattmeter method.
7. Verification of Superposition Theorem.
8. Verification of reciprocity theorem.
9. To plot the Resonance curve for a Series & Parallel Resonance.
10. Determination of resonance frequency using LCR Meter.

Laboratory Outcomes

1. To study and analyze different circuit elements.
2. To study and implements different laws and theorems of electrical circuits.
3. To make the students aware about the principles and applications of basic electrical laws.
4. To measure the power using two wattmeter method.
5. To study and analyze the phenomenon of Resonance in Series and Parallel circuits

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

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Semester-I

Course Title: Engineering Chemistry Lab
Course Code: BSC-CE-131
Duration of Exam: 2 hours

Maximum Marks: 50
University Examination: 25
Internal Assessment: 25
Credits: 1 [0-0-2]

COURSE OBJECTIVE: The course is designed to provide experimental foundation for the scientific method for analysis, synthesis and determination of various chemicals.

LIST OF EXPERIMENTS:

1. Acid Base Titrations.
2. Viscosity of Solutions, Determination of composition of sugar solutions from Viscosity.
3. Synthesis of Aspirin.
4. Determination of Functional Groups in Organic Compounds.
5. Synthesis of p-Nitro Aniline from Acetanilide.
6. Conductometric Titrations.
7. Determination of Proteins in given sample of Food.
8. Determination of Flash and Fire Point of a Lubricant.

Laboratory Outcomes

At the end of practical course the students will be familiarized about

1. Titrations and Synthesis of organic compounds,

2. Students are able to determine protein

3. Students are also known to viscosity of solutions

4. Able to know temperature dependent properties of lubricant.

5. Have knowledge of flash and fire point

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Semester-I

Course Title: Engineering Physics Lab **Maximum Marks: 50**
Course Code: BSC-CE-132 **University Examination: 25**
Duration of Exam: 2 hours **Internal Assessment: 25**
Credits: 1 [0-0-2]

Lab. Objective: The course is designed to provide experimental foundation for the theoretical concepts and to familiarize students with experimental apparatus, the scientific method and method of data analysis.

List of Experiments: (Perform any 08) 1.
Measurement of Resistance.
2. Measurement of e/m by Helical method/Thomson's method.
3. Determination of Resistivity of a given wire.
4. Determination of Band Gap of a semiconductor.
7. To determine the refractive index of the prism material using spectrometer.
8. To determine Young's modulus of a bar. 9. To determine the wavelength using Fresnel's bi-prism/diffraction grating. 10. To Determine Plank's Constant.
11. Verify the Stefan's law by incandescent lamp
12. To determine the susceptibility of a ferromagnetic material
13. Study of nano TiO2 solar cell
14. Ultrasound measurement a given liquid
15 Joule's constant experiment
16. Determination of unknown capacitance of a capacitor by de-Sauty bridge method.
17. Refractive index of a glass slab/ water by travelling microscope
18. To determine the frequency of an ac supply by using electrical vibrator
19. To find the inner and outer diameter of a hollow cylinder by using Vernier caliper.
20. To determine the diameter of a thin wire by using screw gauge and its area of crossection.
21. Measurement of 'g' and Time period by using compound pendulum. 22. To find the viscosity of a liquid using stoke's method.

Laboratory Outcomes: On Completion of this course, students are able to –

1. Develop skills to impart practical knowledge in real time solution.
2. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
3. Design new instruments with practical knowledge.
4. Gain knowledge of new concept in the solution of practical oriented problems and to understand more deep knowledge about the solution to theoretical problems.
5. Understand measurement technology, usage of new instruments and real time applications in engineering studies.

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Semester-I

Course Title: Engineering Graphics **Maximum Marks: 100**
Course Code: ESC-CE-132 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3 [1-0-4]

Lab. Objective: The course is designed to develop the ability to visualize and communicate three dimensional shapes and train the students to create drawings following the engineering graphics conventions.

UNIT-I

INTRODUCTION TO ENGINEERING GRAPHICS: Engineering drawing as language of Engineers. Drawing instruments and their uses. Projections: The planes of projections, first and thirdangle projections, projection of points lying in any quadrant. Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute;Scale: needs and importance, to find representative factor of a scale, drawing of simple and diagonal scales.

UNIT-II

PROJECTION OF STRAIGHT LINE AND THEIR TRACES: projection of planes. Planes parallel to reference plane; plane perpendicular to both reference planes; planes perpendicular to one and inclined to other reference plane. Projection of solids with their axes perpendicular or inclined to one reference plane but parallel to other.

UNIT-III

SECTION OF SOLIDS & DEVELOPMENT OF SURFACES: Definition of sectioning and its purpose, Procedure of sectioning, Illustration through examples, types of sectional planes.sectional orthographic views of geometrical solids, Purpose of development, , Development of prism, cylinder, cone and pyramid surface

UNIT-IV

ORTHOGRAPHIC PROJECTIONS: Theory of orthographic projections (Elaborate theoretical instructions) Drawing 3 views of given objects (Non symmetrical objects and blocks may be selected for this exercise) Exercises on both first angle are third angle.

UNIT-V

ISOMETRIC PROJECTION: Classification of pictorial views, Basic Principle of Isometric projection, Isometric Views of lines, Planes, Simple and compound Solids;, Difference between isometric projection and Isometric view, Isometric projection of solids such as cube, prism, pyramid and cylinder. Introduction to computer aided drafting (CAD)

Lab. Outcomes: On completion of course students must be able

1. To read Engineering Drawing and execute the construction work with the help of available drawing

2. To represent three dimensional objects by two dimensional views.
3. Students must be in a position to show hidden details of objects or underground constructions work by drawing sectional views.
4. Exposure to creating working drawings
5. Exposure to the visual aspects of engineering design

TEXT BOOKS:

1. Bhat, N. D. & Panchal, V. M, *Engineering Drawing*, Charotar Publishers, Anand.
2. Narayana, K. L. &Kannaiah P, *Engineering Graphics*, Tata McGraw Hill, New Delhi.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education 4.Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.

REFERENCE BOOKS:

1. Gill P. S., *Engineering Graphics and Drafting*, Katria and Sons, Delhi.
2. Luzzadde Warren J., *Fundamentals of Engineering Drawing*, PHI.

Note for paper setter: The Question paper shall comprise of 10 questions and two questions shall be set from each Unit. The student has to attempt five questions, selecting one from each Unit. Questions must be set in such a way that the students be able to answer 5 questions within 3 hours

Semester-I

Course Title: Induction Program **Maximum Marks: 0**
Course Code: MC-CE-111 **University Examination: 0**
Credits: 0 [0-0-0] **Internal Assessment: 0**

Induction program

Induction program for students to be offered right at the start of the first year. It should include but not limited to following Activities

1. Physical activity
2. Creative Arts
3. Universal Human Values
4. Literary
5. Proficiency Modules
6. Lectures by Eminent People
7. Visits to local Areas
8. Familiarization to Dept./Branch & Innovations

Semester-I

Course Title: Computer Fundamentals Lab **Max. Marks: 50, Credits: 1[0-0-2]**

Course Code: ESC-CSE-133 **University Examination: 25**

Duration of Exam: 2 hours **Internal Assessment: 25**

Lab. Objective: The lab has been designed to provide and implement basic knowledge about the computer fundamentals to the students.

List of Experiments:

1. Experiments on dismantling of PC.
    a. Dismantling the system unit, recognize all major components inside a PC, describe function of each component and define the relationship of internal components.
2. Perform these DOS commands
    a. Internal commands.
    DIR, TYPE, DEL, ERASE, MD, CD, COPY, RMDIR, VER, DATE, TIME, PATH, CLS, RMDIR, VER, DATE, TIME, PATH, CLS, BREAK, SET, EXIT.
    b. External commands.
    APPEND, CHKDISK, ATTRIB, SYS, EDIT.
3. Experiments on system utilities
    a. Explore and describe some system utility like regedit, memory partioning, control panel, window tools.
4. MS-Word: Introduction, Starting MS-Word, MS-Word Screen and its Components, Elementary Working with MS-Word.
5. MS-Excel: Introduction, Starting MS-Excel, Basics of Spreadsheet, MS-Excel Screen and Its Components, Elementary Working with MS-Excel.
6. Create a spreadsheet of students, which contains marks obtained by students of a class in different subjects and then calculate maximum, minimum, average and sum of marks in each subject. Also calculate % of each student using functions and formulas in MS-Excel also draw pie chart and bar graph also.
7. MS-PowerPoint: Introduction, Starting MS-PowerPoint, Basics of PowerPoint, MS-PowerPoint Screen and Its Components, Elementary Working with MS-PowerPoint.
8. Make a simple presentation on your college, use 3D effects, animation on network topologies.
9. Create HTML pages for your business website.
10. Create HTML pages showing timetable of trains departing from Jammu-Tawi railway station.
11. Create web pages for your college.

Lab Outcomes: Upon the completion of course, the students will be able to:

1. Working on various Operating Systems and their usage
2. Understand and use MS-Office to create documents
3. Understand the basic DoS Commands
4. Recognize Hardware components and their assembly
5. Install Operating system on Hardware and working on HTML

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Semester-II

Course Title: Mathematics-II **Maximum Marks: 100, Credits: 04[3-1-0]**
Course Code: BSC-CE-221 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**

Course Objective: This course is designed to impart advanced knowledge of multivariable integration, theory of differential equations and complex variable to engineering students that will serve them to solve real life engineering problems.

Unit- I

Multivariable Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, spheres and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes' (without proofs).

Unit- II

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Second order linear differential equations with variable coefficients, method of variation of parameters.

Unit- III

Partial Differential Equations: Partial differential equations and its formation, Linear and non-linear partial differential equations of first order and their solutions, Charpit's method, Lagrange's method, Homogenous and non-homogenous linear partial differential equations with constant coefficients and their solutions, Applications of Partial Differential Equations with initial and boundary conditions, Solution by the method of separation of variables.

Unit- IV

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Unit- V

Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem (without proof) and Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

Course Outcomes: Upon the completion of this course, the students will be able to:

1. Compute double and triple integrals over rectangular and spherical domains and memorize important theorems: Green, Gauss divergence and Stokes with their applications in various engineering problems.
2. Distinguish between linear and non-linear equations. Recognize and solve equations of Bernoulli, Euler and Clairaut.
3. Solve partial differential equations of various kinds and apply the same to solve problems of real world.
4. Understand the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations and conformal mapping.

5. Apply the Cauchy Residue theorem to evaluate definite integrals, compute the Taylor and Laurent expansions of simple functions and determine the nature of the singularities and calculating residues.

Text Books

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **D. Zill,** Advanced Engineering Mathematics**,** Jones & Bartlett.
3. **N. Piskunov,**Differential& Integral calculus, Vol-I & II
4. **Jain &Iyengar**, Advanced Engineering Mathematics, Narosa Publishers

Reference Books

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
4. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
   J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004

Note for Paper Setter: -The Question paper shall comprise of 10 questions. Two questions will be set from each Unit .The student has to attempt five questions at least one from each Unit.

SEMESTER-II

Course Title: Basic Electronics Engineering **Maximum Marks: 100**
Course Code: ESC-CE-221 **University Examination: 60**
Duration of Exams: 3 hours **Sessional Assessment: 40**
Credits: 3 [2-1-0]

Course Objective: This course aims to provide students with solid background of semiconductors and some basic solid state electronic devices used in circuits.

Unit-I

Semiconductors: Classification of materials and energy band diagram, Semiconductor types, Energy band diagram for Semiconductors, Drift and Diffusion Current, Mass Action Law, Charge Neutrality equations, Current density and Conductivity, Hall Effect.

Unit-II

P-N Junction and applications: Basic structure, PN junction Diodeand Characteristics, Current components in p-n junction, temperature dependence, equivalent circuits. Rectifiers, half wave, full wave rectifiers, bridged rectifiers (efficiency, ripple factor). Clipping and clamping circuits. Basic operations of Zener, Avalanche and Photo Diodes.

Unit-III

Transistors: Types of transistors, operation& characteristics, CE, CB and CC configurations, Input output characteristics, biasing and bias stability, use of transistor as an amplifier and switch.

Unit-IV

Junction Field Effect Transistors: Operation and characteristics. JFET configurations and biasing. JFET as amplifier

Unit-V:

MOSFET: Types (Depletion and Enhancement), Operation and Characteristics (no derivation), Introduction to MOSFET Scaling and types, Introduction to Short-Channel Effects (V_{TH} roll-off, DIBL, Hot-carrier injection)

Course outcomes: At the end of the course, the student will be able to

1. Describe the energy bands and the scientific principles behind controlled conductivity in semiconductors.
2. Analyze the working of PN junction diode and apply diode in various applications such as rectifiers and other wave shaping circuits.
3. Analyze the working of the traditional transistor BJT and as well as the concept of biasing.
4. Understand the operation of MOSFET and various issues of scaling in MOSFET.
5. Design basic analog circuits

Text Books:

1. **Millman&Halkias**, Integrated Electronics, TMH
2. **BoylestadandNashelky,** Electronic Devices & Circuits, PHI.

Reference Books:

1. **Floyd T. L.,** Electronic Devices, Pearson Education.
2. **Mehta V. K.**, Electronic Devices, S. Chand and Sons, New Delhi
3. **Sedra& Smith,** Microelectronic Circuits,Oxford Printing Press.

Note for Paper Setter: The Question paper shall comprise of 10 questions. Two questions will be set from each Unit .The student has to attempt five questions at least one from each Unit

SEMESTER-II

Course Title: Mechanics of Materials **Maximum Marks: 100**
Course Code: ESC-CE-222 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0]

Objective: This course has been designed to make the students acquainted about forces and its effects, kinematics and statics.

UNIT-I
Two Dimensional force System:
Basic Concepts, principal of transmissibility, resultant of a force System, Free body Diagrams, Equilibrium and equation of equilibrium Applications. Moment of a force about a point, Varrigon theorem, friction, law of friction, equilibrium of body lying on horizontal and inclined plane. Ladder friction applications.

UNIT-II
Member forces in Trusses:
Planer truss structure, trust joint identification, strategy for planer truss analysis, Statistical determinacy and stability of planer trusses. Numerical truss analysis (Method of joints and method of sections)

UNIT-III
Centroid and Centre of gravity:
Centroid and moment of inertia; centroid of plane area and solid bodies. Moment of inertia of plane area. Theorem of parallel axis, Theorem of perpendicular axis, radius of gyration composite ideas

UNIT-IV
Analysis of stress and strains:
Forces and stress normal stress and strain under axial loading, ultimate and allowable stresses, mechanical properties, Hooke's law, modulus of elasticity. Factor of safety, deformation of members under axial loading, thermal stresses, Poisson's ratio multi axial loading, bulk modulus, shearing Strain, Relation among shear modulus, Young's Modulus and Bulk Modulus.

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

Course Out-come: Upon successful completion of the course, student should be able to:

1. Understand and determine the engineering properties for metals and non-metals.
2. Understand basic concepts of centroid and center of gravity of various sections and deformation in bars
3. To understand the various type of truss and their analysis by various method
4. To understand the principal stresses and strains and their transformation by analytical and graphical
5. Understand the concepts of shear force, bending moment, axial force for statically determinate beams

Text Books:

- Engineering Mechanics of Solids By E.P. Popov, Pearson Education.
- Solid Mechanics by S.M.A. Kazimi, TataMcGRAW HIL
- Mechanic of Materials by R.C. Hibbeler, Pearsons.

Reference Books:

- Mechanics of Materials by Beer &Jonhston, Dewolf, McGRAW HILL.
- Strength of Materials by S. Timoshenko
- Strength of Materials by R. K. Rajput

Note for Paper Setter: -The Question paper shall comprise of 10 questions. Two questions will be set from each Unit .The student has to attempt five questions at least one from each Unit.

SEMESTER-II

Course Title: Communication Skills **Maximum Marks: 100**
Course Code: HSMC-CE-221 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 2 [2-0-0]

Objective: This subject is designed to attain the general proficiency in English language for the engineering students.

UNIT-I

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives., Synonyms, antonyms, and standard abbreviations.

UNIT-II

Basic Writing Skills: Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.

UNIT-III

Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Articles, Prepositions, Redundancies and Clichés.

UNIT-IV

Describing, Defining, Classifying, Providing examples or evidence, writing introduction and conclusion.

UNIT-V

Writing Practices: Comprehension**,** Précis Writing**,** Essay Writing

Course Outcomes: Upon the completion of the course, the students will be able:

1. To acquire basic proficiency in English including reading, listening comprehension, writing and speaking skills.
2. To make the students authoritative in self-expression in their day to day life in this fast-changing world.
3. To identify the common errors involved in writing.
4. To understand the nature and style of sensible writing.
5. To write effective and coherent paragraphs.

TEXT BOOKS

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
4. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

REFERENCE BOOKS:

1. Practical English Usage. Michael Swan, OUP. 1995.
2. Remedial English Grammar, F.T. Wood, Macmillan.2007
3. On Writing Well, William Zinsser, Harper Resource Book. 2001
4. Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press, 2006.

SEMESTER-II

Course Title: C-Programming **Maximum Marks: 100**
Course Code: ESC-CE-223 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 4 [3-1-0]

Objective: This course is provided aiming to enhance the logical skills of engineering students with the basic programming concepts and implementation in C Programming.

UNIT I

Introduction to C Programming: Overview of programming languages, algorithms and flowcharts, History of C, Structure of a C Program, Compiling & Executing a C program. Constants, Variables and Data Types, Storage classes, Operators and Expressions, Data Input and Output.

UNIT II

Control Statements: Decision making and branching, IF statement, IF-ELSE statement, nested IF-ELSE statement, Switch statement, break statement, continue statement. Looping: while statement, do-while statement, for statement.

UNIT III

Introduction to arrays: One dimensional array, Two dimensional arrays and Multidimensional arrays, basic operations on arrays, strings, basic string operations**.**
User defined data types: Structure, Defining structures, Array of Structures, Introduction to Union and enumerated data types.

UNIT IV

Functions: Introduction to Function, Types of functions, function declaration, calling a function, passing arguments to functions, passing arrays to functions, Recursion.

UNIT V

Introduction to Pointers & Files: Operations on pointer, pointers & multidimensional arrays, pointers & character strings. Dynamic Memory Allocation in C: malloc, calloc, realloc and free functions. Introduction to File, Operations on files: open, close, read and write.

COURSE OUTCOMES:

The student will be able:

1. To translate the algorithms and flowcharts to programs (in C language) for execution.
2. To make the usage of various control statements for developing an efficient program to solve the problems.
3. To decompose a complex problem into functions for solving it efficiently.
4. To use the arrays and user defined data types for synthesizing a complete program.
5. To use pointers, files and dynamic memory allocations to perform several operations in programs.

Text Books

1. **Brian Kernighan and Dennis Ritchie**, The C Programming Language-2nd Edition, (Prentice Hall Software)
2. Yashavant P. Kanetkar **,** Let Us C, BPB Publication, 15th Edition.
3. **Gottfried**, Programming with C, TMH.

Reference Books

1. **E. Balaguruswamy**, Programming in ANSI C, Tata McGraw-Hill.
2. **Venugopal**, C Programming, TMH.
3. **Yashwant Kanitkar**, Pointers in C, TMH.

Note for Paper Setter: -The Question paper shall comprise of 10 questions. Two questionswill be set from each Unit. The student has to attempt five questions at least one.

Course Title: Indian Constitution

Maximum Marks: 100

Course Code:MC-CE-221 **University Examination: 60**

Duration of Exam: 3 hours **Internal Assessment: 40**

Credits: 0 [4-0-0]

OBJECTIVE: The basic purpose of this subject is to make a general awareness about our constitution.

UNIT I

Constitutional Framework: Historical Background, Making of the constitution, Salient features of the Indian Constitution, Preamble to the Constitution, Union and its territory, Citizenship, Fundamental rights, Directive principles of state policy, Fundamental duties, Amendment of the constitution, Basic structure of the constitution.

UNIT II

System Of Government: Parliamentary system, Federal System, Centre-state relations, Inter-state relations, Emergency provisions

UNIT III

Central Government: President, Vice-President, Prime Minister, Central Council of Ministers, Cabinet committees, Parliament, Parliamentary committees, Parliamentary forums, Supreme Court State Government: Governor, Chief Minister, State Council of Ministers, State legislature, High court,
Subordinate Courts, Special status of Jammu and Kashmir, Special provision for some states Local Government: Panchayati raj, Municipalities

UNIT IV

Constitutional Bodies: Election commission, Union Public service commission, State Public Service Commission, Finance Commission, National Commission for SC's, National Commission for ST's, Special officer for Linguistic minorities, Comptroller and auditor general of India, Attorney General of India, Advocate General of India.

UNIT V

Non-Constitutional Bodies: Planning Commission, National Development Council, National Human Rights Commission, State Human Rights Commission, Central Information Commission, State
Information Commission, Central vigilance Commission, Central Bureau of Investigation, Lokpal and Lokayuktas Other Constitutional Dimensions: Co-operative societies, Official Language, Public services, Tribunals, Rights and Liabilities of the Government, Authoritative text of the Constitution in Hindi Language, Special Provision relating to certain classes.

COURSE OUTCOME: Upon the completion of this, the students will able to know:

1. About the constitutional framework.
2. About the government system

3. Various type of government
4. About Constitutional bodies: Election commission, UPSC, SPSC, Commission for ST/SC and many others.
5. Non-constitutional bodies: Planning Commission, NDC, NHRC, SHRC, CBI, Vigilance Commission and other dimensions of constitution.

Books Recommended:

1. Indian Constitutional Law, M.P. Jain, 7th Edition
2. Introduction to the Constitution of India, B. K. Sharma, PHI

Note For Paper Setter: -The Question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-II

Course Title: Mechanics of Materials Lab **Maximum Marks: 50**
Course Code: ESC-CE-232 **University Examination: 25**
Duration of Exam: 2 hours **Internal Assessment: 25**
Credits: 1 [0-0-2]

Lab. Objectives: The objective of the Engineering mechanics Lab is to perform experiments which are related to Statics and Dynamics Loading in order to understand the behavior of different mechanical equipment's which students study in theory.

List of Experiments:

1. To conduct tensile test and determine the ultimate tensile strength, percentage elongation and reduction.
2. To conduct the compression test and determine the ultimate compressive strength for a specimen.
3. To determine centroid of Lamina.
4. To determine the hardness of a given specimen using vicker/brinel/Rockwell hardness testing machine.
5. To very Lami's theorem.
6. To verify polygon law of forces.
7. Friction experiment on inclined plane.
8. Experiment on screw Jack.
9. To verify reactions at the supports of a simply supported beam.
10. To determine moment of inertia of various shapes.

Lab. Outcomes: After the completion of lab course students will be-

1. Able to understand different engineering mechanics apparatus.
2. Able to understand the mechanical properties of materials.
3. Able to understand the moment of inertia of various shapes.
4. Get the practical idea of frictional forces.
5. Get working principle of screw jack.

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

SEMESTER-II

Course Title: Communication skills Lab **Maximum Marks: 50**
Course Code: HSMC-CE-231 **University Examination: 25**
Duration of Exam: 2 hours **Internal Assessment: 25**
Credits: 1[0-0-2]

Lab. Objective: The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

The following course content is prescribed for the English Language Laboratory sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

Lab. Outcomes: Upon the completion of the lab, the students will be able to:

1. Developing intellectual, personal and professional abilities.
2. On completion of the course, the students will be accurate in communication.
3. The students will be able to communicate effectively on complex engineering activities with the engineering community and with the society at large.
4. Able to comprehend and write effective reports and design documentation,
5. It will make effective presentations and give and receive clear instructions.

SEMESTER-II

Course Title: Basic Electronics Lab **Maximum Marks: 50**
Course Code: ESC-CE-231 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits: 1[0-0-2]

Lab. Objective: The course is designed to provide experimental foundation for the theoretical concepts and to familiarize students with basic electronic devices, their applications and characteristics.

List of Experiments:

1. To plot the Resonance curve for a series & parallel resonance.
2. To determine and plot operating characteristics of a PN junction diode.
3. To study the input / output waveforms of Half wave and bridge wave rectifiers.
4. To suppress the ripple in rectifiers using RC filters.
5. To study the clipper and clamper circuits.
6. To study the Zener characteristics and its application as voltage regulator
7. To plot characteristics of transistor in CE/CB configuration
8. To plot characteristics of a BJT.
9. To plot MOSFET characteristics.
10. To study frequency response of RC Coupled Oscillators.

Lab. outcomes: At the end of the course, the student will be able to

1. Describe the energy bands and the scientific principles behind controlled conductivity in semiconductors.
2. Analyze the working of PN junction diode and apply diode in various applications such as rectifiers and other wave shaping circuits.
3. Analyze the working of the traditional transistor BJT and as well as the concept of biasing.
4. Understand the operation of MOSFET and various issues of scaling in MOSFET.
5. Design basic analog circuits

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

SEMESTER-II

Course Title: C-Programming lab **Maximum Marks: 50**
Duration of Exam: 2 Hrs **Internal Marks: 25**
Course code: ESC-CE-233 **University Examination: 25**
Credits: 1[0-0-2]

Lab. Objectives: The course is designed to provide practical foundation for computer programming and to familiarize students with error handling in programming.

List of Experiments:

1. Familiarization with programming environment.
2. Basic programs in Sequential Statement in C
3. Simple computational problems using arithmetic expressions.
4. Problems involving if-then-else structures.
5. Iterative/looping problems e.g., sum of series.
6. Performing operations on 1D Array.
7. Performing operations on 2D Array.
8. Performing operations on String.
9. Programs on Function declaration, definition and calling.
10. Implementation of Mathematical function
11. Programming for solving Numerical methods problems.
12. Programs on Recursive functions.
13. Programs on Pointers and structures.
14. Programs on File operations.

Lab. Outcomes

1. To be able to correct syntax and logical errors as reported by the compilers and run time for basic programs.
2. To be able to write iterative as well as recursive programs using functions as well
3. To be able to represent data in arrays, strings and structures and manipulate through a program
4. To be able to declare pointers of different types and use them in defining self-referential structures.
5. To be able to create, read and write to and from simple text files.

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

SEMESTER-II

Course Title: Workshop Practice **Maximum Marks: 50**
Course Code: ESC-CE-234 **University Exam: 0**
Duration of Exam: 2 hours **Internal Assessment:50**
Credits 1(0-0-2)

Lab Objective: In this course the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

Laboratory Experiments

Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods

1. Fitting operations & power tools
2. Electrical & Electronics
3. Carpentry
4. Plastic moulding, glass cutting
5. Metal casting
6. Welding (arc welding & gas welding), brazing

COURSE OUTCOMES: Upon completion of this course, the students will:

1. Gain knowledge of the different manufacturing processes which are commonly employed in the industry.
2. Able to fabricate components using different materials.
3. Able to cast metal
4. Students again knowledge in wielding.
5. Students again knowledge in Fitting operation.

TEXT BOOKS:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., ―Elements of Workshop Technology‖, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, ―Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I‖ Pearson Education, 2008.

4. Roy A. Lindberg, Processes and Materials of Manufacture‖, 4th edition, Prentice Hall India, 1998.

5. Rao P.N., Manufacturing Technology, Vol. I and Vol. II, Tata McGrawHill House,

Note: Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

SEMESTER III

Course Title: Mathematics-III **Max. Marks: 100**
Course Code: BSC-CE-321 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credit 3(2-1-0)

Objective: The course is designed to provide basic knowledge of special functions and transform to engineering students.

Course Objective: The objective of this course is to familiarize the prospective engineers with standard concepts and techniques in continuous transform, discrete transform and statistical techniques that will serve them well in tackling the various problems in the discipline.

Unit-I

Integral Transform-I: Introduction, Laplace transform, Existence theorem, Propertiesand theorem of Laplace transform, Laplace transform of unit-step function, impulse function, periodic function and error functions, Inverse Laplace transform, Convolution theorem. Applications of Laplace transform in solving differential and integral-differential equations.

Unit-II

Integral Transform-II: Fourier integral, Fourier Sine and Cosine integrals, Complexform of Fourier integral, Fourier transform, Inverse Fourier transform, Fourier Sine and Cosine transforms, Properties of Fourier transform, Inverse Fourier transform, Convolution theorem, Parseval's identities for Fourier transforms, Fourier transform of the derivatives of a function, Applications of F-transform to Boundary Value Problems.

Unit-III

Z-Transform: Introduction and definition of z-transform, some standard forms, Linearity property, Damping rule Some standard results, shifting un to the right and to the left, Multiplication by n.Two basic theorems, Inverse Z-Transform, Convolution theorem, Application to difference equations.

Unit-IV

Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables,

Unit-V

Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares-fitting of straight lines, second degree parabolas.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Understand the basic concepts and techniques to solve Laplace transform and also learn to apply the same to solve various problems of engineering which are modeled through differential equations
2. Demonstrate the ability to understand the basic concepts and techniques to solve Fourier's transform and also learn to apply the same to find solutions of boundary value problems (BVP).
3. Apply the concepts of the z-transform in solving difference equations and other discreet signal system.
4. Learn the ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
5. Understand the basic ideas of statistics including measures of central tendency, correlation and regression and apply various statistical methods in engineering problems.

Text Books:

1. **Erwin kreyszig**, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **Ross, A:** First Course in Probability, 6th Ed., Pearson Education India, 2002.
3. **Ramana B.V.,** Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010
4. **Veerarajan T.,** Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2010.
5. **W. Feller,**An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
6. **David A. Santos,** Probability: An Introduction, Jones &Bratlett

Note for Paper Setter :-The Question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit.

SEMESTER III

Course Title: Introduction to Solid Mechanics **Max. Marks: 100**
Course Code: PCC-CE-322 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credit 3(2-1-0)

Objective: The objective of this course is to acquaint the students about some basic concepts like bending moments, shear force, stresses, slopes and deflections and buckling loads employed for the analysis of civil engineering structural forms.

UNIT-I

Shear force and Bending moment: SF and BM Diagrams for simply supported over-hanged and cantilever beams subjected to moments and varying loads; SF, BM & Torque Diagrams for inclined beams & brackets subjected to concentrated load, udl, moments and varying loads.

Unit-II

Bending in beams: Bending theory, bending equation, bending stresses in rolled steel and built up sections; Shear stresses in beams: shear flow, shear centre, variation of shear stresses in beam cross section. Torsion in circular shaft.

Unit-III

Analysis of Stresses and Strains: **:** tensor notations, equilibrium equations, transformation of stresses, invariants of stress tensor, plane stress condition, principal stresses, maximum shear stress and their planes, Mohr's circle. Transformation of strains, invariants of stain tensor, plane strain condition, principal strains, maximum shear strain and their planes;–Strain relationship.

Unit-IV

Deflection of beams: Direct integration and Macaulay's methods for simply supported and cantilever beams subjected to concentrated loads, uniformly distributed loads, varying loads and moments. Moment area method, conjugate beam method, application of these methods to statically determinate beams & frames.

Unit-V

Columns and struts: Columns and struts subjected to compression and bending, Buckling of long columns. Euler's, Rankine's and Secant formulae. Combined and Direct bending stress.

Course Outcomes:

On completion of the course, the student will be able to:

1. Understand about the Longitudinal and hoop stresses, volumetric strains of Thin and Thick Cylinders;
2. Draw SF and BM Diagrams for simply supported, over-hanged and cantilever beams subjected to moments and various types loads;

3. Understand Bending theory, bending equation, bending stresses in rolled steel and built up sections;
4. Find out Slope and Deflection for simply supported and cantilever beams subjected to moment and various type of beam.
5. Understand the different end conditions of Columns and struts subjected to compression and bending, difference of short and long column, core or kernel of sections.

Text Books:

1. Engineering Mechanics of Solids By E.P. Popov, Pearson Education.
2. Solid Mechanics by S.M.A. Kazimi, Tata Mcgraw Hill.
3. Strength of materials by S. Ramamrutham & N. Narayan, Dhanpat Rai Publishing Company
4. Mechanic of Materials by R.C. Hibbeler, Pearsons

Reference Books:

1. Mechanics of Materials by Beer & Jonhston, Dewolf, Mcgraw Hill.
2. Strength of Materials by R. Subramanian, Oxford University Press
3. Strength of Materials by R. K. Rajput

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER III

Course Title: Introduction to Fluid Mechanics **Maximum Marks: 100**
Course Code: PCC-CE-323 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credit 3(2-1-0)

Objective: The objective of this course is to acquaint the students about the characteristics and behavior of static and flowing fluids and to introduce the students to various concept and applications of hydraulics. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulics.

Unit-I

Physical Properties of Fluids: Mass density, Weight density, Specific gravity; Viscosity-kinematic viscosity, Units, Newtons law of viscosity; Surface tension- expressions for liquid droplet, hollow bubble & liquid jet Capillarity-expressions for rise/fall; Types of Fluid-Ideal, Real, Newtonian & Non-Newtonian fluids; Types of flows-Laminar & turbulent flows, Steady & unsteady, Uniform & non-uniform, Compressible & incompressible flows, Streamlines, Streak lines & Path lines; Continuity equation & its differential form; Velocity potential and Stream functions.

Unit-II

Fluid Statics: Pressure-absolute, gauge, atmospheric & vacuum pressures; Pascal's law and Pressure variation in a static fluid; Manometers-piezometer, U-tube, Single column and differential U-tube manometers; Total pressure & Centre of pressure on plane and curved submerged surfaces; Buoyancy & Archimedes Principle, Meta-Centre-determination of metacentric height by analytical & experimental methods; Stability of submerged and floating bodies.

Unit-III

Dynamics of Fluid Flow: Euler's equation of motion along streamline and Bernoulli's equation; Flow measurement by Venturimeter & Orificemeter; Momentum of fluid- Impulse-momentum equation, Kinetic & Momentum Correction factors and Moment of momentum equation; Vortex Motion-Free and Forced vortex flows.

Unit-IV

Dimensional Analysis and Similitude: Dimensional homogeneity, Dimensional analysis-Rayleigh method and Buckingham's Pi- theorem; Similitude; Dimensionless numbers; Model Laws-Reynolds and Froude Model laws; Model testing of partially submerged bodies; Distorted models and their scale ratios.

Unit-V

Miscellaneous

Flow around submerged bodies: Drag on a flat plate, cylinder and sphere. Circulation & lift on cylinder. Orifices & Mouthpieces: Flow through large rectangular orifice & external cylindrical mouthpiece. Notches & Weirs: Discharge over rectangular, triangular and trapezoidal notches/weirs.

Course Outcomes: After the completion of the course the students will be able to

1. Understand type of fluid, behavior of fluid, basic concept and theorem used in fluid Mechanics and apply their knowledge of fluid mechanics in addressing problems in Hydraulics.
2. They will possess the skills to solve problems in laminar flow, Turbulent flow, boundary layer thickness calculation and for better understanding of this all application.
3. They will gain knowledge in Types of models, Application of dimensional analysis and model studies to fluid flow problem.
4. The basic of The Laminar Flow and turbulent flow and concept of boundary layer theory
5. The Dimensional analysis and model studies to the flow problems.

Text Books:

1. **Kumar, D. S.,** Fluid Mechanics. Kataria & Sons Publishers, New Delhi, 1998 Ed.
2. **Streter V. L., Wylie, E.B. & Bedford K. W.,** Fluid Mechanics, MGH, 2001 **Reference**

Books:

3. **P.M. Modi and S.M. Seth**, Hydraulics and Fluid Mechanics, Standard Book House
4. **K. Subramanya** ,Theory and Applications of Fluid Mechanics, , Tata McGraw Hill

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER III

Course Title: Surveying -I **Maximum Marks: 100**
Course Code: PCC-CE-324 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credit 3(2-1-0)

Objective: The aim of this course is to make the students aware about science of determining relative positions and elevation of points by various techniques. With the successful completion of the course.

UNIT-I

Introduction: Importance and Principles of Surveying. Types of surveying. Different classification of surveying, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines. Chain Surveying: Chain Surveying principle, Field Equipment, Methods of chaining, Offsets, Corrections in chaining, Obstacles in chain surveying; Degree of accuracy. Tape and chain corrections.

UNIT-II

Compass Surveying: compass survey and its significance, Types of compass, Methods of Compass survey-Traversing and triangulation survey, Closed traverse, Open traverse, Problems on included angles, Local attraction, Problems on local attraction, Magnetic declination, Adjustment of closing error, Advance techniques- Total Station, Horizontal and vertical Curves.

UNIT-III

Plane Table Surveying and Contouring: Plane Table Surveying principle, Field equipments and accessories, Orientation, Advantages and disadvantages of plane tabling, Methods of plane tabling, Two point and Three point problem, Precautions, Accuracy. Definition, uses and characteristics of contours, Contour interval and horizontal equivalent, Methods of contouring. Interpolation, Computation of area and volume by different methods and their comparison.

UNIT-IV

Levelling: An introduction to Levelling Instruments and their types, Temporary adjustment of level, Types of leveling staffs, Types of leveling, differential, reciprocal leveling, profile levelling and cross sectioning. Bench mark & its types, Field book recording, Methods of reduction of levels (Height of instrument and Rise and fall method) Sensitivity of bubble tube. Corrections applied. Digital and Auto Level, Errors in levelling.

UNIT-V

Photogrammetry: Photogrammetry Scale flying height, remote sensing, platform and sensors, visual image interpretation, basics of geographical information system (GIS) and geographical Positioning system (GPS).

Course Outcomes: The course will enable the students to**:**

1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities
2. Translate the knowledge gained for the implementation of Civil infrastructure facilities.
3. Identify and calculate the errors in measurements and to develop corrected values for differential level circuits, horizontal distances and angles for open or closed-loop traverses,
4. Operate an automatic level to perform differential and profile leveling; properly record notes; mathematically reduce and check levelling measurements,
5. Effectively communicate with team members during field activities; identify appropriate safety procedures for personal protection; properly handle and use measurement instruments. Be able to identify hazardous environments and take measures to insure one's personal and team safety

Text book:

1. **Bhavikatti, S.S**., Surveying and Levelling, Vol. I and II, I.K. International, 2010
2. **Arora, K.R**., Surveying, Vol-I, II and III, Standard Book House, 2015.
3. **Basak** "Surveying & Levelling" Tata McGraw Hill, New Delhi

Reference book:

4. **Kanetkar, T. P. and Kulkarni, S.V."**Surveying & Levelling" Vols. I & II PVG
5. **P.B. Shahni** ,Surveying & Levelling
6. **Punmia, B.C."**Surveying" Vol. 1&2, Laxmi Publications Pvt. Ltd, New Delhi, 2002.

Note for Paper Setter:-The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each.

SEMESTER III

Course Title: Disaster Preparedness & Planning **Maximum Marks: 100**
Course Code: PCC-CE-325 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credit 3(2-1-0)

Objective: To increase the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences and to ensure skills and abilities to analyze potential effects of disasters and of the strategies and met to deliver public health response to avert these effects.

UNIT: 1

Disaster and Hazards

Definition of vulnerability, risk, capacity, impact, prevention, mitigation. ecological fragility; Factors affecting vulnerability; Sustainable and environmental-friendly recovery; Reconstruction and development.

UNIT: II

Classification of Disasters

Natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.), Causes of natural disasters; Man-made disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills), Causes and concern of man-made disasters.

UNIT III:

Disaster Impacts

Disaster impacts- Global (Climate change), regional (urban disasters) and local- environmental impacts (physical, social, ecological, economic, political, etc.), health impacts, psycho-social issues; demographic aspects (gender, age, special needs), Impact evaluation and analysis.

UNIT IV:

Disaster Risk Reduction: Disaster management cycle phases; prevention, mitigation, preparedness, relief and recovery; Structural and nonstructural measures; risk analysis, vulnerability and capacity assessment; Early warning systems, Post-disaster environmental response, Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT V:

Disasters management and control: Management of natural disasters (Earthquake, flood and drought), Various components and their functions; Man-made disasters (Industrial and nuclear disaster)-management and control, preventives measures, regulatory aspects.

Course Outcomes: At the end of completion of subject students will able to understand:

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
2. Capacity to describe, analyse and evaluate the environmental, social, cultural, economic, legal and organisational aspects influencing vulnerabilities and capacities to face disasters.
3. Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
4. Capacity to manage the Public Health aspects of the disasters.
5. Capacity to obtain, analyse, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

Text Books:

1.http://ndma.gov.in/ (Home page of National Disaster Management Authority). 64

2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.

Reference Books:

3.Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.

4. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each

SEMESTER III

Course Title: Biology& Life Science **Maximum Marks: 100**
Course Code: PCC-CE-326 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3 (2-1-0)

Course Objective: The purpose of this course is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

Unit I

Basic Cell Biology: Introduction: Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism Homoeostasis- Cell growth, reproduction, and differentiation.

Unit II –

Biochemistry and Molecular Aspects of Life: Biological Diversity --Chemistry of life: chemical bonds-Biochemistry and Human biology--Protein synthesis—Stem cells and Tissue engineering.

Unit III

Enzymes and Industrial Applications: Enzymes: Biological catalysts, Proteases, Carbonic anhydrase, Restriction enzymes, and Nucleoside monophosphate kinases—Photosynthesis

Unit IV

Mechanochemistry: Molecular Machines/Motors—Cytoskeleton—Bioremediation—Biosensors

Unit V

Nervous System, Immune System, and Cell Signaling: Nervous system--Immune system- General principles of cell signaling

Course Outcomes:

1. Students will understand the Basic of Cell.
2. To familiarize the students with the basic organization of organisms and subsequent building to a living being.
3. To impart an understanding about the machinery of the cell functions that is ultimately responsible for various daily activities.
4. To provide knowledge about biological problems that requires engineering expertise to solve them.
5. To provide knowledge Nervous System, Immune System, and Cell Signaling

REFERENCES/ TEXT BOOK

1. **S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan**, "Biology for Engineers," Tata McGraw-Hill, New Delhi, 2012.

2. **Jeremy M. Berg, John L. Tymoczko and Lubert Stryer**, "Biochemistry," W.H. Freeman and Co. Ltd., 6th Ed., 2006.
3. **Robert Weaver**, "Molecular Biology," MCGraw-Hill, 5th Edition, 2012.
4. **Jon Cooper**, "Biosensors A Practical Approach" Bellwether Books, 2004.
5. **Martin Alexander**, "Biodegradation and Bioremediation," Academic Press, 1994.
6. **Kenneth Murphy**, "Janeway's Immunobiology," Garland Science; 8th edition, 2011.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-III

Course Title: Solid Mechanics Lab. **Maximum. Marks: 50**
Course Code: PCC-CE-331 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

List of Practical's:

1. To determine ultimate tensile stress of a metal.
2. To conduct the compression test and determine the ultimate compression strength.
3. To conduct torsion test on mild steel or cast iron specimen to determine modulus of rigidity.
4. To determine Rockwell and Brinell hardness of mild steel, cast iron and brass specimen.
5. To determine the Modulus of Elasticity for the materials of given beam using deflection method.
6. To verify theoretical Bending Moment by wooden beam apparatus at the section of hinge using various load combination on a simply supported beam using beam apparatus.
7. To study the toughness and energy absorbing property of cast iron and mild steel using Charpy and Izod.
8. To Determine The Euler Buckling Load Experimentally And compare It To The Euler Theory.

Course Outcomes: After the completion of the course the students will be able to

1. Material property like elastic behavior, hardness, toughness and use UTM.
2. Understand the hooks law and plot the graph.
3. Measure the deflections of beam and verify the Maxwell's reciprocal theorem.
4. Understanding the modulus of rigidity of materials.
5. Understanding the impact strength of steel.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

SEMESTER-III

Course Title: Fluid Mechanics Lab **Maximum. Marks: 50**
Course Code: PCC-CE-332 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

List of Practical's:

1. To determine the density of a liquid (Water, oil, petrol)
2. To determine experimentally the Meta-centric height of a ship model.
3. To verify the Archimedes principle experimentally.
4. To verify the Bernoulli's equation experimentally.
5. To determine coefficient of discharge in an Orificemeter.
6. To determine coefficient of discharge in Venturimeter.
7. To determine the coefficients of discharge, velocity and contraction of a rectangular orifice.
8. To determine the coefficients of discharge, velocity & contraction of external cylindrical mouthpiece.
9. To determine the coefficients of discharge, velocity and contraction of a rectangular Notch.
10. To calibrate a sharp crested triangular Weir.

Course Outcomes: After the completion of the course the students will be able to

1. Understand about metacenter and measure metacentric height.
2. Measure the coefficients of contraction, discharge, velocity.
3. Carry out the flow measurements by orificemeter & venturimeter.
4. Understand about the boundary layers.
5. Measure the friction factor for commercial pipes.

Note: These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

SEMESTER-III

Course Title: Surveying Lab **Max. Marks: 50**
Course Code: PCC-CE-333 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

List of Practical's:

Chain Surveying

1. Ranging/Chaining a line and recording the field book.
2. Setting-out Right Angles using Tape.
3. Taking offsets and setting-out Right Angles using:
   (a) Cross Staff
   (b) Indian Optical Square
4. Testing and Adjustment of Chain.

Compass Surveying

1. Study of Prismatic Compass
2. Field Work in Compass Surveying
3. Measurement of Angles between the lines meeting at a point.
4. Compass Traversing by radiation method.
5.

Plane Table Surveying

1. Study of Equipment
2. Setting-up the plane table- Temporary adjustments.
3. Marking North Direction and Orientation by: I. Magnetic Needle/Trough Compass II. Back-sighting.
4. Plotting a few points by Radiation Method.
5. Plotting a few points by Intersection Method.
6. Plotting a traverse.
7. Two point and three point problem.

Levelling

1. Study of Equipment and levelling staff.
2. Temporary adjustments of level in Field.
3. Field work using levelling Instrument.
4. Taking Staff Readings and.
5. Recording the fielfbook
6. Longitudinal Section of Road/Railway/Canal/Dam
7. Cross Section of a Road/Railway/Canal/Dam.
8. Taking Staff readings on different stations / finding difference of level between them.

Course Outcomes: At the end of experiment student will able to

1. Use the surveying instruments like chain, tape, staff, compass etc
2. Measure angle by compass and plot an area.

3. Use plane table and understand the advantage of plane table surveying.
4. Measure differences elevations.
5. Able to draw and utilize contour plots and calculate volumes for earthwork.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

SEMESTER-IV

Course Title: Numerical Techniques **Max. Marks: 100**
Course Code: BSC-CE-421 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3 (3-1-0)

Course Objective: This Course aims at providing the necessary basic concepts of a numerical techniques and give procedures for solving numerically different Kinds of problems occurring in engineering and technology.

Unit-I

Solutions to Algebraic and Transcendental Equations: Solutions to algebraicand transcendental equations by iterative, Bisection, Regula-Falsi, Newton-Raphson methods and Secant Methods.

Unit-II

Interpolation: Finite-differences and operators, Relation between operators, Interpolation with Equal Intervals – Newton's Forward and Backward Difference Formulae, Interpolation with Unequal Intervals – Lagrange's Interpolation – Newton's Divided Difference Interpolation.

Unit-III

Numerical Differentiation & Integration: Introduction to Numerical differentiation and integration, Errors in Numerical differentiation, Trapezoidal rule, Simpson's one-third rule, Simpson's third-eight rule, Boole's rule and Weddle's rule, Newton-Cote integration formula.

Unit-IV

Matrix and Linear System of Equations : Direct Methods: Gauss and Gauss-Jorden method, Crout's Triangularization method, Iterative methods: Gauss –Jacobi and Gauss Seidel method, Newton method for nonlinear simultaneous equations

Unit-V

Numerical Solutions to Ordinary Differential Equations : Numerical solution of ordinary differential equations by Taylor's Series, Picard's method, Euler's method, Modified Euler's method and RungeKutta method of 4^{th} order, Finite-difference method for Boundary value problems

Course Outcomes:

Upon the completion of this course, the students will:

1. Comprehend of the Power of Numerical Techniques, and Ideas.
2. Apply these techniques to problems drawn from Industry, Management and other engineering fields.
3. Demonstrate the ability to solve linear system of equations.
4. Solve various problem of linear differential equation.
5. Able to solve nonlinear differential equations by using numerical methods.

Text Books:

Introductory Methods of Numerical Analysis

1. **Introductory Methods of Numerical Analysis,** S S Sastry, PHI
2. **Numerical Methods in Engineering and Science: (C, and C++, and MATLAB)**, B. S. Grewal, Khanna Publication
3. **Jain, M. K & Iyengar. S.R.K**, numerical method for scientific and engineering computation, 3rd edition, New Age Publishers
4. **Grasselli, M. & Pelinovsky, D**: Numerical Mathematics, Jones & Bratlett

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit.

SEMESTER-IV

Course Title: Theory of Structures **Max. Marks: 100**
Course Code: PCC-CE-422 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3 (2-1-0)

Objective: The objective of this course is to acquaint the students about various methods used to solve indeterminate beams and frames.

Unit-I

Types of Structures: stability and Indeterminacy of structure (rigid & Pin jointed), Arch structures: 3-hinged parabolic & circular arches, thrust, radial shear and bending moment diagram, Analysis of Cable and suspension bridges.

Unit-II

Energy Methods: Strain energy in members: axial loaded members, under bending, under shearing, circular members under torsion; Law of conservation of energy: virtual work, virtual work on rigid body, virtual work on elastic body; Betti's law and Maxwell's law of reciprocal deflection, application of virtual work on beams (application of product integral table); flexural stiffness of beam with far end pinned; Deflection of statically determinate rigid frames.

Unit-III

Deflection of pin jointed plane trusses: Unit load method, Castigliano's theorems, application of Castigliano's theorems to brackets, lamp posts & curved members; Deflection of truss due to temperature variation; fabrication error and camber.

Unit-IV

Introduction of Displacement method of analysis:

Analysis of indeterminate beams & frames (with and without sway) by classical Displacement methods-slope deflection method, moment distribution methods.

Unit-V

Influence line for statistically determinate Structures: Single concentrated load, UDL (shorter and longer than span), two concentrated loads, series of concentrated loads for maximum shear force at a section, BM under a given load, maximum BM at a given section, Absolute maximum shear & moment in beams. Influence Lines for trusses and three hinged arches.

Course Outcomes: Students who successfully complete this course will be able to:

1. Upon compilation of this course students should have acquired adequate knowledge of advanced concepts in strength of materials
2. Able to understand deflection, energy principles, stability criteria, theories of failure, unsymmetrical bending.
3. Able to know the concept of behavior of curved bars and locating shear centre.Influence Line for Statically determinate structures.
4. Influence Lines, Influence Lines for Beams, Qualitative Influence Lines.

5. Influence Lines for trusses and three-hinged arches.

Text Book

1. Mechanics of Materials by R. C. Hibbeler,Pearsons
2. Structural Analysis, by R. C. Hibbeler,Pearsons
3. Structural Analysis by C. S. Reddy, Tata McGrawHill
4. Intermediate Structural Analysis by C. K. Wang, Tata McGrawHill
5. Structural Analysis by Pandit& Gupta, Tata McGrawHill

Reference Books:

1. Structural Analysis, by T.S.,Thandavamoorthy, Oxford Higher Education
2. Civil Engineering Materials by Neil Jackson
3. Strength Of Materials, by Ramamrutham .S, Narayan .R, DhanpatRaiPublishing Company Pvt. Ltd.
4. Strength of Material", Khurmi.R.S, 23rd" edition, S. Chand Limited, New Delhi.
5. Mechanics for Engineers, "Beer and Johnson ,Statics and Dynamics", McGraw Hill.
6. Advanced Mechanics of Materials, Fred B. Seely, James Ohrea Smith, Wiley.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit.

SEMESTER-IV

Course Title: Hydraulic Engineering **Max. Marks: 100**
Course Code: PCC-CE-423 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3 (2-1-0)

Objective: The objective of this course is to acquaint the students with the basic knowledge of flow of fluid in pipes and channels. They are also introduced to hydraulic machines.

Unit-I

Flow through Pipes: Turbulent flow characteristics, Shear stress in turbulent flow-Boussinesq's theory, Reynolds equation and Prandtl mixing length; Universal velocity distribution equation, velocity distribution in smooth and rough pipes, Velocity distribution in terms of average velocity; Major head losses- Darcy-Wiesbach formula, Chezy equation; Minor head losses- Loss of head due to sudden expansion, sudden contraction, Pipe fittings, Pipe bends, Entrance & Exit. Hydraulic gradient & total energy lines, Pipes in series, equivalent pipes, pipes in parallel; Power transmission through pipes.

Unit-II

Flow in Open Channels: Comparison between open channel flow and pipe flow, Classification of flow in open channels, Chezy's formula for discharge through open channel, Most economical section-Rectangular and trapezoidal sections; Specific energy and specific energy curve, Critical depth and critical velocity, Critical, Sub-critical & Super critical flows, Alternate depths. Gradually varied flow, Afflux and back water curve. Hydraulic Jump-expressions for depth & energy loss.

Unit-III

Turbines: Classification of hydraulic turbines, Impulse & Reaction turbines, Pelton turbine-construction, work-done & efficiency; Radial flow reaction turbines- construction, work-done & efficiency, Francis turbine, Axial flow reaction turbines- Kaplan turbine. Draft Tube-types, theory & efficiency. Specific speed, Unit quantities- unit speed, unit discharge & unit power.

Unit-IV

Pumps: Centrifugal pumps -construction & work-done, definition of various heads & efficiencies, Minimum speed for starting a centrifugal pump, Specific speed, Priming. Reciprocating pumps-construction, working, discharge & work-done; Slip and negative slip of a centrifugal pumps. Maximum speed of a reciprocating pump.

Unit-V

Miscellaneous

Water Hammer: Gradual closure of the valve, Quick closure of valve in a rigid pipe, Quick closure of valve in an Elastic pipe and Compressible fluid. Boundary Layer Theory: Description of Boundary Layer, Boundary layer parameters-boundary layer thickness, displacement, momentum & energy thicknesses, Blasius solution for laminar boundary layer flows, Von-Karman momentum integral equation (without derivation); Laminar & turbulent boundary layers in a flat plate, Boundary layer separation.

Course Outcomes: The students will be able to

1. Apply their knowledge of fluid mechanics in addressing problems in flow through pipes.
2. Apply their knowledge of fluid mechanics in addressing problems in open channels.
3. Possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
4. Understand about the pressure diagram and analysis of surge tank.
5. Have knowledge in hydraulic machineries (pumps and turbines).

Text books:

1. **Kumar D. S**, Fluid mechanics, S. K. Kataria & Sons publishers, New Delhi, 1998
2., **P.M. Modi and S.M. Seth**, Hydraulics and Fluid Mechanics, Standard Book House
3. **K. Subramanya** ,Theory and Applications of Fluid Mechanics, , Tata McGraw Hill.
4. **K. Subramanya** ,Open channel Flow, Tata McGraw Hill.

Reference Books:

1. **Garde R. J**, Engineering Fluid Mechanics.
2. **Ranga Raju, K.G,** Flow through Open Channels, TMH Ltd, New Delhi, 1986.
3. **Nigam P.S**, Handbook of Hydropower Engineering.
4. **Deshmukh,M.M.** Water Power Engineering, Dhanpat Rai & Sons, Delhi, 1978.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-IV

Course Title: Surveying-II **Max. Marks: 100**
Course Code: PCC-CE-424 **University Examination: 60**
Duration of Exams: 3 hours **Sessional Assessment: 40**
Credits 3 (3-1-0)

Objective: The objective of this course is to acquaint the students about tachometric and Theodolite surveying and will be introduced to setting out works.

UNIT-I

Theodolite Surveying: Different terms used, Construction, Temporary adjustment of transit Theodolite; Angle measurements (horizontal and vertical) Measurement of deflection angle and magnetic bearing, Theodolite traversing-Traverse calculations; Traverse adjustments. Height of objects.

UNIT-II

Tachometry: Tachometry, Determination of Stadia constants, Anallatic lens, Methods of Tachometry, Heights and distances from stadia intercepts; Subtense method, Tangential method; Measurement of distances, Problems.

UNIT-III

Curves: Curves, Elements of simple curve, Types of horizontal curves, Design and setting out of a simple curve, compound curve, Transition curve objectives, requirements and calculation of lengths, Vertical Curves.

UNIT-IV

Geodetic Surveying: Triangulation- principles: Choice of stations, Base line measurements and corrections applied ,Electronic methods of distance measurements, Satellite station, Triangulation adjustments; Spherical excess, Computations of sides of spherical triangles, Basenet.

UNIT-V

Introduction to Remote Sensing: Idealized remote sensing, Basic principles: EM spectrum, Wavelength regions and their applications in remote sensing, Interaction of EM radiation with atmosphere and earth's surface. Platforms and sensors. Applications of remote sensing.

Course Outcomes: At the end of the course, the student will be able to:

1. Theodolite and its use.
2. About tachometric survey.
3. Understand different types of cures and their design.
4. Understand triangulation and their application.
5. Able to know Remote sensing and its applications.

TEXT BOOKS

1. Duggal, S.K." Surveying" Vols. I & II, Tata McGraw Hill, New Delhi,20M
2. Punmia, B.C."Surveying" Vol. 1&2, Laxmi Publications Pvt. Ltd, New Delhi, 2002

BOOKS RECOMMENDED

1. Surveying Vols. I & II by Dr. K.R.Arora
2. Basak "Surveying & Levelling" Tata McGraw Hill, New Delhi
3. Kanetkar, T.P. and Kulkarni, S.V."Surveying & Levelling" Vols. I & II PVG Prakashan, Pune, 1994.

Note for Paper Setter: The Question paper shall comprises of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

SEMESTER-IV

Course Title: Building Materials & Construction **Max. Marks: 100**
Course Code: PCC-CE-425 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credit 3 (2-1-0)

Objective: The objective of this course is to make the students aware about the knowledge of the materials used in buildings and constructional forms like partitions, DPC, floors and roofs etc.

Unit-I

Stones and Bricks: Stones: Classification, requirements of good materials, Querying of stones Testing of stones. Bricks: Classification of bricks, Properties of Conventional bricks, Autoclave aerated blocks (AAC), Fly ash bricks, manufacturing and testing procedures of Conventional bricks, Autoclave aerated blocks (AAC), Fly ash bricks.

Unit-II

Cement and Admixtures: Cements: Grades, Composition, manufacturing of Portland cement, field testing of cement, special types of cements (Introduction only), storage of cement. Admixtures: types (Fly ash, Micro silica, Ground granulated blast-furnace slag (GGBS), Chemical Admixtures etc.), Properties and their suitability, advantages, disadvantages and limitations.

Unit-III

Steel, Timber and Polymers: Steel: Types of steel (Mild Steel, Hard Steel, Stainless Steel, Heat resistance steel, Manganese steel, Magnet Steel), Steel marketable forms of steel. Timber: Classification, Structure, Seasoning and defects. Paints and Varnishes, Constituents of paints, types of paints (oil paint, enamel paint, emulsion paint cement paint), constituents and characteristics of varnishes,Polymers: Classification, properties and applications in civil engineering of Polymeric materials viz. PVC, Polyester, HDPE, and LDPE.

Unit-IV

General Construction: Brick and Stone masonry: Various terms used, types and bonds in brick work. Partition and cavity walls: Types of non-bearing partition, brick partitions, clay block partitions, Gypsum board Partition, timber partitions and glass partitions, construction of masonry cavity walls.

Unit-V

DPC, Floors and Roofs: Dampness: Sources, effects and prevention of dampness, Materials used in damp proofing course. Floors: Components of floor, brick floors, cement concrete floors, terrazzo flooring, mosaic floorings and tiled flooring, Tiles and Terra-cotta: Manufacturing of tiles and terra-cotta (introduction only), types of terra cotta. Doors and Windows: Locations, sizes general types of door movement, various types of doors and windows (definition only). Roofs (Single Roof: Lean-to-roof, Couple roof, Couple closed roof, Collar-beam roof) & terms used in sloping roof: king post truss, queen post truss.

Course Outcomes: After successful completion of the course, student will be able to

1. Identify various construction materials like stone and bricks
2. Know and differentiate elemental properties of construction materials
3. Know about the different types of materials used in construction such as steel timber polymers 4. Demonstrate an appropriate application of construction material.
5. Know about the different components in construction building.

Reference Books:

1. **Surinder Singh**, Engineering Materials
2. **Sharma and koul,** Building Construction
3. **Kulkarni et.el,** Civil Engineering Materials
4. **B.C. Punmia**, Building Construction

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-IV

Course Title: Estimating & Costing **Max. Marks: 100**
Course Code: PCC-CE-426 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credit 3 (2-1-0)

Objective: The aim of this course is to make the students able enough to determine various quantities and the cost of civil engineering projects.

UNIT-I

Estimate & Types of Estimate: Importance, Items of a work and their Units. Types of estimates, viz. preliminary, Plinth are estimate, Cube rate estimate (for buildings), Approximate quantity method estimate, detailed estimate/Item rate estimate, revised estimate, supplementary estimate, bill of quantities and abstract of cost.

UNIT-II

Analysis of Rates: Preparing analysis of rates, labour schedule, material schedule & rate schedule. Analysis of rates - of lime concrete in foundation; Brickwork in Foundation, super structure, R.C.C. work (Beams, Slabs, Columns), Cement Plastering, white washing, earth work in foundation, D.P.C, Steel work for Reinforcement .

UNIT-III

Specifications: General specifications and detailed specifications, Book of specifications, specifications for earth work in foundation, L.C in foundation, R.C.C. work, Brick work, R.B. Work, Wood work in doors, windows. D.P.C, Centering and Shuttering.

UNIT-IV

Methods of Building Estimates: Methods of building estimate-Long-wall, short-wall and centre line methods, Estimation of masonry platform, estimate of a masonry tank, estimate of roof trusses (wooden/steel). Estimate of a single room and two room buildings, estimate of an R.C.C beam and Slab.

UNIT-V

Road Estimating and Valuation: Methods of estimating: earth work, estimate of metallic road Valuation, Methods of valuation,(1:Rental Method, 2:Direct Comparison with the capital value, 3:Valuation based on profit 4: Valuation based on profit, 5: Depreciation method of valuation), Depreciation, Methods of calculating depreciation. Valuation of building-various methods, rent fixation, plinth area requirement**.**

Course Outcomes: After successfully studying this course, students will:

1. Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.
2. Able to determine rates of different items in engineering works.
3. Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.

4. Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
5. Be able to quantify road estimation and valuation.

Text Books:

1. **Dutta B. N :** Estimating and Costing, UBS Publication.
2. **Mahajan S.P, Satya Srakashan:** Civil Estimating, Costing Evaluation & Specifications.
3 **Khanna**: Hand Book of Civil Engineering.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one

SEMESTER IV

Course Title: Hydraulic Engineering Lab
Course Code: PCC-CE-431
Duration of Exams: 2 hours

Max. Marks: 100
University Examination: 25
Internal Assessment: 25
Credit 1 (0-0-2)

List of Practical's:

1. To determine loss coefficients sudden expansion.
2. To determine loss coefficients in sudden contraction.
3. To determine loss coefficients in pipe fittings.
4. To determine coefficient of bend in a pipe.
5. To determine friction factor in a pipe.
6. To determine critical Reynolds number in a pipe flow.
7. To determine Manning's coefficient of roughness N for the bed of a given flume.
8. To study the formation of hydraulic jump.
9. Study of performance characteristics of a Pelton wheel turbine at constant speed.
10. Study of performance characteristics of a centrifugal pump at constant speed.

Course outcomes: End of the course the students will able to

1. Find loss coefficient for various pipe fittings.
2. Understand velocity distribution in a pipe and open channel.
3. Determine Manning's coefficient of roughness N.
4. Measure the hydraulic jump.
5. Able to understand open channel flow.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Department of Civil Engineering

SEMESTER-IV

Course Title: Structural Analysis Lab **Max. Marks: 50**
Course Code: PCC-CE-432 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

Objective: The objective of the Materials Testing Laboratory is to demonstrate the basic principles in the area of strength and mechanics of materials to the undergraduate students through a series of experiments. The objectives of this course are to make students to learn: Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials. Ability to function on multi-disciplinary teams in the area of materials testing. Ability to use the techniques, skills and modern engineering tools necessary for engineering.

Experiments:

1. To verify Moment Area Method for Slope and Deflection using Steel Beam Apparatus
2. To Verify Maxwell's theorem of reciprocal deflection using steel beam apparatus.
3. To determine elastic displacement of curved members
4. To determine the deflection at given joint of the truss analytically and verify the same experimentally.
5. To Verify the Maxwell's theorem of reciprocal deflection by means of truss.
6. To determine horizontal thrust in a three hinged in a three hinged arc experimentally and verify with theoretical values
7. To obtain influence line diagram (ILD) from horizontal thrust in a three hinged arch experimentally and compare theoretically.

Course Outcomes: After successful completion of the course, the students will be able to:

1. Understand the concept of Moment area method to find slopes and deflection.
2. Understand Verify Maxwell's theorem of reciprocal deflection.
3. Understand elastic displacement of curved members
4. Determine deflection at given joint of the truss
5. Understand Maxwell's theorem of reciprocal deflection by means of truss.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Department of Civil Engineering

SEMESTER-IV

Course Title: Surveying-II Lab **Max. Marks: 50**
Course Code: PCC-CE – 433 **University Examination: 25**
Duration of Exams: 2 hours **Sessional Assessment: 25**
Credits 1(0-0-2)

List of Practical's:

A. THEODOLITE SURVEYING

1. Study of Equipment:

   I. Ordinary Theodolites

   II. EDM Theodolites.

   III. GTS Theodolites.

2. Temporary Adjustments of a Theodolite.

3. Field work using a Theodolite.

   I. Measurement of Horizontal and vertical angles by ordinary and electronic theodolites.

   II. Measurement of linear and angular measurements using EDM/GTS instruments.(basic introduction).

   III. Measurement if magnetic bearing.

B. TACHEOMETRIC SURVEYING

1. Study of equipment and graduated staff.

2. Temporary adjustments

3. Field work:

I. Determination of constants "k & C"

II. Stadia traversing & recording stadia field book.

III. Location of Details by Tachometric methods.

4. Substance Bar Method: Theory and Field work

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

1. Able to understand different types of Theodolite and its use.
2. Understand about theodolite and its use.
3. Perform Tachometric surveying in the field.
4. Able to determine constant like K and C
5. Able to know stadia traversing.

Department of Civil Engineering

SEMESTER-V

Course Title: Geotechnical Engineering **Max. Marks: 100**
Course Code: PCC-CE-521 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: This course aims at giving knowledge about formation of soil and its properties.

UNIT-I

Introduction: Soil and its formation, Types of soils, Various Parameters of Soil and their determination, plasticity of soil, Atterberg limits, flow & toughness indices, definitions of activity and sensitivity. Use of consistency limits. Classification of Soils-Introduction of soil classification: particle size classification, textural classification, unified soil classification system, Indian standard soil classification system. Identification: Index property of soil, typical characteristics of soil in different groups.

UNIT-II

Permeability of Soil and Effective Stress principal- Darcy's law and its assumptions, Determination of coefficient of permeability: Laboratory methods, Seepage Analysis, stream and potential functions. Effective Stress, Principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, quick sand condition.

UNIT-III

Compaction of Soil and Stresses in Soil- Theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. Stresses in soils due to several types of loads, Influence factors, Isobars, Boussinesq's equation, Westerguard theory, Newmark's Influence Chart.

UNIT-IV

Consolidation of Soil – Theory of consolidation, comparison between compaction and consolidation, Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. – $\sqrt{t}$ and log t methods. e-log p relationship consolidation settlement N-C clays – O.C clays – Computation.

UNIT-V

Shear Strength- of cohesive and cohesion less soils – Mohr-Coulomb failure theory – shear strength – Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Factors influences shear strength of soil.

Course Outcomes: After successfully studying this course, students will:

1. Understand the different types of soil based on their formation mechanism and understand the various phase diagrams and derive various phase relationships of the soil.

2. Understand the physical significance of effective stress and its relation with pore Pressure and Plot various stress distribution diagrams along the depth of the soil mass
3. Understand field compaction and different stresses in soil due to different types of loadings.
4. Understand about theory of consolidation and soil settlements.
5. Understand the shear strength parameters of soil and different types of shear strength tests on soil.

Text Books: -

1. Fundamentals of Geotechnical Engineering by Bajra M. Das
2. Soil Mechanics and Foundation Engineering by K.R Arora

Reference Books: -

1. Principles of soil Mechanics by D.W.Taylor
2. Soil Mechanics by Terzaghi& Peck
3. Soil Mechanics by Witman & Lamb
4. Soil Mechanics by Alam Singh
5. Soil Mechanics by Gopal Ranjan

Note for paper setter: - The Question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

Department of Civil Engineering

SEMESTER-V

Course Title: Environmental Engineering.
Course Code: PCC-CE-522
Duration of Exams: 3 hours

Max. Marks: 100
University Examination: 60
Internal Assessment: 40
Credits 3(2-1-0)

Objective: This course aims to make students understand the various aspects of environment and to understand the impact of humans on environment.

UNIT -I

Water quality and treatment: Water demand Residential, Commercial, Institutional, industrial and agricultural, Forecasting of water demand, Sources of Water, water quality parameters, Water quality standards, Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes, Water Supply systems, Components of water supply system, Distribution system, Plumbing and various valves used in water supply systems.

UNIT II

Sewage Characteristics and treatment: Quantity of Sewage, Sewage flow variations, Characteristics and composition of sewage, Pollution due to improper disposal of sewage, Sewerage system and its components, Design of Sewerage system primary, secondary and tertiary treatment of sewage- description of various unit operation and processes, aerobic and anaerobic treatment systems, suspended and attached growth systems, quality requirements (Regulatory standards) for various usages.

UNIT III

Air Pollution and control: Definition of Air pollution, major pollutants- sources and impacts, Air Quality standards, Air pollution meteorology, Plum rise and plum behaviour, Introduction to air quality models and their applications, Monitoring of air pollutants, Control measures.

UNIT IV

Solid waste management- Solid waste, Municipal, industrial and hazardous solid waste, Characteristics and Composition of solid waste, Impact of improper disposal of solid waste, solid waste management, Elements of solid waste management system- generation, collection, transfer and transport, segregation, recycling, reuse, disposal, composting, vermin composting and landfills

UNIT V

Noise pollution and control: Noise pollution, sources (Indoor and outdoor) and impacts, Permissible limits, measurement of noise, Addition of Noise, Noise propagation, control of noise pollution- at source.

Course Outcomes: After successfully studying this course, students will:

1. Understand the impact of humans on environment and environment on humans
2. Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil.
3. Be able to plan strategies to control, reduce and monitor pollution.
4. Be able to select the most appropriate technique for the treatment of water, waste water solid waste and contaminated air.
5. Be conversant with basic environmental legislation.

Text books:

1. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw - Hill International Editions, New York
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg S.K: Water Supply Engineering (Environmental Engineering Vol.–I) 4. Garg S.K: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).

Reference Books:

1. Modi, P. N;Water supply Engineering. Volume-I
2. Introduction to Environmental Engineering and Science by Gilbert Masters, PrenticeHall, New Jersey.
3. Introduction to Environmental Engineering by P. AarneVesilind, Susan M. Morgan,Thompson /Brooks/Cole.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Department of Civil Engineering

SEMESTER-V

Course Title: Design of Concrete Structure **Max. Marks: 100**
Course Code: PCC-CE-523 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The aim of the course is to provide knowledge to the students about design of civil engineering structures like beams, columns, slabs and foundation.

UNIT-I

Introduction: Characteristic strength, stress-strain relationship for concrete and steel, IS specifications (IS 456, 875 and 1893), characteristic imposed loads, DL, EL & WL. Design philosophies – Working stress method and limit state method. Strength and serviceability requirements, Analysis and design for flexure of singly / doubly rectangular and T-beam.

UNIT-II

Beams: Analysis and design for flexure of singly / doubly rectangular and flanged beam sections – by limit state method. Serviceability limit states for deflection and cracking, requirements for curtailments and detailing of reinforcement, minimum / maximum tension and compression reinforcement, minimum and maximum spacing of bars.

UNIT-III

Bond stress: Flexural & anchorage bond stress, design bond stress, development length, anchorage length; Behavior of beams in shear, design for shear & torsion as per limit state method; Reinforcement detailing.

UNIT-IV

One-Way and Two-Way Slabs: Design of one-way and two-slabs with and without corners held down, Staircase (Dog legged), Placement of reinforcement in slabs.

UNIT-V

Columns and Foundations: Design of columns, short and long columns, eccentrically loaded columns. Design of foundation-Isolated and combined footing for columns. All designs to be as per the most recent BIS standards as applicable.

Course Outcomes: After successfully studying this course, students will:

1. Understand the different methods of designing concrete structures.
2. Able to design a beam.
3. Understand the concept of bond stresses in reinforced concrete structures.
4. Able to design one-way slab and two-way slab.
5. Students are able to understand the design of columns and foundation.

Text Books:

1. **Jain A.K**, Design of Reinforced Concrete: Limit State Design.
2. **Sinha**, Design of R.C.C Structures.

Reference Books:

1. **Kong and Evans,** Design of reinforced Concrete and Pre-stressed Concrete Structures.
2. **Karve and Shah**, Design of R.C.C Structures.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Department of Civil Engineering

SEMESTER V

Course Title: Concrete Technology **Max. Marks: 100**
Course Code: PCC-CE-524 **University Examination:**
60 Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: Concrete is the most important civil engineering material, often used with steel reinforcement. The course aims to give details about composition of concrete and its characteristics.

UNIT I

Concrete and its Ingredients: Concrete, Properties of ingredients, tests, Production of concrete, mixing, compaction curing, Properties of fresh concrete, Defects in Concrete, Concrete additives.

UNIT II

Properties of Concrete: Behaviour of concrete in tension and compression, shear and bond, Influence of various factors on test results, Time dependent behaviour of concrete -creep, shrinkage and fatigue.

UNIT III

Concrete Mix Design: Concrete mix design; Proportioning of concrete mixes, basic considerations, cost specifications, factors in the choice of mix proportion, different method of mix design.

UNIT IV

Concrete Operations and transportation: Concrete manufacturing methods(Batching plants) ,transportation(transit mixtures, concrete pumps) ,Quality control, Behavior of concrete in extreme environment; temperature problem in concreting, hot weather, cold weather and under water conditions, Resistance to freezing sulphate and acid attack, efflorescence, fire resistance; Inspection and testing of concrete-Concrete cracking, types of cracks, causes and remedies Non-destructive tests on concrete, Chemical tests on cement and aggregates.

UNIT V

Admixtures and Special Concretes: Admixtures and their uses, Special concrete; types and specifications, Fibre reinforced and steel Fibre reinforced concrete, Polymer concrete, Deterioration of concrete and its prevention Repair and rehabilitation.

Outcome: After successfully studying this course, students will

1. Identify the suitability of materials for the construction works.
2. Able to understand the properties of concrete
3. Able to design the concrete mix design with using different methods of mix design.
4. Implement the special concreting methods required for Cold weather and Hot weather regions.
5. Able to understand the importance of admixture in concrete design.

Text Books:

1. **Neville. A M**: Properties of Concrete.
2. **Kulkarni, PD, Ghosh, RK and Phull, YR**: "Text Book of Concrete Technology"; New Delhi Oxford and IBH Publishing Co.
3. **Gupta BL and Gupta Amit**: "Text Book of Concrete Technology"; Standard Publishers Distributors, Delhi.

Reference Books:

1. **Varshney, RS:**"ConcreteTechnology";New Delhi, Oxford and IBH Publishing
2. **M.S. Shetty**: Concrete Technology.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Department of Civil Engineering

SEMESTER-V

Course Title: Hydrology &Water Resource Engineering **Max. Marks: 100**
Course Code: PCC-CE-525 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The aim of the course is to provide basic knowledge to the students about measurement and occurrence of water and water resource planning.

UNIT I

Precipitation- Hydrologic cycle, water-budget equation, Forms of Precipitation, Measurement of Precipitation, Rain Gauge Network, Test for consistency and continuity of rainfall data, Mean Precipitation over an Area, Intensity-Duration-Frequency analysis, Depth- Area-Duration curves, Probable Maximum Precipitation (PMP).

UNIT II

Abstractions from precipitation- Evaporation process, Measurement, Estimation and Control of Evaporation, Evapo-transpiration, Measurement of Evapo-transpiration, Interception and Depression Storage, Infilitration, Measurement of Infilitration, Infilitration models, Infilitration indices, Runoff, Effective Rainfall.

UNIT III

Stream Flow Measurement and Hydrographs- Methods for measurement of stream flow, stage-discharge relationships, Runoff characteristics, Catchment characteristics, Factors affecting the runoff, yield from a catchment, flow duration curve and flow mass curve. Components of Hydrograph, Base flow separation, Direct runoff hydrograph, Unit hydrograph theory, Derivation of Unit Hydrograph.

UNIT IV

Ground water – Occurrence of Ground Water, Types of aquifers, aquifer properties, Darcys law, Geologic formations of aquifers, steady state flow in wells, unsteady flow in unconfined aquifers, well loses, pumping tests.

UNIT V

Reservoir- Types of Reservoirs, Capacity of Reservoirs, Zones of storage, Mass curve technique, Reservoir flood routing, movement of sediment from watersheds, Sedimentation of reservoirs, life of a reservoir, Erosion and reservoir sedimentation problems in India,

Outcomes: At the end of the course, students are in a position to learn:

1. Various components of hydrologic cycle that affect the movement of water in the earth.
2. Techniques of measurement of precipitation and presentation of rainfall data
3. Concept of abstraction of precipitation and Techniques for measurement of Evaporation, Evapotranspiration, infiltration.
4. The concept of movement of ground water beneath the earth
5. The technical knowhow of reservoirs and the method for determining the storage capacity of reservoirs.

Text Books:

1.G L Asawa, Irrigation Engineering, Wiley Eastern

2. L W Mays, Water Resources Engineering, Wiley.

3. J D Zimmerman, Irrigation, John Wiley & Sons

4. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

Reference Books:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.

2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.

3. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-Graw Hill.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each

Department of Civil Engineering

SEMESTER-V

Course Title: Industrial Training **Max. Marks: 25**
Course Code: PCC-CE-531 **University Examination: Nil**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1 (0-0-0)

Details:

At the end of semester IVth and VIth students are required to attend an Industrial Training for 6 weeks duration, during summer vacations. After the completion of training every student is required to prepare a detailed report of the training work which he/she has attended in an Organization/Industry/Company. Industrial Training shall be an essential component of curriculum to fulfill the eligibility criteria for appearing in semester Vth and VIIth university examination. The examination of Industrial Training shall be conducted during semester Vth and VIIth examination.

Table 3. Distribution of Weightage for Industrial Training of 25 marks.

Component	**Weightage**
Industrial Training	25
Total	**25**

Department of Civil Engineering

SEMESTER-V

Course Title: Geotechnical Engineering Lab **Max. Marks: 50**
Course Code: PCC-CE-532 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

OBJECTIVES:
At the end of the course student attains adequate knowledge in assessing both Physical and Engineering behavior of soils through laboratory testing procedures.

List of Practical's:
1. Determination of Moisture Content
2. Determination of Specific Gravity
3. Field Density Test
4. Grain Size Analysis
A. Sieve Analysis
B. Hydrometer Analysis
5. Determination of Consistency Limits
6. Density Index/Relative Density Test
7. Permeability Test
A. Constant Head Method
B. Falling Head Method
8. Proctor Test
9. Vane Shear Test
10. Direct Shear Test
11. Unconfined Compression Test
12. Undrained Triaxial Test
13. One Dimensional Consolidation Test

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

Note: -These are only the suggested list of experiments. Instructor may add or change some Experiments relevant to the course contents

Department of Civil Engineering

SEMESTER-V

Course Title: Environmental Engineering Lab **Max. Marks: 50**
Course Code: PCC-CE-533 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

Objectives: To understand the sampling and preservation methods and significance of characterization of wastewater.

List of Practical's:

1. Determination of Solids in wastewater sample: Total Solids, Suspended solids, Dissolved solids, Volatile solids, Fixed solids.
2. Determination of Sulphates content.
3. Determination of Ph of Given water sample.
4. Determination of Total Hardness of given water sample.
5. Determination of Biochemical oxygen demand.
6. Determination of Optimum Coagulate Dose.
7. Determination of the moisture content of solid waste.
8. Determination of chloride content of water sample.
9. Determination of SPM and RSPM.
10. Determine the Leq, Lmax and Lmin Noise level.

Laboratory Outcomes:

1. Students will be trained in analytical and conceptual skills required for environmental engineering research.
2. Students will be able to correlate environmental impacts and field processes.
3. Able to determine physico chemical characteristics of water.
4. Able to know air pollution standards.
5. Analyze water and waste water.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Department of Civil Engineering

SEMESTER-V

Course Title: Civil Engineering Material **Max. Marks: 50**
Course Code: PCC-CE-534 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

Objectives:

To prepare the students to effectively link theory with practice and application and to demonstrate background of the theoretical aspects.

List of Practical's:

1. To determine the silt content of fine aggregate
2. To determine the initial and final setting time of a given sample of cement
3. To determine the specific gravity of given sample of fine aggregate.
4. To determine the workability or consistency of concrete mix of given proportion by slump test.
5. To determine the workability of freshly mixed concrete by the of Compacting Factor Test
6. To measure the workability of concrete by vee-bee consistometer test
7. To determine the compressive strength of standard cement mortar cubes
8. To determine the split tensile strength of concrete of given mix proportions
9. To determine the compressive strength of given concrete mixes, 7days,28days,
10. To determine fineness modulus and grade of fine and coarse aggregate of size (10 &20mm)

Outcomes: . Students will able to learn:

1. The behavior and properties of structural materials, e.g. concrete, cement and steel can be better understood by detailed, well-designed, first-hand experience with these materials
2. The students will become familiar with the nature and properties of these materials by conducting laboratory tests.
3. To prepare the students to solve problems including design elements and related to their course work.
4. To encourage the students to use computers in analyzing the data.
5. To emphasize the knowledge and application of safety regulations.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents

Department of Civil Engineering

SEMESTER-V

List of courses in Open Elective Course-III (OEC-I)

Course Title: Operating System **Max. Marks: 100**

Course Code: OEC-CE-581/PCC-ITE-322 **University Examination: 60**

Duration of Exams: 3 hours **Internal Assessment: 40**

Credits 3(2-1-0)

OBJECTIVES:

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the mechanisms involved in memory management in contemporary OS
4. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. To know the components and management aspects of concurrency management

UNIT-1

Introduction: Introduction to Operating System, History of Operating System and Function, Evolution of Operating System, Batch Systems, Time Sharing and Real Time System, System Protection and Methods. Operating System Structure: System Components, System Structure.

UNIT-II

Process Management: Process concept, Process states, Principle of Concurrency, Semaphores and its types. Process Scheduling, Process Synchronization, Classical problems in Concurrency, Producer Consumer, Critical Section and readers writers problem, Producer Consumer Problem, Inter Process Communication, Process Generation, Resident Monitors.

UNIT-III

CPU Scheduling: Scheduling Concept, levels of Scheduling, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System Model, Shared resource, Resource allocation and Scheduling, Resource allocation graph, Deadlock Characterization, Prevention, Detection and Recovery.

UNIT-IV

Memory Management: Multiprogramming with Fixed Partition and Variable Partition, Multiple Base

Register, Paging, Demand Paging, Segmentation, Virtual Memory Concept, Allocation of Frames, Paged Replaced Algorithm, Thrashing, Cache Memory Concept.

Department of Civil Engineering

UNIT-V

I/O Management: I/O Devices and Organization of I/O Function, I/O Buffering, DISKI/O, Disk Scheduling algorithms and Operating System Design Issues.File System: File Concept, File Organization and Access Mechanism, File Directories, File Sharing.Unix and Linux Operating System as case studies, Time OS and Mobile OS

COURSE OUTCOMES: At the end of this course, the students will able to do the following:

1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system.
5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

TEXT BOOKS:

1. Milenekovic, Operating System Concepts, McGraw Hill
2. Silverschwatz, Operating System Concepts, Willey & Willey.

REFERENCE BOOKS:

1. Dietel, An introduction to operating system, Addision Wesley.
2. Tannenbaum A. S., Operating system design and implementation, PHI

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit

Department of Civil Engineering

SEMESTER-V

List of courses in Open Elective Course-III (OEC-I)

Course Title: Object Oriented Programming using Java **Max. Marks: 100**
Course Code: OEC-CE-582/PCC-ITE-324 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

OBJECTIVES: To provide a good understanding of Object Oriented Programming Language and its implementation using Java.

UNIT-I

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

UNIT-II

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.

UNIT-III

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

UNIT-IV

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing. Generic programming with templates: Class templates, Function Templates.

UNIT-V

I/O programming & Multithreading: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

COURSE OUTCOMES: After taking the course, students will be able to:

1. Understand the basics of java programming.
2. Understand the basic principles of the object-oriented programming.
3. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
4. Design applications with an event-driven graphical user interface.
5. Implement I/O and multithreading in Java

TEXT BOOKS:

1. Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.
2. Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press
3. Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

REFERENCE BOOKS:

1. Core Java Volume-I Fundamentals., Eight Edition, Horstmann & Cornell, Pearson Education
2. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH
3. Java Programming, D. S. Malik, Cengage Learning

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit.

Department of Civil Engineering

SEMESTER-V

List of courses in Open Elective Course-III (OEC-III)

Course Title: Power System-I **Max. Marks: 100**
Course Code: OEC-CE-583/PCC-EE-521 **University Exam: 60**
Duration of Exam: 3 Hours **Internal Assessment: 40**
Credits: 3 [3-0-0]

Objective: The objective of this course is to develop an understanding of the diverse concepts of power system generation, transmission and distribution. It also involves the study of various power transfer methods and phenomenon associated with power system.

Unit-I

Electric Supply System: Typical A.C. Power Supply Scheme, Comparison of D.C. and A.C. Transmission, Advantages of High Transmission Voltage, Various Systems of Power Transmission, Economic Choice of Conductor Size, Economic Choice of Transmission Voltage, Requirements of satisfactory electric supply, Main components of Overhead Lines, Conductor Materials, Bundled Conductors, Line Supports, Insulators, Type of Insulators, Potential Distribution over Suspension Insulator, String Efficiency, Methods of Improving String Efficiency, Corona, Factors affecting Corona, Advantages and Disadvantages of Corona, Methods of Reducing Corona Effect, Sag in Overhead Lines, Calculation of Sag, Some Mechanical principles.

Unit-II

Distribution System: Classification of Distribution Systems, Methods of obtaining 3-wire D.C. System, Connection Schemes of Distribution System, Requirements of a Distribution System, Design Considerations in Distribution System. Types of D.C. Distributors, D.C. Distribution Calculations, D.C. distributor fed at one end (concentrated loading), Uniformly loaded distributor fed at one end, Distributor fed at both ends(concentrated loading), Uniformly loaded distributor fed at both ends, Distributor with both concentrated and uniform loading, Ring Distributor, Ring main distributors with Interconnector, 3-wire D.C. system, Current distribution in 3-wire D.C. System, Balancers in 3-wire D.C. system, Booster, Comparison of 3-wire and 2-wire D.C. distribution, Ground detectors. A.C. Distribution Calculations, Methods of solving A.C. Distribution Problems, 3-phase unbalanced loads, 4-wire, star-connected unbalanced loads, Ground detectors.

Unit-III

Line Parameter Calculations: Resistance of a Transmission Line, Skin effect, Flux Linkages, Inductance of a Single Phase Overhead Line, Inductance of a 3-Phase Overhead Line, Concept of self-GMD and mutual GMD, Inductance Formulas in terms of GMD, Electric Potential, Capacitance of a Single Phase Overhead Line, Capacitance of a 3-Phase Overhead Line.

Unit-IV

Classification of overhead Transmission Lines: Performance of Single Phase Short Transmission Lines, Three-Phase Short Transmission Lines, Effect of load p. f. on Regulation and Efficiency, Medium Transmission Lines, End Condenser Method, Nominal T Method, Nominal II Method, Long Transmission Lines, Analysis of Long Transmission Line, Generalised Constants of a Transmission Line, Determination of Generalised Constants for Transmission Lines.

Department of Civil Engineering

Unit-V

Underground Cables: Construction of Cables, Insulating Materials for Cables, Classification of Cables, Cables for 3-PhaseService, Laying of Underground Cables, Insulation Core Cable, Dielectric Stress in a Single Core Cable, Most Economical Conductor Size in a Cable, Grading of Cables, Capacitance Grading, Inter sheath Grading, Capacitance of 3-Core Cables, Measurement of Cc and Ce, Current carrying capacity of underground cables, Thermal resistance, Thermal resistance of dielectric of single-core cable, Permissible current loading, Types of cable faults, Loop tests for location of faults in underground cables, Murray loop test, Varley loop test.

Course Outcome:

At the end of this course, students will demonstrate the ability to

1. Understand the various concept of power system and realize its importance.

2. Understand the working of various distribution systems

3. Understand the various constants of transmission lines

4. Evaluate performance analysis on transmission lines

5. Understand various Underground Cables

Text Books/References:

1. **J. Grainger and W. D. Stevenson**, "Power System Analysis", McGraw Hill Education, 1994.

2. **O. I. Elgerd**, "Electric Energy Systems Theory", McGraw Hill Education, 1995.

3. **A. R. Bergen and V. Vittal,** "Power System Analysis", Pearson Education Inc., 1999.

4. **D. P. Kothari and I. J. Nagrath**, "Modern Power System Analysis", McGraw Hill Education, 2003.

5. **B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac**, "Electric Power Systems", Wiley, 2012.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

SEMESTER-V

List of courses in Open Elective Course-III (OEC-III)

Course Title: Electronic Multimedia Engineering **Max Marks: 100**

Course Code: OEC-CE-583/PEC-ECE-522 **University Exam: 60**

Duration of Exam: 3 Hours **Internal Assessment: 40**

Credits: 3 [2-1-0]

Objective: The course has been designed to get student acquainted with basic concepts, principles and applications related to field. Emphasis is given to latest technologies.

Unit-I

Electro-acoustical Transducers: A microphone, Types of microphones their polar frequency response: moving coil, crystal microphone, Ribbon microphone, Single button microphone, condenser microphone, Principle characteristics of microphone, Magnetic microphone, Transformer less microphones, MEMS microphones, Noise- suppressing microphones, Wireless microphones, Useful frequency range for microphones, Comparison of microphones, ,

Unit-II

Loudspeakers and Recording systems: Loudspeaker basics, performance factors, Types of Loudspeakers: Dynamic cone-type moving coil loudspeaker, Horn-type moving coil loudspeaker and Electrostatic type loudspeaker, multi way speaker systems: Cross over networks, Woofers, midrange and Tweeters, Baffles and enclosures, mounting of direct radiator loudspeakers. Earphones and hearing aids.

Unit-III

Recording: Video Cassette recorders, Video Tape characteristics, Tape recording and play back. Basic principal of video recording on Disc, Digital Video Disc (DVD): DVD technology, Disc and data details DVD Audio- DVD Video, Dolby digital sound, blue ray disc

Unit-IV

Display Fundamentals: Television basics, Composite video signal, Modulation requirement, TV standards requirement, NTSC and PAL colour system, Advanced DTH system, cable TV, IP TV in multimedia, digital TV- HD (High definition) display.

Unit-V

Principle of Vision and Application of Visual Properties: Luminance and Colour, response of eye, Colour representation, Video system characteristics, Function of digital Camera, charged coupled device (CCD), Principle and display application of LED, Liquid crystal and plasma devices, 3D display concept, Touch screen basics.

Course Outcomes:

After completion of the course student will be able to:

1. Understand and analyse various microphones and loudspeakers.
2. Know the basic principle of recording and reproduction system like stereo recording and playback.
3. Explain the modern digital systems like DVD, Dolby digital sound, Blue ray disc.
4. Understand the basics of television standards and advanced HD TV and advanced DTH.
5. Acquire knowledge about advanced digital cameras, LED display, 3D display and touch screen.

Text Books:

1. **Ajay**- Dhanpat Rai & Sons Pub Audio Video and T.V Engineering.
2. **Gupta K.G-** Audio and Video Systems, Tata McGraw Hill Publication.

Reference Books:

1. **Kinsler**- Fundamentals of Acoustics, John Wiley & Sons. Inc.
2. **Whitaker Jerry** - Electronic Displays Technology, Design, and Applications, McGraw-Hill International Editions. 1994.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

Semester-V

List of courses in Open Elective Course-III (OEC-III)

Course Title: Data Structures Using C **Max Marks: 100**
Course Code: OEC-CE-584/PCC-CSE-321 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3 [3-0-0]

Objectives:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Unit-I

Review of Data Types and Concepts: Review of data types, Scalar types, Primitive types, Structures, Unions, Enumerated types, Records, Sparse Matrices, Recursion and its importance.

Unit-II

Searching and Sorting: Searching: Sequential search, Binary search, Hashing, General Idea for Hash Function, Separate Chaining, Open Addressing, Linear Probing.

Sorting: Bubble sort, Insertion Sort, Selection sort, Heap sort, Merge sort, Quick sort, External Sorting.

Unit-III

Expression and Linear Data Structure: Definition of a Data structure, ADT, Linear Data structures. Stack**:** Operations, Applications, implementation using linked list as well as arrays, Expressions and their conversions, Infix, Postfix & Prefix.

Queue**:** Types, Operations, Applications, implementation using linked list as well as arrays. Linked List**:** Types, Operations, Applications, Implementation.

Unit-IV

Trees: Preliminaries, Trees, Forest, Binary Trees, Binary Search Tree ADT, Binary Search Trees, Conversion of Forest to Binary Tree, Binary Search Tree, AVL Trees, Tree Traversals, Priority Queues (Heaps), Model, Simple implementations, Binary Heap.

Unit-V

Graphs: Definitions, Representation of Graphs, Adjacency Matrix, Path Matrix, Operations on Graphs, Traversing a graph: BFS and DFS, Shortest Path Algorithms:

Dijkstra`s Algorithm and Warshall`s Algorithm, Minimum Spanning Tree, Kruskal`s Algorithm and Prim`s Algorithm.

Course outcomes:

At the end of this course, the student will able to do the following:

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Text Books:

1. **Tanenbaum A. S.**, Data Structure Using C, Dorling Kindersley Publisher.
2. **Ellis Horowitz and SatrajSahni**, An Introduction to Data Structures, ComputerScience Press, Rockville MA 1984.

3. **M. A. Weiss**, "Data Structures and Algorithm Analysis in C", 2nd ed, Pearson Education Asia.

Reference Books:

1. **E. Horowitz & S. Shani**Fundamentals of Data Structures in C, Galgotia Pub. 1999.
2. **Richard F. Gilberg, Behrouz A. Forouzan**, Data Structures: A Pseudocode Approach with C, Thomson Cole, 1998.
3. **Hopcroft A. J. E. & Ullman J. D.,** Data Structures and Algorithms, Pearson Education Asia, 1983.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one question from each unit.

SEMESTER-VI

Course Title: Transportation Engineering **Max. Marks: 100**
Course Code: PCC-CE-621 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0]

Objective: The objective of this course is to provide basic knowledge to the students pertaining to roads, their construction material and bridges.

UNIT I

Highway development and planning-Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation.

UNIT II

Geometric design of highways-: Introduction; highway cross section elements, sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems

UNIT III

Traffic engineering & control- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems

UNIT IV

Pavement materials- Materials used in Highway Construction- Soils, Stone Aggregates, bituminous binders, bituminous paving mixes; requirements for different types of pavements and their design.

UNIT V

Design of pavements- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems

Course outcome: The students will be able to:

1. Carry out surveys involved in planning and highway alignment
2. Design the geometric elements of highways and expressways
3. Carry out traffic studies and implement traffic regulation and control measures and intersection design
4. Learn Characterize pavement materials
5. Design flexible and rigid pavements as per IRC

Text Books:

1. Partha Chakraborty, ' Principles Of Transportation Engineering, PHI Learning,
2. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,' Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley

Reference Books:

1 Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering',Revised 10th Edition, Nem Chand & Bros, 2017

2 Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Department of Civil Engineering

SEMESTER-VI

Course Title: Irrigation Engineering **Max. Marks: 100**
Course Code: PCC-CE-622 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The aim of the course is to provide basic knowledge to the students about measurement and occurrence of water and water resource planning.

UNIT-I

Introduction: Irrigation requirements and Advantages; Types of Irrigation; Various methods of Irrigation-Gravity, Lift, Sprinkler and Drip irrigation; Water Requirement of Crops-Crop types, Consumptive use, Measurement of consumptive use, Irrigation requirements, Duty, Delta, Irrigation efficiencies; Irrigation Management.

UNIT-II

Canal Irrigation: Types of canals, parts of canal irrigation systems, channel alignment, assessment of water requirements, water logging and drainage, estimation of channel losses, Design of Channels, Regime and semi-theoretical approaches; canal lining, factors affecting choice of various types of canal lining.

UNIT-III

Diversion Headwork: Diversion head works, types of weirs/Barrages, Parts of diversion head works, Selection of sites and layout, design of weirs on permeable foundations, silt excluders and silt ejectors.

UNIT-IV

Cross Drainage Works: Necessity of cross drainage works, their types and selection; design of various types of cross drainage works such as aqueduct, siphon, super passage, river training.

UNIT-V

Flood Control: Floods, types of flood control measures, drainage of irrigation land both saline and alkaline.

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

1. Understand the irrigation system, types, methods and its advantages
2. Design of channels
3. Understand the different types of diversion headwork.
4. Understand the different types of cross drainage works and able to design them.
5. Understand the concept of floods and its control.

Text Book/Reference Books:

1. Bharat Singh, Fundamentals of Irrigation Engineering.
2. Varshney, Gupta & Gupta, Theory and design of irrigation structures Vol. I & II

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Course Title: Advance Structure Design **Max. Marks: 100**
Course Code: PCC-CE-623 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: This course aims to strengthen the design skills in foundations, R Walls, domes and Pre stressed structures.

UNIT-I Foundations: Various types of RCC footings, Design of isolated and combined footings. Introduction to Raft foundation.

UNIT-II Retaining Walls: Stability analysis of retaining walls, design of cantilever and counter for type RCC retaining walls.

UNIT-III Water Retaining Structures: Design of underground, circular and rectangular water tanks-reference to IS:3370

UNIT-IV Shell Structures: Membrane analysis of spherical and conical domes by statical methods. Design of domes and ring beams.

UNIT-V Pre-Stressed Concrete: General principles, Methods of pre-stressing, pre-tensioning and post-tensioning, losses in pre-stress. Design of rectangular, T and I section beams.

Course Outcomes:

After studying the course student will:

1. Able to design the isolated and combined footing.
2. Able to design the retaining walls and analyse them for stability.
3. Capable of designing the different water tanks.
4. Able to do the membrane analysis of domes and design them.
5. Understand the methods of pre-stressing and able to calculate losses in pre-stress member.

Text Books:

1. Bowels, Foundation Engineering.
2. Jain & Jaikrishen, Design of R.C.C Structures Vol.-II.
3. Krishnarayan, Prestress Concrete Structures.

Books Recommended:

1. Kong & Evans, Design of reinforced and pre stressed concrete Structures.
2. A.K. Jain, Design of R.C.C.-Limit state Method.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Course Title: Transportation Engg. Lab. **Max. Marks: 50**
Course Code: PCC-CE-631 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits 1(0-0-2)

List of Practical's:

(A) Tests on Aggregate:

1. Aggregate grading and determination of specific gravity.
2. Determination of crushing value.
3. To carry out Los Angels abrasion test.
4. To carry out Impact test.
5. Shape tests: Flakiness and elongation index determination.

(B) Tests on Bitumen:

6. Determination of Penetration value.
7. To find out ductility of a bitumen sample.
8. Determination of Flash & Fire-point.

(C) Tests on Subgrade:

9. Determination of sub-grade modulus.
10. Determination of California bearing ratio.

Course Outcomes: The students will be able to find out the different properties of aggregate, bitumen and subgrade soil.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

SEMESTER-VI

Course Title: Survey Camp **Max. Marks: 100**
Course Code: PCC-CE-632 **University Examination: 50**
Duration of Exams: 3 hours **Internal Assessment: 50**
Credits 2(0-0-4)

A. Two Week Duration

1. Triangulation:
    i. Ordinary Methods
    ii. On the basis of Global positioning system (GPS)
    iii. Shifting of Horizontal and Vertical Controls
2. Setting out of works
4. Setting out of Curves
5. Contouring:
    i. Contouring of a Dam Reservoir/Railway line
    ii. Preparing a contour plan by various methods
    iii. Setting out of Contour lines of an appropriate site.

Course Outcomes: The students will know how to set out curves and prepare a contour map. Further, in Survey camp, students obtain extensive hands-on experience in the use of land surveying instruments and in the essentials of survey practice. Measurements of distances and angles, calculation and correction of errors are introduced.

Note:-These are only the suggested list of experiments. Instructor may add or change some experiments relevant to the course contents.

Professional Elective Course- I (PEC-I)
SEMESTER-VI

Course Title: Construction Engg. & Management **Max. Marks: 100**
Course Code: PEC-CE-661 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The objective of this course is to acquaint the students about equipment employed to construct civil engineering structures and the methodology to execute various construction works.

UNIT-I

Basics of Construction-Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution. pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail.

UNIT-II

Construction project planning- Stages of project planning: Techniques of planning- Bar charts, Gantt Charts Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion.

UNIT-III

Construction Equipment basics*:* Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities.

UNIT-IV

Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and SCurves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and levelling. Common Good Practices in Construction.

UNIT-V

Contracts Management basics*:* Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods. Construction Costs*:* Make-up of construction costs*;* Classification of costs, time cost trade-off in construction projects, compression and decompression.

Course Outcomes: After successfully studying this course, students will have:

1. An understanding of modern construction practices
2. A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resource required and project economics.
3. A basic ability to plan, control and monitor construction projects with respect to time and cost and an idea of how to optimise construction projects based on costs
4. An idea how construction projects are administered with respect to contract structuresand issues.

Text Books:

1. Punmia B.C, PERT & CPM.
2. Purifoy R. L, Construction Methods, Plant & Equipment.
3. Arora S.P, Bindra S.P, Building Construction, DhanpatRai publication.

Reference Books:

1. Varghese, P.C., "*Building Construction"*, Prentice Hall India.
2. Chudley, R., *Construction Technology*, ELBS Publishers.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Professional Elective Course-I (PEC-I)

Course Title: Pavement Material and Geometric Design of Highway **Max. Marks: 100**
Course Code: PEC-CE-662 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The objective of this course is to provide knowledge to the students pertaining to pavement material and geometric design of highway

UNIT I

Pavement Materials. Soil - Classification, characteristics, compaction, evaluation of soil strength; stabilized pavement materials; Aggregates: requirements, properties and tests on road aggregates for flexible and rigid pavements.

UNIT II

Bitumen: Origin, preparation, properties and tests, constitution of bituminous road binders; requirements; Criterion for selection of different binders. Bituminous Emulsions and Cutbacks: Preparation, characteristics, Bituminous Mixes: Mechanical properties: Resilient modulus, dynamic modulus and fatigue characteristics of bituminous mixes. Bituminous mix design methods and specifications. Weathering and Durability of Bituminous Materials and Mixes. Performance based Bitumen Specifications; Superpave mix design method: design example problems. Cement Concrete for Pavement Construction: Requirements, and design of mix for CC pavement, IRC and IS specifications and tests, joint filler and sealer materials.

UNIT III

Geometric Design of Highways: Classification of rural highways and urban roads, Topography, vehicle characteristics and design vehicle, driver characteristics, speed, traffic flow and capacity, levels of service, pedestrian and other facilities, environmental factors, Objectives and requirements of highway geometric design, geometric design of highway and Design Controls.

UNIT IV

Design Elements: Sight distances, Horizontal alignment - design considerations, stability at curves, super elevation, widening, transition curves; curvature at intersections, vertical alignment - grades, ramps, design of summit and valley curves, combination of vertical and horizontal alignment including design of hair pin bends, design of expressways, IRC standards and guidelines for design problems; Cross Section Elements: Right of way and width considerations, roadway, shoulders, kerbs traffic barriers, medians, frontage roads, Facilities for pedestrians, bicycles, buses and trucks, Pavement surface characteristics - types, cross slope, skid resistance, unevenness;

UNIT V

Design Considerations and Design: Design considerations for rural and urban arterials, freeways, and other rural and urban roads; Design Of Intersections: Characteristics and design considerations of atgrade intersections, Rotary intersections; Grade separations and interchanges -Design of Parking lots.

Course Outcomes: The students will be able to understand:

1. The different type of pavement materials.
2. Different properties of bitumen and cement concrete pavement.
3. The geometric design of highways
4. The different design elements of highways.
5. The design consideration of roads and design of intersection.

Reference books:

1. **Victor,** DJ Essentials of Bridge Engineering, H Oxford and IBH Publishers, New Delhi
2. **Bindra,** S.P Principles and Practice of Bridge Engineering", DhanpatRai and Sons, New Delhi. 3. **Bhanot, K. L** "Highway Engineering", S. Chand and Company Pvt. Ltd. New Delhi 4. **Khanna, S & Justo,** Highway Engineering,Nem Chand Brothers Roorke.
5. **Ponnuswamy S. & H. Toto,** Bridge engineering, McGraw Hill, New Delhi.
6. **R.J Salter & N.B Hounsel,** Highway Traffic Analysis and
7. Design,Macmillan Press ltd.1996

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Professional Elective Course-I (PEC-I)

Course Title: Advance Soil Mechanics **Max. Marks: 100**
Course Code: PEC-CE-663 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective:
To impart advanced knowledge and skill for soil identification, classification other physical properties of soils, viz. seepage, stress distribution, shear strength and cofferdam.

UNIT I
Soil Structures & Mineralogy: Soil texture, Solid particles in soil, Atomic & molecular bond, Interparticle forces in a soil mass, Single grained structure, Honey -comb structures. Flocculent &dispersed structures, Structure of connected soil, Clay minerals.

UNIT II
Soil Waterand stress: Modes of occurrence of water in soils- Absorbed water, Double layer, Capillary water. Stress condition in soil - Effective & neutral pressures.

UNIT III
Drainage in soil Capillary permeability test. Drainage & Dewatering Ditches & sumps, Well point system, Shallow well system, Deep well drainage, Electrosmosis method, Protective filters.

UNIT IV
Shear Strength Use of Stress path in triaxial test- Undrained & drained tests for Normally Consolidated & Over Consolidated clay samples. Skempton‘s pore-pressure parameters, Choice of shear parameters. Stability of open cut - braced open cut. Bishop‘s rigorous method, Limit equilibrium approach.

UNIT V
Bulk Head & Cofferdams: Classification - cantilever sheet pile wall in cohesion less and in cohesive soils Arching in soils, Classes of underground conduits, loads on positive projecting and negative projecting conduits.

Course Outcomes: The students will be able to understand:
1. The different type of soil structure.
2. Occurrence of water in soil and stress condition.
3. The phenomenon of drainage in soils.
4. The methods to determine the shear strength of soil.
5. The sheet pile walls and different type of conduits, cofferdams.

Text Books:

1. Geotechnical Engineering - S. K. Gulatiet. al., TMH Publishing Co. Ltd, New Delhi.
2. Basic and Applied Soil Mechanics - GopalRanjan and A. S. R. Rao, Wiley Eastern Ltd, New Delhi.
3. Lambe T. W. and Whitman, R.V. (1979), Soil Mechanics, John Wiley & Sons Inc.

Reference Books:

1. Soil Mechanics in Engineering Practice - Terzaghi and Peck, John Wiley and Sons Inc., New York.
2. Soil Mechanics- Lamb and Whitman, Wiley Eastern Pvt. Ltd, New Delhi.
3. Fundamentals of Soil Mechanics - Taylor, John Wiley and Sons Inc New York.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Professional Elective Course-I (PEC-I)

Course Title: Design of Hydraulic structure **Max. Marks: 100**
Course Code: PEC-CE-664 **University Examination: 60**
Duration of Exams: 3 hours **internal Assessment: 40**
Credits 3(2-1-0)

Course objectives: To impart knowledge regarding the design of the various minor irrigation structures and To convey the knowledge on the causes of failure, design criteria and stability analysis of different types of dams.

UNIT I

Diversion head works - layout and functions of components. Causes of failure of weirs on permeable soils, Bligh's theory and Khosla's theory. Irrigation canals

UNIT II

Design of unlined canals through alluvial soils-Kennedy's theory and Lacey's theory. Minor irrigation structures- Cross drainage works, Canal Regulation works: Falls and Regulators

UNIT III

Design of Hydraulic Structures: Aqueduct, siphon aqueduct, Canal falls-notch type, well type, Sarda type, and Cross regulator.

UNIT IV

Gravity dam - forces acting - stability analysis and modes of failure - theoretical and practical profiles- Functions of shafts, galleries, keys and water stops. Arch dams-types,

UNIT V

Design of canal falls, transitions and cross drainage works; Design principles for gravity and earthen dams Earth dams-types, causes of failure and design criteria. Spillways-Types. Ogee type spillwayprofile.

Course Outcomes: The students will be able to

1. Design minor irrigation structures such as regulators, cross drainage works and canal falls
2. Design the unlined canals.
3. Design the different hydraulic structures.
4. Perform the stability analysis of gravity dams
5. Explain the causes of failure of different types of dams and their design criteria

Text Books :

1. Garg S.K, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2006.
2. Modi. P. N., Irrigation Water Resources and Water Power Engineering, Standard Book House, 2009.

3. Punmia B.C. Ashok K Jain, Arun K Jain, B. B. L Pande, Irrigation and Water Power Engineering, Laxmi Publications (P) Ltd. 2010.

References Books:

1. Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, 2010.
2. Asawa. G.L. Irrigation and Water Resources Engineering, New Age International,
3. Sahasrabudhe S.R., Irrigation Engineering & Hydraulic Structures, S.K. Kataria& Sons, 2013
4. Sathyanarayana M. C. Water Resources Engineering-Principles and Practice, New Age International Publishers. 2009

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Professional Elective Course-I (PEC-I)

Course Title: Rural Water Supply **Max. Marks: 100**

Course Code: PEC-CE- 665 **University Examination: 60**

Duration of Exams: 3 Hours **Internal Assessment: 40**

Credit 3(2-1-0)

Objective: The objective of this course is to provide the students' knowledge about rural water supply and the different types of on-site sanitation system

UNIT I

Sources & Standards: Sources of water, features of water supply systems, Selection of water source, drinking water quality standards, Water borne diseases.

UNIT II

Treatment systems: Stages of water treatment process (brief description only); Bio-sand filters; Removal of arsenic, fluoride, iron and manganese.

UNIT III

Distribution & Disinfection systems: Requirements of a distribution system, Distribution networks – Dead end system, Grid iron System, Ring System and radial System; Disinfection systems for rural areas-Chlorination; Point of use water treatment system. Solar disinfection system.

UNIT IV

Sanitation: Sanitation-definition, relationship between water quality and sanitation. WASH (Water Sanitation & Health) Programme; On-site Sanitation-requirements, advantages, disadvantages and Technologies of on-site sanitation. Meaning of offsite sanitation.

UNIT V

Treatment Units: Design of septic tanks, single-pit and double-pit toilets. Small bore systems, bio digesters, reed beds, constructed wetlands, sludge management systems.

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

1. Understand the different attributes of water supply system.
2. Understand the different treatment system
3. Have knowledge about different disinfection systems.
4. Design the different treatment units and know the different on-site sanitation systems
5. Knowledge about the treatment units and design of septic tank.

Text Books:

1. Environmental Engineering by Peavy H.S, Rowe D.R. and Tchobanoglous G, Tata McGraw Hills, New Delhi.
2. Environmental Engineering (Vol I), Water Supply Engineering, S.K. Garg, Khanna Publishers, New Delhi.
3. G.M. Fair, J.C. Geyer, D.A. Okan, Elements of Water Supply and Wastewater Disposal, John Wiley and Sons Inc.

Reference Books

1. Terence, J. McGhee Water Supply and Sewerage, McGraw Hill Book Co.
2. M.J. Hammer, Water and Waste Water Technology, John Wiley and Sons, New York.
3. CPHEEO: Manual on water supply and treatment, Ministry of Urban Development.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Professional Elective Course-I (PEC-I)

Course Title: Remote Sensing & GIS **Max. Marks: 100**

Course Code: PEC-CE-666 **University Examination: 60**

Duration of Exams: 3 hours **Sessional Assessment: 40**

Credits 3(2-1-0)

Objectives:

Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object and thus in contrast to on-site observation, especially the Earth.

UNIT-I

Introduction

Introduction to Remote Sensing, Data acquisition and processing, Applications, Electromagnetic Radiation (EMR) and its characteristics, Planck's Law, Stefan's Law, Wein's Displacement law, Properties of solar radiant energy, Atmospheric windows.

UNIT-II

Physical basis of remote sensing

Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infrared thermal and microwave wavelengths, interaction at ground surface, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry.

UNIT-III

Platform and sensors

Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun-synchronous orbits, sensors for visible and near infrared wavelengths, profilers, images, scanners, radiometers, optical mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometric characteristics of scanners, V/H ratio, comparison of some satellite/ aerial platforms and sensors and remote sensing data products, land sat MSS and TM, SPOT, IRS, ERS etc.

UNIT-IV

Geographical Concepts and Terminology

Difference between image processing system and geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitizers.

UNIT-V

Data Base

Raster and vector data, data storage, hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management, data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data management and statistical modeling, applications of GIS in various natural resources and engineering applications.

Course outcome: After successfully studying this course student will:

1. Able to understand Remote Sensing and data acquisition and processing, sensor Systems and its applications.
2. Know the nature of atmospheric interaction, atmospheric effects of visibility and, interaction with soils and rocks etc.
3. Understand multi concept in remote sensing and balloon aircraft and comparison of some satellite/ aerial platforms and sensors and remote sensing data products.
4. Understand difference between image processing system and geographical system (GIS), utility of GIS and essential components of a GIS.
5. Know the raster and vector data, data storage, hierarchical data, network systems, relational database, data management, conventional database management systems and applications of GIS in various natural resources and engineering applications.

Text Books

1. Remote Sensing and Image Interpretation: T.M. Lillensand and R.W. Keifer
2. Principles of Remote Sensing : P.J. Curren
3. Principles of Geographical Information systems for land Resources Assessment : P.A. Baurrough

Reference Books

4. Manual of Remote Sensing, Vol.2 : American Society of Photogrammetry and Remote Sensing
5. Geographical Information systems- A Management Perspective : Stan Aromoff

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each

SEMESTER VI

Professional Elective Course-II (PEC-II)

Course Title: Engineering Geology **Max. Marks: 100**
Course Code: PEC-CE-667 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The aim of this course is to make the students aware about the earth, its constitution, rocks and soil, impact of wind and precipitation. Earthquakes have also been incorporated to be studied.

Unit –I

Introduction- rocks and minerals: Definition and Scope of Engineering Geology with its importance in Civil Engineering. introduction of Rocks, classification of rocks, Application of rocks as an engineering materials, building stone, Physical and chemical properties of Rocks, mode of formation of rocks, agents of metamorphism and zone of metamorphism.

Unit- II

Weathering and faults: Weathering; mechanical and chemical weathering. Erosion; Erosion by running water and wind, fold- various types of folds, faults-various types of faults, joint-various types of joints, civil engineering significance of folds, faults and joints.

Unit –III

Water conservation practices and seismicity: groundwater, ground water recharge, rainwater harvesting system, concepts of zone of aeration and saturation, Seismicity, seismic zones in India and their significance.

Unit IV

Mineralogy and Geological investigations: Rock forming minerals, Properties of minerals, Mineral Composition affecting the properties of Concrete at its fresh stage, geological investigation techniques. Geological investigations of Dam site, reservoir, bridges, highways, buildings and tunnels.

Unit- V

Soft computing tools: An introduction to software's for the solution of engineering geologic problems such as Dip, Strike, Abacus etc., Advantages/Disadvantages and applications of this software. Software for interpretation of sub-surface geological strata and its application.

Course Outcomes: After completing subject, Students will be able to

1. Understand the role of geology in the design and construction process of underground openings in rock.
2. Understand about types of weathering ,fault, fold, joints in rock.
3. Understand about ground water recharge, rain water harvesting and also about the seismic zones in India.

4. Use the geologic literature to establish the geotechnical framework needed to properly design and construct heavy civil works rock projects.
5. Introduction about soft computing tools used in geological investigation.

Text Books

1. Parbin Singh, Engineering Geology.
2. Arthur Holmes, Physical Geology.

Reference Books:

1. Shilling P.B,Structural Geology.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER VI

List of courses in Professional Elective Course-II (PEC-II)

Course Title: Professional practice law and ethics **Max. Marks: 100**
Course Code: PEC-CE-668 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.

UNIT I

Professional Practice and Professional Ethics – Respective roles of various stakeholders: Government; Standardization Bodies (ex. BIS, IRC); professional bodies (ex. Institution of Engineers (India), Indian Roads Congress; Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards). Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures.

UNIT II

General Principles of Contracts Management*:* Indian Contract Act, 1972 and Amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions &Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms.

UNIT III

Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system*:* Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement,

Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats.

UNIT IV

Engagement of Labour and Labour & other construction-related Laws*:* Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piecerate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017.

UNIT V

Law relating to Intellectual property*:* Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies.

Course Outcomes:

1. To familiarise the students to what constitutes professional practice, introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing the profession
2. To give a good insight into contracts and contracts management in civil engineering dispute resolution mechanisms; laws governing engagement of labour
3. To give an understanding of Intellectual Property Rights, Patents.
4. To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
5. To develop good ideas of the legal and practical aspects of their profession.

Text Books:

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts
2. The National Building Code, BIS, 2017

Reference Books:

3. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
4. Vee, Charles &Skitmore, Martin (2003) Professional Ethics in the Construction
5. Industry, Engineering Construction and Architectural management
6. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER VI

Professional Elective Course-II (PEC-II)

Course Title: Construction practice and planning **Max. Marks: 100**
Course Code: PEC-CE-669 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(3-0-0)

Objective: The objective of this course is to acquaint the students about equipments employed to construct civil engineering structures and the methodology to execute various construction works.

UNIT I

Construction Methods basics: Types of foundations and construction methods;

Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.

UNIT II

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

UNIT III

Construction Project Planning& Systems. Definition of Projects; Stages of project planning: pretender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.

UNIT IV

Project Monitoring & Control- Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of

time and cost overruns and corrective measures. Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modelling (BIM) in project management; Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

UNIT V

Construction Cost Analysis. Introduction to the application of scientific principles to costs and estimates of costs in construction engineering; concepts and statistical measurements of the factors involved in direct costs, general overhead costs, cost markups and profits; fundamentals of cost recording for construction cost accounts and cost controls.

Course Outcomes: After successfully studying this course, students will have:

1. An understanding of modern construction practices.
2. A basic ability to plan, control and monitor construction projects with respect to time and cost and an idea of how to optimise construction projects based on costs
3. An idea how construction projects are administered with respect to contract structures and issues.
4. The idea about the project monitoring ,supervison and controlling.
5. Knowledge of methods of cost analysis in different construction projects.

Text Books:.

1. **Purifoy R. L,** Construction Methods, Plant & Equipment.
2. **Arora S.P, Bindra S.P**, Building Construction, DhanpatRai publication.

Reference Books:

3. Varghese, P.C., "*Building Construction"*, Prentice Hall India.
4. Chudley, R., *Construction Technology*, ELBS Publishers.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER VI

Professional Elective Course-II (PEC-II)

Course Title: Industrial Waste Treatment **Max. Marks: 100**
Course Code: PEC-CE-670 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: To impart knowledge for the various techniques employed for characterisation and quantification of waste/wastewater generated by various industrial activities, and safe disposal of treated waste/wastewater employing appropriate treatment methods in to the environment.

UNIT I

Industrial wastewaters, nature and effects, water pollution and problem pollutants Stream sanitation, de-oxygenation and self-purification in streams.

UNIT II

Sources and characteristics of industrial wastewaters, sampling and analysis In-plant waste control and water reuse.

UNIT III

Different methods of treatment, Screening, sedimentation, Coagulation and Flocculation, floatation, aeration, aerobic and anaerobic digestion.

UNIT VI

Ion exchange, reverse osmosis, adsorption, combined biological, physical and chemical process.

UNIT V

Application of treatment methods to some selected industries. Introduction to ISO: 14,000, Life cycle analysis etc.

Outcome: The students would be able to

1. characterize and quantify of wastewater generated from the various industry,
2. Knowledge of sources and characterstic of industrial waste waters
3. Knowledge of different methods of treatments of waste water
4. Knowledge of different methods of treatments of waste water
5. design the various process for the treatment of the Industrial wastewater.

Text Books:

1. Waste Water Engineering: Treatment and Reuse, Metcalf & Eddy, T.M.H. Publication. Environmental Engineering by Peavy H.S, Rowe D.R. and Tchobanoglous G, Tata McGraw Hills, New Delhi.

Reference Books:

1. G.M. Fair, J.C. Geyer, D.A. Okan, Elements of Water Supply and Wastewater Disposal, John Wiley and Sons Inc.
2. Terence, J. McGhee Water Supply and Sewerage, McGraw Hill Book Co.
3. M.J. Hammer, Water and Waste Water Technology, John Wiley and Sons, New York.
4. CPHEEO: Manual on Sewerage and Sewage Treatment, Ministry of Works and Housing, New Delhi.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER VI

Professional Elective Course-II (PEC-II)

Course Title: Highway Construction and Pavement Design **Max. Marks: 100**
Course Code: PEC-CE-671 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: To introduce the elements related to highway engineering. The subject knowledge of traffic engineering, geometric design and pavement design shall be imparted along with highway material and construction.

UNIT I

Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements. Stresses and Deflections in Flexible Pavements: Stresses and deflections in homogeneous masses. Burmister's two-layer theory, three layer and multi-layer theories; wheel load stresses, various factors in traffic wheel loads; ESWL of multiple wheels. Repeated loads and EWL factors; sustained loads. Pavement behaviour under transient traffic loads.

UNIT II

Flexible Pavement Design: Methods For Highways and Airports: Empirical, semi-empirical and theoretical approaches development, principle, design steps, advantages; design of flexible pavements as per IRC;Stresses in Rigid Pavements: Types of stresses and causes, factors influencing the stresses general considerations in rigid pavement analysis, EWL; wheel load stresses, warping stresses, frictional stresses, combined stresses.

UNIT III

Rigid Pavement Design: Types of joints in cement concrete pavements and their functions, joint spacings; design of CC pavement for roads and runways as per IRC, design of joint details for longitudinal joints, contraction joint sand expansion joints. IRC method of design by stress ratio method. Design of continuously reinforced concrete pavements; Maintenance, repair and rehabilitation of pavements including design of bituminous and concrete overlays as per IRC

UNIT IV

Highway Construction: Flexible Pavement Construction: Earthwork, compaction and construction of embankments, specifications of materials, construction methods and field control checks for various types of flexible pavement materials in subbase, base, binder and surface course layers and their choice;

UNIT V

Cement Concrete Pavement Layers: Specifications and method of cement concrete pavement construction; Construction of interlocking block pavements, Quality control tests; Construction of various types of joint, Soil Stabilized Pavement Layers Principles of gradation/proportioning of soil aggregate

mixes and compaction; Design factors, mix design, construction control and quality control checks for mechanical, soil-cement, soil-bitumen and soil-lime stabilization methods. Use of additives, Numerical problems on mix design and applications;

Outcome: The students will have

1. Understanding of stresses and deflection in flexible and rigid pavement.
2. The ability to design the flexible pavements.
3. The ability to design the rigid pavements.
4. Understanding of the construction of highway.
5. Knowledge of the different layers of a rigid concrete pavement.

Text Books:

1. Khanna, S. K. and Justo, C. E. G., Highway Engineering, Nemchand Bros., Roorkee
2. Kadiyali, L. R., Principle and Design of pavements, Khanna Publishers, New Delhi
3. Kumar SrinivasaR.,Textbook of Highway Engineering, University Press

Reference Books:

1. Wright, P. H., Highway Engineering, John Wiley and Sons, New York.
2. Hay, W. W., Introduction to Transportation Engineering. John Wiley and Sons, New York.
3. Papacostas, C. S., Fundamentals of Transportation Engineering, Prentice Hall of India, New Delhi.
4. Huang, Y. H., Pavement analysis and Design. Prentice Hall, Englewood Cliffs, New Jersey.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

Professional Elective Course-II (PEC-II)

Course Title: Tunnel Engineering **Max. Marks: 100**

Course Code: PEC-CE-672 **University Examination: 60**

Duration of Exams: 3 hours **Internal Assessment: 40**

Credits 3(2-1-0)

Objectives: To introduce the basic concept of tunneling & ground improvement techniques and Students will be able to understand the fundamentals design of tunnels. Students will be able to recognize the different types of tunnelling methods, operations and equipment**.**

UNIT I

Introduction: Terminology & general aspects, historical developments of tunnelling, classification of tunneling methods, merits and demerits, conditions favorable for tunnel construction - parameters influencing location, shape and size; surface and subsurface conditions; planning and site investigations like geology, hydrogeology, geological disturbances etc.,

UNIT II

Geomechanics: Classification and characterization of rock mass and soil, in-situ determination of engineering properties of rock mass, geotechnical exploration for soil profile, effect of geological structures on tunnel excavation, stress analysis using numerical methods; instrumentation and measurements in tunneling.

UNIT III

Conventional Tunnelling Methods: Factors affecting choice of excavation technique; various tunneling methods - soft ground and hard rock, shallow tunneling, deep tunneling; Scaling factor using their properties in tunnel design; Operation cycles in conventional tunneling; selection of drilling equipment, drilling tools, drill ability factors; types of drilling patterns and vertical drilling; selection of blasting techniques - explosives, initiators, blast design, tunnel blast performance - powder factor, equipment selection for mucking and transportation.

UNIT IV

Modern Tunneling Methods: Tunnelling by road headers and impact hammers - cutting principles, method of excavation, selection, limitations and technical problems, tunnel boring machines - boring principles, method of excavation, selection, performance, limitations and technical challenges, scope of application, special methods - New Austrian tunneling; Immersed tunneling, micro tunneling, tunnel jacking, technical considerations and limitations.

UNIT V

Supports, Ventilation and Safety: Ground squeeze, rock burst, types of supports, design and selection of support - lining, rock bolt, grouting, ground treatment in tunneling, tunnel ventilation systems during and

after completion - methods of ventilation, air conditioning, tunneling utilities - lighting and drainage of tunnels, risk management of tunneling; Safety aspects in road, rail tunnels and metro tunnels.

Outcomes The students will able to

1. Design the tunnel for the given geo-technical conditions
2. Choose the type of the equipment and operations**.**
3. Understand the conventional tunneling methods
4. Understand the modern tunneling methods.
5. Have a sound knowledge of safety norms adopted while tunneling.

Text Books:

1. Bernhard M. Markus T. Ulrich M., "Handbook of Tunnel Engineering I & II: Basics And Additional Services For Design And Construction", John Wile Publications, 2014.
2. Brady B H G, Brown E T, "Rock Mechanics: for Underground Mining", Springer's Publishers, 3rd Edition, 2004.
3. Champan D, "Introduction to Tunnel Construction", CRC Press, 1st Editions, 2010.

Reference Books:

4. Kuesel, T. R., King, E. H., Bickel, J. O. , "Tunnel Engineering Handbook", Springer US, 2nd edition, 2011.
5. Ramamurthy T N, "Engineering in Rocks for Slopes Foundations and Tunnels", PHI Learning Pvt Ltd, 2nd Edition, 2010.
6. Subhash C Saxena, "Tunnel Engineering", DhanpatRai&Sons , New Delhi, 1998.
7. Srinivasan R, Bhaskar R C,"Harbour, Dock and Tunnel Engineering", Charotar Publishers, 2003.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Data Base Management System **Max. Marks: 100**
Course Code: OEC-CE-681/PCC-IT-421 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(3-0-0) Objectives:

Course Objective: The main objective of this course is to introduce the basic concepts of database, data modeling techniques using entity relationship diagram, relational algebra and calculus, basic and advanced features SQL, normalization, transaction processing, concurrency control, and recovery techniques.

UNIT-I

INTRODUCTION: Drawbacks of Files Management System, Database System Concepts and Architecture, Data Abstraction, Schemas and Instances, Data Independence, Data Models, Database Language and Interface, Structure of DBMS.

Data Modelling Using Entity Relationship Model: ER Model Concept, Notation for ER Diagrams, Mapping Constraints, Weak and Strong Entity Types, Extended ER model concepts.

RELATIONAL MODEL: Relational Data Model Concepts, Keys Constraints, Integrity Constraints, Domain Constraints, Referential Integrity,

UNIT-II

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple Calculus - Domain calculus.

INTRODUCTION TO SQL: SQL Data Type and Literals, Types of SQL Commands, SQL Operations (DDL, DML, and DCL), Tables, Views and Indexes, Queries and Nested Sub queries, Aggregate and Scalar Functions, Triggers.

UNIT-III

Normalization – Functional Dependencies, Armstrong's axioms for FD's, Normal Forms: First, Second, Third Normal forms, BCNF, Properties of Decompositions, Multivalued Dependencies, Fourth Normal Form, Join Dependencies, Fifth Normal form, Inclusion Dependencies.

UNIT-IV

Transaction & Concurrency Control: Transaction Concept, Transaction State, ACID properties. Schedules, Serializability, Testing of Serializability, Recoverability. Recovery from Transaction Failures, Log Based Recovery, Checkpointing, Shadow Paging.

Concurrency Control: Lock Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Multi-Version Schemes, Deadlock Handling.

UNIT-V

Implementation Techniques- Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

COURSE OUTCOMES:

1. For a given query write relational algebra expressions for that query and optimize thedeveloped expressions
2. For a given specification of the requirement design the databases using E R methodand normalization.
3. For a given specification construct the SQL queries for Open source and CommercialDBMS -MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity,consistency, isolation, and durability.

TEXT BOOKS:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education

REFERENCE BOOKS:

1. **J. D. Ullman** "Principles of Database and Knowledge – Base Systems", Vol 1 by, Computer Science Press.
2. **R. Elmasri and S. Navathe,** "Fundamentals of Database Systems", 5th Edition by Pearson Education

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt 5 questions selecting at least one question from each unit

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Computer Network **Max. Marks: 100**
Course Code: OEC-CE-682/PCC-IT-425 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment:40**
Credits 3(3-0-0)

OBJECTIVES:

1. To provide insight about fundamental concepts and reference models (OSI and TCP/IP) and Its functionalists.
2. To gain comprehensive knowledge about the principles, protocols, and significance of Layers in OSI and TCP/IP.
3. To know the implementation of various protocols

UNIT- I

Introduction: Basic communication model, Introduction to data communication, components of data communication system, data flow (simplex, half –duplex and full duplex), data transmission (parallel transmission, serial transmission), introduction to computer network, components of computer network, advantages and disadvantages of computer networks, network criteria, network topology, OSI and TCP-IP.

PHYSICAL LAYER: Functions of Physical Layer. Classification of transmission medium.

UNIT-II

Data Link Layer and Medium Access Sub Layer: Functions of Data link Layer, Error Detection and Error Correction (type of errors, Redundancy, coding) parity checking, CRC, Flow Control and Error control protocols, Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window Piggybacking, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.

UNIT-III

Network Layer: Functions of Network Layer, Packet Switching and Datagram approach, IP addressing methods, IPV4, IPV6, transition from IPv4 to IPv6 (Dual stack and tunneling) Sub netting, Delivery (direct, indirect), Forwarding (forwarding techniques) Routing protocols (RIP, OSPF, BGP), unicast, multicast and broadcast routing Bellman ford and Dijkstra algorithm, ARP, RARP, BOOTP and DHCP.

UNIT-IV

Transport Layer: Functions of Transport Layer, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion control, Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT-V

Application Layer: Domain Name Space (DNS), TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, Bluetooth, Firewalls, Basic concepts of Cryptography.

Course outcomes:

1. Explain the functions of the different layer of the OSI Protocol.
2. Able to understand the two main functions of Data link layer i.e data link control and media access control
3. Able to understand the delivery, forwarding and routing of packets.
4. Understand the difference between process to process, host to host and node to node communication.
5. Able to understand what services are provided by the application layer to the user.

TEXT BOOKS:

1. Behrouz A. Forouzan, Data Communication and Networking, 4th Edition, McGraw Hill.
2. William Stallings, Data and Computer Communication, 8th Edition, Pearson Prentice Hall India.

REFERENCE BOOK:

1. Andrew S. Tanenbaum, Computer Networks, 8th Edition, Pearson New International Edition.
2. Douglas Comer, Internet working with TCP/IP, Volume 1, 6th Edition Prentice Hall of India.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will
be set from each unit. The student has to attempt 5 questions selecting at least one question
from each unit.

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Electrical Measurement-I **Max. Marks: 100**
Course Code: OEC-CE-683/PCC-EE-423 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment:40**
Credits 3(3-0-0)

Objective: The objective of this course is to expose the students to a broad knowledge of experimental methods and measurement techniques.

Unit-I: Measurement System & Characteristics of Instruments

Introduction, significance of measurements, methods of measurements, Instruments & measurement system, Classification of instruments – mechanical, electrical & electronic instruments, deflection & null type instruments, Comparison of Analog & digital modes of operation. Application of measurement systems, errors in measurements, types of errors. Accuracy, Precision, Resolution, loading effects. Units Absolute, Fundamental & derived.

Unit-II: Bridge Circuits

Wheatstone Bridge- galvanometer sensitivity, current through galvanometer & limitations, Kelvin Double Bridge, Maxwell Inductance Bridge, Maxwell inductance – capacitance bridge, Anderson's bridge, Schering Bridge, Hay Bridge & Wien's Bridge. Measurement of effective resistance, inductance & capacitance at high frequency Meter.

Unit-III: Eectro-mechanical Indicating Instruments

D Arsonval Galvanometer- construction & theory, Torque equation, Dynamic behavior & Galvanometer constants. Ballistic galvanometer- construction & theory. Introduction to PMMC Instruments and Moving Iron Instruments.

Unit-IV: Ammeters, Voltmeters

DC Ammeter, Multi-range Ammeter, RF Ammeter. DC Voltmeter, Multi-range Voltmeter, Extending ammeter & Voltmeter Ranges- Multipliers & shunts, The Aryton Shunt or Universal Shunt, Requirements of a Shunt, Introduction to Instrument Transformers & their application to extension of Instrument range.

Unit-V: Measurement of Energy & Power

Measurement of power in three phase AC circuits using single phase & three phase wattmeter, Measurement of reactive power (single phase & three phase), Measurement of energy using Induction type meter, Energy meter testing, Power factor meter.

Course Outcomes.

The student will learn:

1. Introduction to Measurement System & Characteristics of Instruments.
2. Exposure to the Bridge Circuits and to learn various measurements techniques used for the measurement of capacitance and inductance.
3. Exposure to Electromechanical Indicating Instruments.
4. Exposure to various types of Ammeters and Voltmeters.
5. Exposure to different methods used in the measurements of Energy & Power.

Text Books/References:

1. **Albert D.Helfrick and William D. Cooper**, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.
2. **Ernest o Doebelin and dhanesh N manik**, "Measurement systems" ,5th edition ,McGraw-Hill, 2007.
3. **John P. Bentley**, "Principles of Measurement Systems", Fourth edition, Pearson Education Limited, 2005.
4. **A. K. Sawhney**, "Course In Electrical And Electronic Measurement And Instrumentation", DhanpatRai Publisher, 2000.
5. **Bouwens,A.J**, "Digital Instrumentation", Tata Mc-Graw Hill, 1986.
6. **David A.Bell**, "Electronic Instrumentation and Measurements", Second edition, Prentice Hall of India, 2007.

Note for Paper Setter: -The Question paper shall comprise of 10 questions. Two questions will be set from each unit.The student has to attempt five questions selecting one from each unit.

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Computer Graphics and Multimedia **Max Marks: 100**

Course Code: OEC-CE-684/PCC-CSE-622 **University Exam: 60**

Duration of Exam: 3 hours **Internal Assessment: 40**

Credits 3(3-0-0)

OBJECTIVE: To understand the basics of various inputs and output computer graphics hardware devices. Exploration of fundamental concepts in 2D and 3D computer graphics. To know 2D raster graphics techniques, 3D modelling, geometric transformations, 3D viewing.

Unit–I

Basic of Computer Graphics: Introduction to computer graphics, Applications of computer graphics, Display devices, Raster scan systems, Graphics input devices, Graphics software and standards.

Unit–II

Graphics Primitives: Points, lines, circles as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes.

Unit–III

2D Transformations and Viewing: Transformations, matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping, polygon clipping.

Unit–IV

3D Transformations & Introduction to Curves: curved lines and surfaces, spline representation, cubic spline interpolation methods, Bezier curves and surfaces, B-spline curves. 3D transformations: 3D scaling, rotation and translation, composite transformation, Projection: parallel and perspective.

Unit–V

Introduction to Multimedia: Introduction to multimedia, Multimedia computer system, Multimedia components, Multimedia terminology: communication modes, media types, Multimedia networks, Applications of multimedia, distributed multimedia systems, Synchronization

COURSE OUTCOMES

1. Explain various applications of computer Graphics.
2. To be able to understand a graphics processing system.
3. To able to under and implement computer graphics algorithms.
4. To be able to implement 3D graphics primitives 5. To be able to understand and use multimedia aids.

TEXT BOOKS:

1. Steven Harrington, Computer Graphics, A programming approach second Edn.
2. Computer Graphics; Principles and practice; Second Edition in C; J. D. Foley, A.Van Dam, S. K. Feiner and J. F. Hughes; Addison Wesley, 1997.

REFERENCE BOOKS:

1. Rogers, Procedurals elements of Computer Graphics, McGraw hill.
2. Newman and Sproul, Principle of interactive Computer Graphics, McGraw Hill.
3. John F. Koegel Buford, Multimedia Systems, Pearson Education.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit.

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Renewable Energy Sources **Max Marks: 100**

Course Code: OEC-CE-685/PCC-EE-421 **University Exam: 60**

Duration of Exam: 3 hours **Internal Assessment: 40**

Credits 3(3-0-0)

Course Objective: The course is designed to give knowledge of various renewable energy sources, systems and applications in the present context and need.

Unit-I

Energy Scenario in India, Renewable and Non-renewable Energy sources, Causes of Energy Scarcity, Solution to energy Scarcity, Need for Renewable Energy, Advantages and Disadvantages of Renewable energy, Renewable Energy statistics worldwide and India.

Unit-II

Solar energy, solar photovoltaic, PV Technologies-Amorphous, monocrystalline, polycrystalline, V-I characteristics of a PV cell, PV module, array, Maximum Power Point Tracking (MPPT) algorithms, Concentrated Solar Power, types of collectors, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, Application of Solar Power, Economic Policies to Promote Solar Energy.

Unit-III

Introduction, Electricity Generation using Wind Energy Generators (WEG), Evaluating Wind Turbine Performance, Wind Potential, Wind Energy in India, Wind Turbine Size and Power Ratings, Advantages of Wind-Generated Electricity, Cost Issues, Environmental Concerns, Supply and Transport Issues.

Unit-IV

Bio energy, Types of Bio Gas Plants, tidal energy, classification of Tidal Plants, ocean thermal energy systems, Open OTEC Cycle, Closed OTEC Cycle. Introduction to Magneto Hydro Dynamics (MHD) Power & fuel cells.

Unit-V

Introduction, characteristics of energy storage system, storage capacity, charging and discharging rate, storage efficiency, storage of mechanical energy, fly wall energy storage, compressed air storage, electro chemical energy storage system (Battery).

Course Outcome:

After learning the subject, student will be able to:

1. Appreciate the importance of energy crises and consequent growth of the power generation from the renewable energy sources
2. Demonstrate the knowledge of physics of solar power generation and the associated issues.
3. Demonstrate the knowledge of the physics of wind power generation and all associated issues.

4. Understand the utilization of Bio Gas Plants, Tidal, MHD, Fuel Cells by identifying the sites where their production is feasible.
5. Demonstrate the ways by which energy can be stored in different forms.

Text books/ References:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, McGraw-Hill Education
2. Solar Engineering of Thermal Processes, John A. Duffie, William A. Beckman, John Wiley, New York
3. Non-conventional energy resources, Shobh Nath Singh, Pearson India 4. Solar Energy Engineering, Soteris Kalogirou, Elsevier/Academic Press.
5. Principles of Solar Energy, Frank Krieth & John F Kreider, John Wiley, New York

Note for Paper Setter: The Question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Energy Audit and Management **Max Marks: 100**

Course Code: OEC-CE-686/PEC-EE-622 **University Exam: 60**

Duration of Exam: 3 hours **Internal Assessment: 40**

Credits 3(3-0-0)

Course Objective: This course gives an overview of various aspects of conservation, management& audit of electrical energy.

Unit-I

Energy Scenario: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, longterm energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation, Energy Conservation Act and its features.

Unit-II

Energy Management & Audit: Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Unit-III

Energy Efficiency in Electrical Systems: Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

Unit-IV

Energy Efficiency in Industrial Systems: Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fansand blowers: Types, performance evaluation, efficient system operation, Pumps and Pumping System: Types, performance evaluation, efficient system operation. Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling

Unit-V

Energy Efficient Technologies in Electrical Systems: Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lightingcontrols, energy saving potential of each technology.

Course Outcomes

At the end of this course, students will demonstrate the ability to

1. Understand the current energy scenario and realize the need for new reforms to efficiently manage the energy resources.
2. Learn various auditing techniques used for proper energy management.
3. Realize how energy conservation could be done in Electrical Systems by managing the energy losses and malpractices.
4. Realize how energy conservation could be done in Industrial Systems by finding out the factor affecting the performance of various industrial devices and mitigating the same.
5. How electrical energy management could be achieved using new energy efficient devices.

Text/Reference Books

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book3, Electrical Utilities (available online)
3. **S. C. Tripathy**, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.
4. Success stories of Energy Conservation by BEE, New Delhi (12.www.bee-india.org)

Note for Paper Setter: -The Question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions at least one from each unit.

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Analog Communication Systems **Max Marks: 100**

Course Code: OEC-CE-687/PCC-ECE-423 **University Exam: 60**

Duration of Exam: 3 hours **Internal Assessment: 40**

Credits 3(3-0-0)

Objective: The main thrust in this course is on making students familiar with basic communication principles and Technologies in vogue. The stress is on the applied Communication with reference to the relevant technologies.

Unit-I

Introduction to communication systems: Elements of an Analog Communication System, Communication Media and their Characteristics, channel capacity, Bandwidth, Shannon Capacity Relationship. Concept of time domain and frequency domain representation of signals. Fourier series expansion and Fourier Transform of some fundamental Signals.

Unit-II

Amplitude Modulation (AM): Concept of Modulation, Need for modulation, Amplitude modulation, Frequency spectrum of AM Waves, Representations of AM waves, Power relation in AM waves, Types of AM- Double sideband techniques and Single Sideband Techniques. SSB generation and Detection, DSB Generation and Detection, Numerical on Power calculations and Spectral analysis of AM.

Unit-III

Frequency Modulation (FM): Concept of Angle Modulation, Introduction to FM, Expression for Monotone FM, Types of FM, Power relations in FM, Spectrum of wideband FM, Bandwidth calculation in FM, Generation Methods of FM- Direct and Indirect, Detection methods of FM signal, PLL as FM detector. Numerical on power calculations, Bandwidth calculations and Spectralanalysis of FM.

Unit-IV

Radio Transmitters and Receivers: Block Diagram of AM/FM radio Transmitter, Characteristicsof Radio receivers- Sensitivity, Selectivity, Fidelity, Image Rejection (IFRR), Block Diagram for TRF Radio Receiver and Super-Heterodyne Receiver, ACG Controller and its configurations.

Unit-V

Noise analysis: Source of noise in analog communication systems, classification of noise - external noise, internal noise, Noise figure, signal to noise ratio (SNR), SNR and noise figure calculation in AM/FM systems, Concept of Pre-emphasis & De-emphasis. Numerical on noise and SNR calculations

Course Outcomes:

After completion of the course student will be able to:

1. Characterize different components of communication systems and find time domain and frequency domain representation of different signals.
2. Apply concept of modulation and carry out power calculations & spectral analysis of AM wave.
3. Carry out power calculations, Bandwidth calculations and Spectral analysis of FM wave.
4. Calculate Noise figure, signal to noise ratio (SNR) in AM/FM systems and analyze different noises present in communication systems.

Text Books:

1. **Taub and Schilling**, Principles of communication systems, TMH
2. **Simon Haykin**, Communication Systems, John Wiley & Sons.

Reference Books:

1. **Roddy and Coolen**, Electronic comm., PHI, New Delhi, 4th Edition, 2003.

Bruce Carlson et al, Comm. systems, McGraw Hill Int., 4th Ed

SEMESTER-VI

List of courses in Open Elective Course-II (OEC-II)

Course Title: Non-Conventional Energy Sources **Max Marks: 100**
Course Code: OEC-CE-688/PCC-ECE-627 **University Exam: 60**
Duration of Exam: 3 Hours **Internal Assessment: 40**
Credits: 3 [3-0-0]

Objective: The aim of the course is to provide the students adequate knowledge of Power Generation from Renewable Energy Sources.

Unit-I

Introduction to Energy Sources: Energy scenario in India, Classification of Energy Resources, Renewable and Non-renewable Energy sources, Environment, Economy, Energy for sustainable development, Direct Energy conversion systems.

Unit-II

Hydro Energy: Renewable Hydro – potential, flow, duration and storage, Hydro Electric Power Plants, mini-micro hydro, small hydro power, types of turbines, generators & controls.

Unit-III

Wind Energy: Wind energy, potential, Site selection, Expression of power in the wind, Wind energy Conversion Systems. Types of wind Mills (Horizontal and Vertical Axis Wind Mill). Forces on Blades and Torque of Wind Mill. Lift Forces & drag Forces, wind mill generator, local control and storage.

Unit-IV

Solar Energy: Solar energy, Principle Of conversion of solar radiations into heat. Extra-terrestrial and inter-terrestrial regions, solar photovoltaic Cell, Applications of solar energy systems, Solar Water Heater, Solar Cookers, Solar Pumping

Unit-V

Other Renewable forms of energy: Bio energy, Biomass energy conversion Technologies. Methods for obtaining energy from Biomass, wave & tidal energy, ocean thermal energy systems (OTEC). Magneto Hydro Dynamic Power Generation (MHD) & fuel cells, geothermal resources, Geothermal Energy Conversions.

Course Outcomes:

After completion of the course student will be able to:

- **CO1.** Understand the importance of non-conventional energy resources for the present energy scenario.
- **CO2.** Understand the working criteria of hydro power generation.
- **CO3.** Acquire knowledge about wind energy conversion system for power generation.

CO4. Analyze solar energy conversion technologies.

CO5. Study other non-conventional sources of energy like geothermal resources, biomass, etc.

Text Books:

1. **Sukhatme S. P. and Nayak J. K.** Solar Energy, Tata McGraw Hill, New Delhi.
2. **Elgerd O. I.** Electrical Energy System Theory, Tata McGraw Hill, New Delhi.

Reference Books:

1. **Singal R. K.,** Non-Conventional Energy Sources, Kataria Sons, New Delhi.
2. **Gupta B. R.,** Generation of Electrical Energy, Khanna Publications.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit.

SEMESTER-VII

Course Title: Major Project-I **Max. Marks: 100**
Course Code: PROJ-CE-721 **University Examination: Nil**
Duration of Exams: 3 hours **Internal Assessment: 100**
Credits: 3 [0-0-3]

During semester VII every student shall be allotted a Major Project-I pertaining to his/her stream under the supervision of an allotted mentor. Students are required to report in their respective departments to do preliminary exercise of survey of literature and preparation of a road map of the selected Major Project-I under the supervision of an allotted mentor. Students are required to complete the Major Project-I during semester VII. Major Project-I shall be evaluated internally as per university statutes by a committee consisting of:

i) Head of the Department
ii) One member nominated by Principal
iii) Coordinator(s)/Supervisor(s) of minor project/training

SEMESTER-VII

Course Title: Design of Steel Structure **Maximum Marks: 100**
Course Code:PCC-CE-722 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3 [3-0-0]

Objective: The course has been designed to provide basic knowledge to the studentsabout the principles of energy management in buildings

UNIT-I

Energy use in Buildings: Energy use in Buildings, Factors effecting Energy use, Energy Conservation options. External Factors – Climate, Climatic Zone, Building Orientation, Shading, Sizing of Shading Devises. Thermal Comfort: Criteria and various Parameters, Psychometric Chart, Indoor air quality; Requirements in residential, Commercial, Hospital Buildings.

UNIT-II

Heat Transmission in Buildings: Heat Transmission in Buildings: Surface Coefficient, Air cavity, Internal and External Surface, Overall Thermal Transmittance Walls and Windows, and Packed Roof, Heat Transfer due to ventilation/ infiltration, Internal Heat gains, Solar Temperature, Steady State Method (for Trombe Wall, Water wall and Solarium),

UNIT-III

Lighting Fundamentals &Day Lighting Use: Lighting Fundamentals, Visual Performance, Calculations of Lighting Levels, Energy Efficient Lighting. Day Lighting Use: Estimation of available Daylight, Day lighting Systems, Advantages and Limitations of Day light Use.

UNIT-IV

ASHRAE Methods and standards for estimates of Heating and cooling and Ventilation, Requirements of Different use Buildings, Air Quality control Equipments, Distribution Systems for Conditioned Air.

UNIT-V

Typical Designs of Selected Buildings in various Climatic Zones, Thumb Rules for Design of Building systems; Building Codes.

Course Outcomes: Upon the completion of the course, the students will be able:

1. To understand the energy use and conservation options in buildings.
2. To understand the concepts of heat transmission in building
3. To learn the lightning fundamentals and day lightning use and estimation.
4. To understand the ASHRAE Methods and standards for estimates of Heating and cooling and Ventilation
5. To designs the Selected Buildings in various Climatic Zone

TEXT BOOKS

1. M S Sodha, N.K. Banaal, P.K.Bansal, A.Rumaar and M.A.S. Malik, Solar Passive: Building Science and Design,Pergamon Preen (1986).

1. Jamee; L. Threlked, Thermal Environment Engineering, Prentice Hall, INC-, Raglevood Cliffs, New Jersey (1970).

3. T.A. Markus and R.N. Morris, Building, Climate and Energy Spottwoode Ballantype Ltd-, London U.K. (1980)

REFERENCE BOOKS:

1. Solar Thermal Energy Storage, H. P. Garg et.al, D. Reidel Publishi

SEMESTER-VII

Course Title: Entrepreneurship Development &Management **Maximum Marks: 100**
Course Code: HSMC-CE-723 **University Examination: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0]

Objective: Course is designed to acquaint the students with the skills required to become entrepreneurs and to create an awareness of the need for systematic management of projects.

Unit-I: Entrepreneurship Development

Meaning, objectives, type of entrepreneurs, importance of entrepreneurship training, factors affecting entrepreneurship, linkage between entrepreneurship and economic development, problem of increasing unemployment, balanced regional growth, harnessing locally available resources, New Industrial Policy and innovation in enterprises.

Unit-II: Entrepreneurship Support System

Small Industries Development Bank of India, Small Industries service Institute, State Small Industries and Export Corporation, District Industrial Centres and Other supporting agencies.

Unit-III: Project Report Preparation

Identifying business opportunities, Project report and its importance, various contents of project report: managerial and entrepreneurial capabilities, socio-economic benefits, Demand analysis, technical feasibility and financial viability.

Unit-IV

Introduction to Marketing Management: Brief introduction to various types of product strategies, Pricing strategies, Channel strategies and Promotional strategies.Introduction to Production Management: Types of production systems, production planning and control, functions of Production Manager and Materials Management.

Unit-V

Introduction To Human Resource Management: Manpower Planning, Recruitment, selection, placement and induction, training and development, compensation. Introduction to Financial Management: source of finance and Working Capital management.

Course Outcome

After completion of this subject student will be able to:

1. Understand the meaning, objectives and types of entrepreneurs.
2. Understand the Entrepreneurship Support System.
3. Prepare to Project Report.
4. Analyze business opportunities, technical feasibility and financial viability in context to entrepreneurship.
5. Plan the business.

Text Books/Reference:

1. **Holt David H**, Entrepreneurship: New Venture Creation, PHI (4000).
2. **Saini Jasmer Singh**, Entrepreneurship Development Programmes and Practices, Deep and Deep Publications, New Delhi (1998).
3. **Dollinger**, Entrepreneurship Strategies and Resources, Pearson Education (4003).
4. **Jose Paul & Kumar Ajith N**, Entrepreneurship Development and Management, Himalaya Publishers, New Delhi (4000).
5. **Hisrich Robert D and Micheal Peters P**, Entrepreneurship, TMH, (4002).

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit.

SEMESTER-VII

Course Title: Industrial Training **Max. Marks: 25**
Course Code: PCC-CE-731 **University Examination: Nil**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits: 1 [0-0-2]

Details:

At the end of semester IVth and VIth students are required to attend an Industrial Training for 6 weeks duration, during summer vacations. After the completion of training every student is required to prepare a detailed report of the training work which he/she has attended in an Organization/Industry/Company. Industrial Training shall be an essential component of curriculum to fulfill the eligibility criteria for appearing in semester V^{th} and VII^{th} university examination. The examination of Industrial Training shall be conducted during semester V^{th} and VII^{th} examination.

Table 3: Distribution of Weightage for Minor project & Industrial Training of 25 marks.

Component	**Weightage**
Industrial Training	25
Total	25

SEMESTER-VII

Course Title: STAAD Pro/CAD Lab **Max. Marks: 50**
Course Code: PCC-CE-732 **University Examination: 25**
Duration of Exams: 2 hours **Internal Assessment: 25**
Credits: 1 [0-0-2]

Objectives:
To analysing and designing civil engineering structures such as buildings, bridges, and plane and space trusses.

List of Practical's:

1. AUTOCAD commands, drawing of lines, circles and different types of polygon.
2. Drawing plan, elevation and cross-sectional views of one storey residential building.
3. Drawing of staircases.
4. Drawing plan, elevation and cross-sectional views of two storey residential building.
5. Drawing plan, elevation and cross-sectional views of five story commercial building.
6. Introduction to STAAD, its Components, structures and analytical models.
7. Creating Basic Geometry (Beams/Columns), Architectural Drawing – Entering Coordinates. Creating some Geometry parts (Beams/Columns) in
8. Architectural Drawing by Snap/Node Beam Command
9. Creating Geometry of Structures using Split Beam and Stretching of Members. Creating Geometry of Vertical and Horizontal Bracings in the Structure. Creating Geometry of Curved Beams/Solids in the Structure.
10. Selection of Members, Creating Group of Members, Assigning of Property to Members, For Steel Members – Using Section Database.
11. For Concrete Members – Using Define Tab. Creating User Table. Using Section Wizard
12. Using Specification Commands in members- beam. Using Specification Command as Truss, Tension and Compression members. Using Master/Slave Command in Staad. Creating Different types of Supports in Staad using Create Support Command.

Laboratory outcome
To prepare the students to solve problems including design elements and related to their course work.

SEMESTER VII

Course Title: Seminar **Max. Marks: 50**
Course Code: PCC-CE-733 **University Examination: Nil**
Duration of Exams: 2 hours **Internal Assessment: 50**
Credits: 1 [0-0-0]

Details:

During semester VI students are required to choose any topic that pertains to civil engineering and get the approval from the coordinator of the same semester or Head of the Department. The date on which the seminar will be held will be decided by head after consulting the coordinator. The student has to give power point presentation before the students and the committee of the faculty members, framed by HoD and has to reply questions and queries asked by the faculty members of the committee. Marks will be given on overall performance in presentation and response to the queries asked to the student. The coordinator of the seventh semester will be overall in-charge.

SEMESTER-VII

List of courses in Professional Elective Course-III (PEC-III)

Course Title: Foundation Engineering **Max. Marks:100**
Course Code: PEC-CE-761 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [3-0-0]

Course Objectives. To understand the design aspects of foundation and to evaluate the stress developed in the soil medium. Understand the framework of soil investigation.

Unit I:
Types of Foundations: Foundation, Types of foundation, Factors governing location and depth of foundation, selection of foundation, plate load test, standard penetration test.

Unit II:
Capacity and Settlements of Shallow Foundations: Terzaghi's theory of bearing capacity – general and local shear failure - effect of water table – design of footings – settlement of footings - immediate and time dependent settlement – permissible limits – differential settlement, introduction to codal provisions.

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

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

Unit V:
Soil Exploration: Objective of site investigation - reconnaissance – detailed site investigation - methods of exploration – geophysical methods - seismic refraction survey. Depth of exploration analysis and design of excavations, retaining walls, cuts & excavations and sheet piles.

Course Outcomes:-On completion of this course, the students will be able to

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

Text Books

1. Arghese P.C (2009), Foundation Engineering 1st Edition, Prentice-Hall of India Private Limited. ISBN: 978-81-203-2652-1.
2. Arun Kr. Jain, B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.

Reference Books

1. ashi K. Gulhati&ManojDatta (2005), Geotechnical Engineering 1st edition, Tata McGraw Hill Ltd. ISBN: 978-00-705-8829-5.
2. Donald P Coduto, William A. Kitch, Man-chu Ronald Yeung (2010), Geotechnical Engineering: Principles and Practices 2nd revised Edition, Pearson Education. ISBN: 97801-313-5425-8.
3. Joseph E. Bowles (2006), Foundation Analysis and Design 5th edition, McGraw-Hill, New York. ISBN: 978-00-711-8844-9.
4. Braja M. Das (2007), Principles of Foundation Engineering 6th Edition, Nelson Engineering. ISBN: 978-81-315-0202-0.
5. Ramamurthy (2010), Engineering in Rocks for Slopes, Foundations and Tunnels, PHI Learning Private Limited. ISBN: 978-81-203-4168-5.

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

SEMESTER-VII

Professional Elective Course-III (PEC-III)

Course Title: Construction Equipment and Automation **Max. Marks:100**
Course Code: PEC-CE-762 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Objective: The objective of this course is to understand the functioning of different types of equipments use in construction industry and their productivity.

Unit-I

Introduction: Conventional construction methods Vs Mechanized methods and advantages of latter.

Unit-II

Construction Equipment's: -Equipment for Earthmoving, Excavators, Backhoe Loaders, Bulldozers, Skid Steer Loaders, Motor Graders, Trenchers, cranes etc.

Unit-III

Dewatering equipments, Concrete mixing equipments, transporting & placing, plastering machines;

Unit-IV

Grouting and lifting Equipment's: -Prestressing jacks and grouting equipment; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials.

Unit-V

Equipment Productivities: - Equipment Productivities; Use of Drones for spread out sites; Use of robots for repetitive activities.

Course Outcomes:-Students will be able to

1. Associate the knowledge of construction of substructures and superstructures.
2. Demonstrate basic knowledge about Construction equipment and machinery
3. Discuss about hauling and conveying equipment.
4. Demonstrate the ability to identify and manage with respect to time and their motion with respect to their movements.
5. Understand the productivity of different equipments.

Text Books:

1. ConstructionEquipment and Its Management - – 2002 by S C Sharma
2. Construction Planning, Equipment and Methods - Robert Peurifoy

References Books:

1.Project Planning and Control with PERT and CPM-B.C. Punmia

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The students have to attempt five questions, selecting one from each Unit.

Semester-VII
Professional Elective Course-III (PEC-III)

Course Title: Open channel Flow **Max. Marks: 100**
Course Code: PEC-CE-763 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Objective:-The objective of the course is to provide a physical understanding of phenomena and concepts in advanced water flows and to introduce calculation methods to analyze a number of important hydraulic problems. The course deals mainly with free-surface flows with emphasis on open channel hydraulics.

Unit I

Difference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation. Uniform flow Chezy's and Manning's equations for uniform flow in open channel, velocity distribution, most efficient channel section.

Unit II

Energy and Momentum Principles

Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

Unit III

Non-Uniform Flow in Open Channel

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, flow in curved channels.

Unit IV

Hydraulic Jump

Surges, Water Waves, Classical hydraulic jump, evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, equation of motion for unsteady flow, open channel surge, celerity of the gravity wave, deep and shallow water waves.

Unit V

Spatially-varied flow

SVF with increasing discharge, differential equation of SVF with increasing discharges, control point, classification and solutions, profile computation, SVF with decreasing discharge, differential equation for SVF with decreasing discharge, computations.

Learning Outcomes:-For a passing grade the student

1. Possess a solid understanding of the basic phenomena and processes that govern free-surface flows.
2. Be able to formulate advanced models based on the governing equations for free-surface flows and to solve the equations for commonly encountered flow situations.
3. Be able to analyze complex flow problems using dimensional analysis and to develop rules for experiments with scale models.
4. In detail understand the impact of flowing water on submerged bodies and structures.
5. Have understanding of the Spatially-varied flow

Text Books:

1. Fluid Mechanics – A.K. Jain (Khanna Publication)
2. Open Channel Flow – Subramanya (Tata McGraw Hill, New Delhi)

Reference Books:

1. Engineering Fluid Mechanics (including Hydraulic Mechanics) (2nd
2. Edition) – Garde, R.J., and A.G.
3. Mirajgaoker (Nem Chand & Bros., Roorkee, 1983)
4. Flow Through Open Channels – Ranga Raju, K.G. (Tata McGraw Hill, New Delhi, 1993)
5. Experimental Fluid Mechanics (Vol. 2) – Asawa, G.L.

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

Semester-VII

Professional Elective Course-III (PEC-III)

Course Title: Rural Construction Technology **Max. Marks: 100**
Course Code: PEC-CE-764 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Objective: the aim of this course to understand of technology of walls roof and how to construct water supply and sanitation

UNIT-I

Introduction to Technology/ Materials: Scope and concept of appropriate technology as applicable to civil engineering, importance of low cost construction in rural areas. Materials: Importance of locally available material, bamboo, tree bushes, grass, mud, sand etc., treatment of materials for protection against termite, decay and for increasing their strength.

UNIT-II

Technology for Walls/Roofs: Construction of plane and block mud walls, bamboo/bush reinforced mud walls, water proofing of mud walls, thickness of mud walls, mud plaster. Use of hollow blocks in the construction of walls for insulation Thatched Roofs: Constructional methods of thatched roofs, fire proofing of thatched roof, low cost treatment of thatched roof.

UNIT-III

Low Cost Housing: Planning and construction of low cost houses cluster of houses, ventilation, low cost doors, construction of mud floors, construction of smokeless chullaha, construction of cement treated gunny bags – sheds and storage bins, construction of sheds for animals

UNIT-IV

Rural Water Supply and Sanitation: Construction of open well, chlorination of open well, construction of hand pumps, constructions of bathing cubicals, construction of low cost drains. Construction of low cost latrines, construction of pre-fabricated septic tanks, and construction of soak pits.

UNIT-V

Miscellaneous: Construction of fair weather roads, construction of bunds. Low lift pumps, Ferro-cement storage tanks, Ferro-cement grain bins, red clay tiles for roof and floors, construction of rapid burning low cost brick kilns solar seasoning plants. Solar cookers, fiber corrugated sheets, individual and comm. Unity biogas plants. Concrete blocks for wall construction, Brick, panels, precast lintels, slabs and beam, water harvesting techniques etc.

Learning Outcomes: Students will be able to

1. Understand the different materials and their characteristics
2. Understand the construction of mud wall.
3. Know about the low cost housing.
4. Acquire knowledge of rural water supply and sanitation.
5. Know about the new technological innovation and different materials used in constructions.

Text Books:-

1. "Building Construction" By: Arora, Dhanpat Rai and Sons'.
2. "A Text of Building Construction" By: SPD Suhil Kumar.
3. "Construction Technology " By: R. Choudary and R. Greano
4. "Rural Technology" By: R.D Punia, U.N. Roy and Sanjay Mahajan, Satya Prakashn
5. "Rural Education and Technology" By: Verma and S.K. Jolaha, Deep and Deep Publications

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

Semester-VII
Professional Elective Course-III (PEC-III)

Course Title: Structural Dynamics **Max. Marks: 100**
Course Code: PEC-CE-765 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Course Objective: Learn how to model discrete single-degree and multiple-degree vibratory systems and calculate the free and forced response of these systems. Calculate the mode shapes and frequencies for the free response of continuous vibratory systems and use modal methods to calculate the forced response of these systems.

Unit I:
Introduction: Types of dynamic loads, Basic background of methods available and motivation for structural dynamics. Earthquake excitation, response history and construction of response spectra, Response spectrum characteristics, tripartite plot, and design spectrum

Unit II:
Dynamics of Single Degree-of-Freedom Structures: Dynamic equation of equilibrium, Free vibration of single degree of freedom systems, Forced vibration: harmonic and periodic loadings, Dynamic response functions, force transmission and vibration isolation, SDOF response to arbitrary function

Unit III:
Dynamic Analysis of Linear MDOF Systems: Introduction, modal analysis, Response-history for earthquake excitations using modal analysis, Response spectrum analysis for peak responses, Concept of Caughey damping as a general type of proportional damping

Unit IV
Free Vibration Response of MDOF Systems: Un-damped systems, natural modes and their properties, Numerical solution for the eigen value problem, Solution of free vibration response for undamped systems, Free vibration analysis of systems with damping.

Unit V:
Generalized Single Degree of Freedom Systems: Basic concepts, mass spring system, Lumped mass systems, Systems with distributed mass and elasticity, Rayleigh's method, shape function selection.

Course Outcomes:-Students who successfully complete the course will be able to

1. Have an ability to apply knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response.
2. Understand the Dynamics of Single Degree-of-Freedom Structures.
3. Understand the Dynamic Analysis of Linear MDOF Systems.
4. Understand the Free Vibration Response of MDOF Systems
5. Have an ability to identify, formulate and solve engineering problems.

Text Books

1. Introduction to Structural Dynamics – J. M. Biggs
2. Dynamics of Structure – Anil K Chopra

Reference Books:

1. Elements of Earthquake Engineering – Jai Krishna and A. R. Chandrasekharan
2. Soil Dynamics – Shamsher Prakash
3. Dynamics of Structures – R.W. Clough& J. Penzien
4. Earthquake Resistant Design of Structure – Pankaj Aggarwal& Manish Srikhande
5. Structural Dynamics – Mario Piaz

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions, selecting one from each Unit.

SEMESTER-VII

Professional Elective Course-III (PEC-III)

Course Title: Port and Harbour Engineering **Max. Marks: 100**
Course Code: PEC-CE-766 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Objective: The objective of this course is to understand design of Harbour related structures and different waterways and port.

Unit-I

Introduction: Harbour Planning: Types of water transportation, water transportation in India, requirements of ports and harbours, classification of harbours.

Unit-II

Design of Harbour:- selection of site and planning of harbours, location of harbour, traffic estimation, master plan, ship characteristics, harbour design, turning basin, harbour entrances.

Unit-III

Dock and Investigation: type of docks, its location and number, Site investigations –hydrographic survey, topographic survey, soil investigations, current observations, tidal observations; Docks and Repair Facilities.

Unit-IV

Designand construction of different comp.:-.Design and construction of breakwaters, berthing structures - jetties, fenders, piers, wharves, dolphins, trestle, moles, Harbour docks, use of wet docks, design of wet docks, repair docks, lift docks, dry docks, keel and bilge blocking, construction of dry docks, gates for dry docks,

Unit-V

Port and waterways: - Port development, port planning, port building facilities, transit sheds, warehouses, cargo handling facilities, container handling terminal facilities, shipping terminals, inland port facilities. Inland waterways, Inland water transportation in India, classification of waterways, economics of inland waterways transportation, national waterways.

Course Outcomes:- Students will be able to

1. Explain the significance of ports and harbours as a mode of transport.
2. Demonstrate the fundamental principles of wave hydrodynamics and port cargo handling.
3. Understand the different types of Docks and their investigation
4. Design, plan and integrate port and harbour infrastructure.
5. Explain the construction, maintenance and renovation aspects of ports and inland waterways

Text Books:

1.Docks and Harbour Engineering Paperback – 2012 by S.P. Bindra

References Books:

1**.**Harbour Dock and Tunnel Engineering Paperback – 2016 by R.Srinivasan

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The students have to attempt five questions, selecting one from each Unit.

Semester-VII
Professional Elective Course-III (PEC-III)

Course Title: Ground Improvement Technique **Max. Marks: 100**
Course Code: PEC-CE-767 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Course Objectives:-To understand problems related to expansive soils and to identify preventive measures for mitigating effect of soil expansion on structures founded on expansive soil. Find out proper methods of ground improvement. Understand various soil engineering problems and to use geotextiles and stabilizers for soil improvement.

Unit I:

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

Unit II:
Chemical stabilization and Special Foundation: Mechanical alteration – Sand cushion technique - CNS concept – Chemical stabilization with lime, fly ash and cement – Special foundations – Underreamed piles – Straight-shafted drilled piers - Belled piers – Granular pile-anchors.

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

Unit IV:
Stabilization: Soil improvement by adding materials, lime, flyash, cement and other chemicals and bitumen, sand column, stone column, sand drains, prefabricated drains, lime column, soil-lime column, stabilization of soft clay or silt with lime, bearing capacity and settlement of treated soils, improvement in slope stability, control methods. Introduction to geotextiles and geo-membranes, applications of geotextiles, design methods using geotextiles, geogrids, geonets, geomembranes, geo-tubes.

Unit V:
Grouting: Introduction, suspension grout, solution grout, grouting equipment's and methods, grouting, design and layout granular piles–ultimate bearing capacity and settlement, method of construction, load test.

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

1. Know the physical & mineralogical properties of expansive soil.
2. Conduct tests for identification of swelling soil.
3. Design suitable method for improving properties of expansive soil.
4. Choose correct method for ground improvement.
5. Design grouting process for various soil engineering problems

Text Books

1. F.H.Chen (1995), Foundations in Expansive Soils, Elseivier Publications. ISBN: 978-04-4443036-6.
2. NiharRanjanPatra (2012), Ground improvement techniques, 1st Edition, Vikas Publishing House. ISBN: 978-93-259-6001-5.
3. Nelson, John D. Nelson, Ron Miller (1997), Expansive Soils: Problems and Practice in Foundation and Pavement Engineering New edition, Wiley-Interscience. ISBN: 978-04-711-8114-9.

Reference Books

1. P. Purushothama Raj (1999), Ground Improvement Techniques 1st Edition, Laxmi Publications. ISBN: 978-81-318-0594-7.
2. Rao (1990), Engineering with Geo-synthetics, Mcgraw-hill Education. ISBN: 978-00-746-0323-9.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions, selecting one from each Unit.

SEMESTER VII
List of courses in Professional Elective Course-IV (PEC-IV)

Course Title: Pre-stressed Concrete and Bridge Design **Max. Marks:100**
Course Code: PEC-CE-768 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Course Objectives: To analyse sections for flexure and deflection and the Losses of pre stressed members. Also analyse the Transfer of Pre-stress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members and Design and detailing of plate girder, steel truss bridges

Unit I:
Basic Principles of Pre-Stressing Systems Basic concepts of pre-stressing, High strength concrete and steel, Stress-strain characteristics and properties, Various pre-stressing systems, Pre-tensioning and Post- tensioning systems with anchorages, Advantages and limitations of pre=stressed concrete.

Unit II:
Analysis of Sections for Flexure and Losses of pre-stress: Basic assumptions, Analysis of stresses in concrete due to pre- stress and loads for different types of cross section, Pressure line or thrust line, Cable profile, Concept of load balancing, Cracking moment. Nature of losses in pre-stress, Various losses encountered in pre-tensioning and post tensioning methods, Deflection, Factors influencing deflection, Elastic deflection under transfer loads

Unit III:
Flexural and Shear Strength of Prestressed Concrete Sections: Types of flexural failure, IS code recommendations for flexure, Ultimate flexural strength of section. Shear and principal stresses, Ultimate shear resistance of prestressed concrete members, Shear reinforcement.

Unit IV:
Transfer of Prestress in Pre-tensioned Members and Anchorage Zone Stresses in Post Tensioned Members Transmission of pre-stress in pre-tensioned members, Transmission length, Bond stresses, Codal provisions for bond and transmission length, Anchorage stress in post- tensioned member. Bearing stress and bursting tensile force, IS code provisions.

Unit V:
Fundamentals of bridge engineering and design: Introduction ,History of Bridges - Components of a
Bridge and its definitions- Classification of Road Bridges - Selection of Site and Initial Decision Process - Survey and Alignment; Geotechnical Investigations and Interpretations. River Bridge: Selection of Bridge site and planning - Collection of Bridge design data - Hydrological calculation Road Bridges - IRC codes - Standard Loading for Bridge - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs Railway Bridges. Selection of main bridge parameters, design methodologies -Choices of superstructure types, Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge- Temperature Analysis, Distortional Analysis, Effects of

Differential settlement of supports Reinforced earth structures, Design of Truss Bridges – Design of Plate girder bridges.

Course Outcomes:-On completion of this course, the students will be able to

1. Analyze sections for flexure and deflection.
2. Analyze the Losses of pre stressed members.
3. Analyze the Transfer of Prestress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members.
4. Understand IRC Code and Design and detailing of plate girder and steel truss bridges.
5. Design the different types of bridges.

Text Books

1. Raju, N. K., "Pre-stressed concrete", Tata McGraw Hill, New Delhi, 1st Edition, 2012.
2. Ramachandra (2004), Design of Steel structures, 4th Edition, Standard Publishers Distributors, ISBN: 9780071544115.

Reference Books 1. Ramamruthum, S., "Pre-stressed Concrete", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2003. 2. Lin, T. Y., Burns, N. H., "Design of pre- stressed Concrete Structures", John Wiley and Sons. New York, 3rd Edition, 1981

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

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

SEMESTER VII
Professional Elective Course-IV (PEC-IV)

Course Title: Traffic Engineering and Management **Max. Marks: 100**
Course Code: PEC-CE-769 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Course Objectives: To teach the concepts of traffic studies, traffic facilities and their regulations and management and understand the methods for efficient management of traffic in urban roads.

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

Unit I
Traffic Facilities: Signals - Islands - Types and General layout of at-grade and grade separated intersections.

Unit III
Traffic Regulations and Management: Traffic signs and markings - Parking practices - Traffic management measures. Simulation: Fundamental principle, application of simulation techniques in traffic engineering - formulation of simulation models, Case studies. Formulation of system model.

Unit IV
General Principles and Flexible Pavement Design: Factors affecting pavements stability – equivalent single wheel load – vehicle, soil, traffic & Climatic factors - stress distribution in different conditions - CBR method of design - AASSO method & Burmister design method.

Unit V
Rigid Pavement Design: Stresses in concrete pavement – IRC method – design of steel reinforcements – Function of joints, design of joints in concrete pavements - Joint Fillers and sealant.

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

1. Perform traffic studies.
2. Know importance of traffic management.
3. Identify the specification of traffic facilities.
4. Design the flexible pavement.
5. Design the rigid pavements

Text Books

1. Kadiyali.L.R. (2008), Traffic Engineering and Transportation Planning, Khanna Publishers, ISBN-9788174092205.
2. ChakroborthyPartha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.

Reference Books

1. Khisty.C.J., and Lall.B.K., (2003) "Transportation Engineering", Indian Edition, Prentice-Hall of India , ISBN- 9788120322127.
2. Papacostas.C.S., and Prevedouros.P.D., (2001) "Transportation Engineering and Planning", Indian Edition, Prentice-Hall of India , ISBN- 9788120321540.
3. Garber. Nicholas J., and Hoel. Lester A., (2009), Traffic & Highway Engineering, Fourth Edition, Cengage Learning, ISBN-9780495082507.

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

SEMESTER VII

Professional Elective Course-IV (PEC-IV)

Course Title: Air and Noise Pollution and Control **Max. Marks: 100**
Course Code: PEC-CE-770 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Course Objectives: To understand the aspects of atmospheric pollution and its flow and know about the issues such as atmospheric composition, monitoring, acidic deposition, urban air quality

Unit I

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

Unit II

Transport of Air Pollution: Elements of atmosphere and dispersion of pollutants, Meteorological factors, Wind roses, Lapse rate, Atmospheric stability and turbulence, Plume rise , Dispersion of pollutions, Gaussian dispersion models, Applications.

Unit III

Control of Air Pollution: Concepts of control of air pollution, Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation, Selection criteria for equipment, gaseous pollutant control by adsorption & absorption, condensation, combustion, Pollution control for specific major industries.

Unit IV

Air Quality Management: Air quality standards, Air quality monitoring, Air pollution control efforts, Zoning, Town planning regulation of new industries, Legislation and enforcement, Environmental Impact Assessment.

Unit V

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

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

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

2. The Implementation of the methods for monitoring and modeling spatial and temporal patterns of pollution
3. The air pollution issues at a range spatial scales and how these are relaxed.
4. The environmental impacts of atmospheric pollutants and assess their concentration.
5. Understand the measures to be taken to control noise pollution.

Text Books

1. M N Rao& H V N Rao (2007), Air Pollution, Tata McGraw-Hill Publishing Company, 26th reprint, New Delhi. ISBN: 0074518718
2. Noel De Nevers (2010), Air Pollution Control Engineering, 2nd Edition, Waveland Press, Inc., Long Grove, Illinois. ISBN: 978-1577666745

Reference Books

1. Singal, S.P. (2000), Noise Pollution and Control, First Edition, Narosa Publishing House, New Delhi.ISBN: 8173193630
2. Rao C.S. (2006) Environmental Pollution Control Engineering, 2nd edition, New Age International,New Delhi. ISBN: 9788122418354
3. William L.Heumann (1997), Industrial Air Pollution Control Systems, McGraw Hill Professional, New York.ISBN: 9780070314306

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

SEMESTER VII
Professional Elective Course-IV (PEC-IV)

Course Title: Rock Mechanics **Max. Marks: 100**
Course Code: PEC-CE-771 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3 [2-1-0)

Objective: This course is meant to provide an understanding to the students about index properties of rocks, failure and their applications.

UNIT–I:
Classification and Index Properties of Rocks: Genesis & Geological classification of rocks- Engineering classification of rocks masses, Index properties of rock systems

UNIT–II:
Rock Strength and Failure Criteria: Modes of rock failures - strength of rock - Laboratory and field measurement of shear, tensile and compressive strength- stress strain behaviour in compression - Mohr - coulomb failure criteria and empirical criteria for failure- Deformability of rocks.

UNIT–III:
Initial Stress and Their Measurements: Estimation of initial stresses in rocks - influence of joints and their orientation in distribution of stresses. Techniques for measurement of in-situ stresses

UNIT–IV:
Application of Rock Mechanics in Engineering: Simple engineering application - underground opening- rock slopes- foundation and mining subsidence

UNIT–V:
Rock Bolting: Introduction- rock bolt systems- rock bolt installation techniques - testing of rock bolts- choice of rock bolt based on rock mass condition.

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

1. Know the different index properties and strength criteria of rocks.
2. Understand the different mode of failure of rock
3. Calculate the stresses in rock
4. Understand the application of rock mechanics engineering.
5. Know about the rock bolting and applications.

Text Books:

1. Goodman P.T., Introduction to rock mechanics, john and sons, 1999.
2. Stillborg B**.,** Professional user Handbook for rock bolting, Tran. Tech Publications.

Reference books:

1. Engineering Rock Mechanics: An Introduction to the Principles by J. A. Hudson and J. P. Harrison
2. Rock Mechanics: For Underground Mining by Barry H.G. Brady
3. Fundamentals of Rock Mechanics, 4th Edition, John Conrad Jaeger, Neville G. W. Cook, Robert Zimmerman

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER VII
Professional Elective Course-IV (PEC-IV)

Course Title: Flood Control and River Engineering **Max. Marks: 100**
Course Code: PEC-CE-772 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits:3[2-1-0)

Objective: This course is meant to provide an understanding to the students about diversion works, cross drainage works and measures for flood control.

UNIT-I
Flood Control: Introduction to flood and Flood problems, types of flood control measures, drainage of irrigation lands both saline and alkaline lands.

UNIT-II
Diversion Headwork and Cross Drainage Works: Selection of sites and layout, parts of diversion head works, types of weirs/Barrages, design of weirs' on permeable foundations, silt excluders and silt ejectors. Necessity of cross drainage works, their types and selection design of various types of cross drainage works such as aqueduct, siphon and super passage.

UNIT-III
Introduction to River Engineering: River Morphology -Bars; Bends and Meanders, Thalweg, Braiding; Bifurcations, Sediment Transport Mechanics -Bed forms, Bed Load transport, Transport of suspended sediment, Local Scour at Bridge Piers and other Hydraulic Structures.

UNIT-IV
Measurements in River: Critical Shear stress, Stage measurements, Channel geometry, Discharge, Sediment samplers and suspended and bed load measurement.

UNIT-V
River Protection and Training Works: Revetments, Dikes, Gabions, Spurs, Bank Protective measures and Bed control structures, Diversion and Cofferdams; River regulations systems; Dredging and Disposal, River restoration.

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

1. Understand the different flood control measures.
2. Know the different types diversion headwork and cross-Drainage work.
3. Know the terminology of river engineering and flood control measures.
4. Measure the discharge of a river
5. Understand the different River Protection and Training Works

Text Books/ Reference Books:

1. **Bharat Singh,** Fundamentals of irrigation engineering.
2. **Varshney, Gupta & Gupta,** Theory and design of irrigation structures

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER VII
Professional Elective Course-IV (PEC-IV)

Course Title: Transport Planning and Management **Max. Marks: 100**
Course Code: PEC-CE-773 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3[2-1-0)

Course Objectives: To teach the transportation planning process, trip generation and distribution methods and various techniques involved in traffic assignments, and introduce evaluation techniques based on economy and performance.

Unit I:
Transport Planning Process:
Scope – interdependence of land use and traffic – systems approach to transport planning – survey of existing conditions and forecasting future conditions. Transport survey – definition of study area – zoning survey – types and methods – inventory on transport facilities – inventory of land use and economic activities.

Unit II
Trip Generation: Factors governing trip generation and attraction rates – multiple linear regression analysis – category analysis – critical appraisal of techniques.

Unit III
Trip Distribution Methods: Uniform factor method, average factor methods – gravity model and its calibration – opportunity model.

Unit IV
Modal Split and Trip Assignment: Modal split – factors, advantages and limitations, logit model and its calibration. Traffic assignment – general principles – assignment techniques – all nothing assignment – multiple root assignment – capacity – restraint assignment – diversion curves

Unit V
Evaluation Techniques: Economic evaluation techniques – performance evaluation – rating and ranking methods – case studies in evaluation – rating and ranking methods – case studies in evaluation of transport projects – land use transport models – transport planning for medium and small sized towns.

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

1. Identify the different planning process involved in transportation and the importance of Zoning.
2. Demonstrate the ability to understand the various distribution methods, trip generation and critically apply the analysis techniques practically.
3. Understand the principles in traffic assignment and apply them suitably as a Successful transportation Engineer.
4. Demonstrate the ability to evaluate a transport projects critically in all aspects and apply transport planning process effectively for medium and small sized towns.

5. Understand the different evaluation techniques.

Text Books

1. Kadiyali.L.R. (2008), Traffic Engineering and Transportation Planning, Khanna Publishers, ISBN-9788174092205.
2. Ortuzar.J.D., and Willumsen. Luis G. (2011), Modelling Transport, Fourth Edition, John Wiley & Sons, ISBN-9781119993520.

Reference Books

1. Wright.P.H.,Ashford.N., and Stammer.R., (1998), Transportation Engineering – Planning & Design, Fourth Edition, John Wiley & Sons, New York, ISBN-9780471173960.
2. Dickey.J.W., (1995), Metropolitan Transportation Planning, Tata McGraw-Hill publishing company Ltd, New Delhi.
3. Papacostas.C.S., and Prevedouros.P.D., (2001) "Transportation Engineering and Planning", Indian Edition, Prentice-Hall of India , ISBN-9788120321540.
4. Garber. Nicholas J., and Hoel. Lester A., (2009), Traffic & Highway Engineering, Fourth Edition, Cengage Learning, ISBN-9780495082507

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions, selecting one from each Unit.

SEMESTER VII

Professional Elective Course-IV (PEC-IV)

Course Title: Solid and Hazardous Management **Max. Marks: 100**
Course Code: PEC-CE-774 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits: 3[2-1-0)

Course Objective: The course on Solid Waste Management gives the student an overview of municipal solid waste management including collection, transfer, transport, and disposal. Methods of processing, basic disposal facilities, disposal options, and the environmental issues of solid waste management will be covered in this course. In addition, this course provides the student with relevant information about municipal solid waste reduction and on hazardous waste management

Unit-I

Sources and Composition of Municipal Solid Waste: Introduction, Sources of solid waste, Types of solid waste, Composition of solid waste and its determination, Types of materials recovered from MSW.

Unit-II

Properties of Municipal Solid Waste: Physical properties of Municipal Solid Waste, Chemical properties of Municipal Solid Waste, Biological properties of Municipal Solid Waste, Transformation of Municipal Solid Waste. Hazardous waste- Risk assessment, Environmental legislation, Characterization and site assessment, Waste minimization and resource recovery, Transportation of hazardous waste, Characteristics Hazardous waste toxicity, reactivity, infectiousness, flammability, radioactivity, corrosiveness, irritation, bio-concentration, genetic activity, explosiveness.

Unit-III

Solid Waste Generation and Collection: Quantities of Solid Waste, Measurements and methods to measure solid waste quantities, Integrated Solid Waste Management System: Collection, Storage, Segregation, Reuse and Recycling possibilities, Transportation, Treatment / Processing and Transformation Techniques, Final Disposal, Factors affecting solid waste generation rate, Quantities of materials recovered from MSW.

Unit- IV

Handling, Separation and Storage of Solid Waste: Handling and separation of solid waste at site, Material separation by pick in, screens, float and separator magnets and electromechanical separator and other latest devices for material separation, Waste handling and separation at Commercial and industrial facilities, Storage of solid waste at the sources.

Unit-V

Processing of Solid Waste: Processing of solid waste at residence e.g. Storage, conveying, compacting, Shredding, pulping, granulating etc., Processing of solid waste at Commercial and industrial site, Facility

Development and operation, Site Remediation: Quantitative risk assessment, site and subsurface characterization, Containment, remedial alternatives.

Course Outcome: The student will be able to:

1. Explain the types, quantity, nature of solid waste generated in a town
2. Estimate the composition and characterization of solid waste
3. Devise strategic planning for the collection of solid waste, mode of transport, site selection criteria, and techniques for safe disposal of solid without harming natural attributes.
4. Explain the modern and scientific methods to dispose solid waste with due concern to environmental issues.
5. Explore the possibilities of reuse, recycling and recovery of materials from the solid waste.

Textbooks :

1. Vesilind, P.A., Worrell, W., and Reinhart, D., "Solid Waste Engineering", Brooks/Cole, 2002.
2. LaGrega, M, Buckingham, P. and Evants, J.C., “Hazardous Waste Management”. McGraw-Hill, New York, 2001.

Reference books:

1. Tchobanoglous, G., Theisen, H and Vigil, S., “Integrated Solid Waste Management”, McGrawHill, New York, 1993.
2. Pfeffer, J.T., "Solid Waste Management Engineering", Prentice Hall, 1992.
3. Wentz, C., “Hazardous Waste Management”. McGraw-Hill, New York, 1995.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions, selecting one from each Unit

SEMESTER-VII

List of courses in Open Elective Course-III

Course Title: Optical Communication **Max Marks: 100**
Course Code: OEC-CE-781/PEC-ECE-727 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3[3-0-0)

Objective: The course has been designed for explaining the basic concepts and principles of Optical Communication to the students. Applied and Industrial Aspects of optical communication have been taken care of in an appropriate manner.

Unit–I

Overview of Optical Fiber Communication: Brief Overview of Optical Communication, Basic concepts, light wave components, principle of light transmission, channel capacity etc. Nature of light, polarization, basic laws and definition, mode theory analysis for optical communication, optical fiber modes and configuration, wave propagation in optical fiber, operating wavelength, single mode and multimode fibers, V–numbers, mode field diameter, numerical aperture, refractive index profiles.

Unit–II

Signal Degradation in Optical Fibers: Attenuation, absorption, scattering losses, bending losses in optical fibers. Dispersion in optical waveguides, group delay, material dispersion, waveguide dispersion, intermodal dispersion and chromatic dispersion in single mode fibers, Non linearities in Fibers

Unit–III

Optical Sources: Basic concepts from semiconductor electronics, energy bands, Concept of Direct and indirect Band Devices. Light emitting diodes: Structure, principle, material, modulation response, transient response. Laser diodes: Principle of action, structure, efficiency and characteristics of laser diodes, modulation He–Ne lasers, DFB lasers.

Unit-IV

Optical Detectors: Basic Information in light detectors, Role of an optical detector, Detector Characteristics: Responsivity, Noise Equivalent Power, Detectivity, Quantum efficiency, Detector response time, Linearity, Spectral response, Noise Considerations, The PN junction photo diode – PIN photodetectors – Avalanche photo diode construction characteristics and properties, APD Specifications, simple model of photo receiver – its equivalent for SNR, Optical Receivers.

Unit–V

Transmission Systems and Advanced Multiplexing Strategies: Power Launching and coupling. Point to point link system consideration, Optical TDM, subscriber multiplexing (SCM), WDM and Hybrid multiplexing methods, Optical amplifiers - EDFA

Course Outcomes:

After completion of the course student will be able to:

1. Recognize and classify the structures of Optical fiber networks and their types.
2. Discuss the channel impediments like losses, interference and dispersion.
3. Describe the Optical sources and detectors and thus able to illustrate their working principle.
4. Familiar with Design considerations of fiber optic systems.
5. Perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyse the results to provide valid conclusions.

Text Books:

1. **John M Senior -**Optical Comm Techniques –PHI
2. **Keiser G-** Optical Fiber Communication, 3rd Edition, Mc Graw Hill International
3. **Mynbacv D.F. and Scheine L -**Fiber Optic Communication Technique, Pearson.

Reference Books:

1. **Ghatak & Thyangarajan K**- Introduction to fiber optics, Cambridge university press,1998.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions, selecting one from each Unit

Semester-VII

List of courses in Open Elective Course-III

Course Title: Digital Logic Design **Max Marks: 100**
Course Code: OEC-CE-782/PCC-CSE-325 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3[3-0-0)

Course Objective: The objective of this subject is to enable the students to know basic concepts of digital electronics design and build digital hardware.

Unit -I

Introduction, Binary numbers, Base-conversions, Octal and hexadecimal numbers, Binary codes, Concept of fixed and floating point numbers, Complement Number Representation, Addition, Subtraction, Multiplication, and Division. Review of Boolean algebra, De-Morgan's Theorems, Boolean functions and representation in canonical and standard forms, SOP and POS forms.

Unit -II

Digital Logic Gates,IC Digital Logic Families, Karnaugh Map Method: 3 variable , 4 variable, 5 variable Map, limitations of K-maps for larger variables, POS-simplification, NAND/NOR implementation, other 2-level implementations, Don’t-care conditions, Tabular method.

U nit-III

Combinational Logic Circuits: Problem formulation and design of Basic Combinational Logic Circuits, Combinational Logic Using Universal Gates. Basic Adders, ALU, Parity-Checkers and Generators, Comparators, Decoders, Encoders, Code Converters, Multiplexer (Data Selector), De-multiplexers

Unit -IV

Sequential Circuits: Latches, Flip-flops (SR, JK, T, D, Master/Slave FF,) Edge-Triggered Flip-Flops, Flip-Flop Operating Characteristics, Basic Flip-Flop Applications, Asynchronous Counter Operation, Synchronous Counter Operation, Up/Down Synchronous Counters.

Unit -V

Shift registers & Memories, Shift Register Functions, Serial In - Serial Out Shift Registers, Serial In - Parallel Out Shift Registers, Parallel In - Serial Out Shift Registers, Parallel In - Parallel Out Shift Registers, Bidirectional Shift Registers, Basics of Semiconductor Memories, Random-Access Memories (ROM), Read Only Memories (ROMs), Programmable ROM's (PROMs and EPROM's), PAL, PLA.

Course Outcomes:
After studying this course the students would gain enough knowledge

1. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.

2. To understand and examine the structure of various number systems and its application in digital design.
3. Ability to identify basic requirements for a design application and propose a cost effective solution.
4. The ability to identify and prevent various hazards and timing problems in a digital design.
5. To develop skill to build, and troubleshoot digital circuits.

Text Books:

1. **Morris Mano**, Digital Logic Design, TMH.
2. **Kumar Anand**, Digital Logic Design, PHI.

References Books:

3. **Thomas L. F.**, Digital Fundamentals, Prentice Hall, Inc, 4thEdition 1997.
4. **Tocci R. J.** &**Widner**, Digital Systems: Principles and Applications, PHI.
5. **Gothman**, Fundamentals of Digital Electronics, PHI.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit.

Semester VII

List of courses in Open Elective Course-III

Course Title: Java Programming **Max Marks: 100,**
Course Code: OEC-CE-783/PCC-CSE-523 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3[3-0-0)

OBJECTIVE: To enhance skills of student with the ever demanding programming language Core Java.

UNIT-I

Overview of Java: Introduction to Java, Features of Java, Object Oriented Concepts, Lexical Issues, Data Types, Variables, Arrays, Operators, Java Virtual Machine, Byte code, Control Statements: Selection, Iteration and Jump Statements, Java Bean Standards.

UNIT-II

Classes and Inheritance: Classes, Objects, Constructors, Overloading Method, Access Control, Static and Final Keywords, Nested and Inner Classes, Abstract Class, Object Class, Inheritance, Overriding Methods, Using Super, Dynamic method Dispatch. Packages, Access Protection, Importing Packages, Interfaces.

UNIT-III

Exception Handling and Multithreading: Exception Handling, Multiple Catch Clauses, Nested Try and Throw. Multithreading: Thread, Creating a Thread, Creating Multiple Threads, Synchronization, Inter Thread Communication, Deadlock, Suspending, Resuming and Stopping Threads, Multithreading.

UNIT-IV

I/O, Applets and String Handing Files: Files, Stream Classes, Serialization, Reading Console Input, Writing Console Output, Print Writer Class, Reading and Writing Files, Transient And Volatile Modifiers, Instance Of, Strictfp, Native Methods. Applets: Introduction: Applet Fundamentals, Applet Architecture. Strings: String Constructors, String Operations, String Buffer, String Builder, Sting Tokenizer.

UNIT-V

Collections Framework: Collections Overview, Collection Interfaces, Collection Classes, Accessing a Collection via Iterator, Map Classes and Map Interfaces, Comparators, Arrays, Legacy Classes and Interfaces, Wrapper Classes.

Course Outcomes:

1. Identify classes, objects, members of a class and relationships among them needed for a specific problem.
2. Write Java application programs using OOP principles and proper program structuring.
3. Demonstrate the concepts of polymorphism and inheritance.
4. Write Java programs to implement error handling techniques using exception handling.

5. Use collections Framework to solve problems

TEXT BOOKS:

1.P. Naughton& H. Schildt, Java2 (The Complete Reference), 3rd Edn, TMH 1999.
2.K. Arnold & J. Gosling, the Java Programming Language, 2nd Edn, Addison Wesley, 1996.

REFERENCE BOOKS:

Cay S. Horstmann, Gary Cornell, Core Java 2 Volume I Fundamentals, 5th Edn. PHI, 4000.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit.

SEMESTER-VII

List of courses in Open Elective Course-III

Course Title: Data Warehousing and Data Mining **Max Marks: 100**
Course Code: OEC-CE-784/PEC-CSE-521 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3[3-0-0)

Course Objective:

1. To introduce the basic concepts of Data Warehouse and Data Mining techniques.
2. Examine the types of the data to be mined and apply pre-processing methods on raw data.
3. Learning different classification algorithms for data mining.

Unit-I

Introduction: Sources, Users, Applications and Goals of a Data Warehouse, Components of a Data Warehouse, Operational Data Store, Dimensional Modeling: Fact and Dimension Tables, Star, Snowflake and Hybrid Schemas, Confirmed Facts and Dimensions. Slowly Changing Dimensions, Casual Dimensions, Helper Tables and Surrogate Keys.

Unit-II

Data Warehouse: Characteristics of a Data Warehouse, Software Architecture and Design, Data Granularity Model, Data Warehouse Bus Architecture. Meta Data: Need and Types of Metadata, Metadata Process Concept. Data Marts and its Characteristics, Comparison between OLTP and OLAP.

Unit-III

Decision Support System (DSS): Using Data Warehouse for DSS, Techniques and Solutions for constructing a Central Data Warehouse, Data Extraction, Cleanup, and Transformation Tools, Managing a Data Warehouse Environment.

Unit-IV

Data Mining: Introduction to Data Mining and Uses, Data Mining Functionalities, Classification of Data Mining Systems, Data Mining Task Primitives.

Association Rules: Association rules mining, Mining Association rules from single level, multilevel transaction databases, multidimensional relational databases and data warehouses, Co-relational analysis, Constraint based association mining.

Unit-V

Classification and Clustering: Classification and prediction, decision tree induction, Bayesian classification, k-nearest neighbor classification, rule based classification, classification of back propagation, support vector machines, associative classification, cluster analysis, types of data in clustering, categorization of clustering methods, genetic algorithms and data visualization concepts.

Course Outcomes

Students who complete this course should be able to

1. Describe the fundamental concepts, benefits and problem areas associated with data warehousing.
2. Describe the various architectures and main components of a data warehouse.
3. Design a data warehouse, and be able to address issues that arise when implementing a data warehouse.
4. Ability to apply acquired knowledge for understanding data and select suitable methods for data analysis.
5. Applicability of various classification algorithms in data mining for real-world problems.

Text Books:

1. **Gray & Smith**, Data Warehousing handbook, CRS, PHI.
2. **Berson**, Data Warehousing, Data Mining & OLAP.

Reference Books:

1. **Mallach**, Data Warehousing, Data Warehousing System, McGraw Hill.
2. Concepts, Techniques, Products and Applications, 2_{nd}Edn, PHI.

Note for paper setter: The question paper shall comprise of 10 questions. Two questions will be set from each unit. The student has to attempt five questions selecting at least one question from each unit

SEMESTER-VII
List of courses in Open Elective Course-III

Course Title: Electrical Engineering Materias **Max Marks: 100**
Course Code: OEC-CE-785/PCC-EE-324 **University Exam: 60**
Duration of Exam: 3 hours **Internal Assessment: 40**
Credits: 3[3-0-0)

Course Objective: The course has been designed to get student acquainted with the properties of various engineering materials and their applications in Engineering Sciences.

Unit-I
Crystal Structure of Solids: Atomic packing, crystal lattice, Different type of crystal Bands, structure of silicon & Germanium, Energy Bands in solids, one dimensional lattice, Electron in periodic potential, concept of hole, Three dimensional Lattice and Brullioun Zones Elastic Wave and Photons (Elementary Ideas).

Unit-II
Insulating Materials: Introduction to Insulators, dielectric behavior, Properties of Insulating Materials, Insulators in Static & Alternating fields, classification as per temperature rise, Practical Dielectrics, Liquid: Solid and Gaseous and their applications.

Unit-III
Dielectric Materials: Polarization, Quantitative and qualitative discussion of dielectric constants of polyatomic molecules, Internal fields in solids and Liquids. Ferroelectrics & Piezoelectric Materials, spontaneous polarization, Frequency dependence of polarizabilities, complex dielectric constant of non-dipolar solids, Dipolar relaxation, dielectric losses, Dielectric Break downs.

Unit-IV
Magnetic Materials: Review of magnetic field concepts, Orbital dipole, and angular momentum of simple atomic models, classification of magnetic materials, spontaneous magnetism, Curie- Weiss Law, coercive forces; antiferro magnetic materials, ferromagnetic materials, Properties & applications of ferrites.

Unit-V
Conductivity of Metals: Ohm's Law, Relaxation time, collision time and mean free path, resistivity of conductors, temperature dependence of resistivity, super conductivity.
Semiconductor Materials: classifying materials as semiconductors, chemical bond in Si and Ge & its consequences, density of carriers in intrinsic semiconductors, the energy gap, the conductivity of intrinsic semiconductors, Carrier densities in n-type semiconductors & p-type semi-conductors, Hall Effect and Carrier Density.

Course Outcomes
1. Given a type of material, the students will be able to qualitatively describe the bonding scheme and its general physical properties, as well as possible applications in electrical engineering.
2. This will be helpful for the students to understand about the insulating properties of the materials.
3. This will be helpful for the students to understand about the Dielectric properties of the materials.

4. Students will be able to do comparative analysis of magnetic materials based upon their properties.
5. Students will be able to differentiate among various materials such as conductor and semiconductor based upon the internal composition and conductivities.

Text Books/References

1. **Dekker**, Electrical Engineering Materials.
2. **Allison**, Materials & Electronics Engineering & Devices.
3. **Raghvan**, Electrical Engineering Materials.
4. **S.P. Seth and P. V. Gupta**, Electrical Engineering Materials.

Note for Paper Setter: The Question paper shall comprise of 10 questions. Two questions will be set from each unit .The student has to attempt five questions at least one from each unit

Semester–VIII

Course Title: Major Project-II **Max. Marks: 450**
Course Code: PROJ-CE-821 **University Examination: 200**
Duration of Exams: 3 hours **Internal Assessment: 250**
Credits 9 (0-0-0)

During semester VIII every student shall be allotted a Major Project-II in continuation to Project-I to his/her stream under the supervision of an allotted mentor. Students are required to report in their respective departments to do Final exercise of and submitted a hard copy report to department. Major Project-II should be under the supervision of an allotted mentor. Students are required to complete the Major Project-II during semester VIII. Major Project-II shall be evaluated internally as per university statutes by a committee consisting of:

i) Head of Department
ii) One member nominated by principal
iii) Coordinator(s)/Supervisor(s) of major project/training

Semester-VIII

Professional Elective Course-V (PEC-V)

Course Title: Advance Structural Design **Max. Marks: 100**
Course Code: PEC-CE-861 **University Examination: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: This course aims to strengthen the design skills in foundations, R Walls, domes and Pre stressed structures.

UNIT-I

Foundations: Various types of RCC footings, Design of isolated and combined footings. Introduction to Raft foundation.

UNIT-II

Retaining Walls: Stability analysis of retaining walls, design of cantilever and counter for type RCC retaining walls.

UNIT-III

Water Retaining Structures: Design of underground, circular and rectangular water tanks-reference to IS:3370

UNIT-IV

Shell Structures: Membrane analysis of spherical and conical domes by statical methods. Design of domes and ring beams.

UNIT-V

Pre Stressed Concrete: General principles, Methods of pre stressing, pre-tensioning and post-tensioning, losses in pre-stress. Design of rectangular, T and I section beams.

Course Outcomes: After studying the course student will:

1. Able to design the isolated and combined footing.
2. Able to design the retaining walls and analyse them for stability.
3. Capable of designing the different water tanks.
4. Able to do the membrane analysis of domes and design them.
5. Understand the methods of pre-stressing and able to calculate losses in pre-stress member.

Text Books:

1. **Bowels,** Foundation Engineering.
2. **Jain & Jaikrishen,** Design of R.C.C Structures Vol.-II.
3. **Krishnarayan,** Prestress Concrete Structures.

Books Recommended:

1. **Kong & Evans,** Design of reinforced and pre stressed concrete Structures.
2. **A.K. Jain,** Design of R.C.C.-Limit state Method.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Professional Elective Course-V (PEC-V)

Course Title: Earthquake Engineering **Max. Marks: 100**
Course Code: PEC-CE-862 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Objectives: The objective of this subject is to study how to design different types of earth quake resistant building.

Unit I

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

Unit II

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

Unit III

Elements of Seismology: Elements of Engineering Seismology – Causes of Earthquake – Plate Tectonic theory – Elastic rebound Theory – Characteristic of earthquake – Estimation of earthquake parameters – Magnitude and intensity of earthquakes – Spectral Acceleration-Information on some disastrous earthquakes, Response of Structures to Earthquake, Response and design spectra - Design earthquake concept of peak acceleration - Site specific response spectrum - Effect of soil properties and damping.

Unit IV

Liquefaction of soils: Introduction, Theory of liquefaction, Liquefaction analysis, factor of safety against liquefaction, Evaluation of liquefaction potential, Remedial measures for liquefaction.

Unit V

Design Methodology: Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993 –Guidelines for Earthquake resistant design , Importance of ductility - Methods of introducing ductility into RC structures Design Methodology IS 1893, IS 13920 and IS 4326 - Codal provisions - Design as per the codes - Base isolation techniques - Vibration control measures – Important points in mitigating effects of earthquake on structures.

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

1. Understand SDOF system and MDOF system.
2. Know about the multiple degree of freedom of different systems.
3. Understand about the elements of seismology.
4. Understand the basics of liquefaction.
5. Understand the basic design codes.

Text Books

1. Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", 4th Edition, Pearson Education, 2011.
2. Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India
Pvt. Ltd. 2007

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VIII

Professional Elective Course-V (PEC-V)

Course Title: Ground Water Hydrology **Max. Marks: 100**
Course Code: PEC-CE-863 **University Exam: 60**
Duration of Exams: 3 hours **Internal Assessment: 40**
Credits 3(2-1-0)

Course Objective: Objective of this course is to introduce the students to the fundamentals of ground water flow, distribution of ground water, concept of aquifers, flow in confined and unconfined aquifers, interference among wells, well hydraulics, ground water development, ground water exploration by different techniques.

UNIT-I

Introduction: Darcy's Law, Hydraulic Head, Hydraulic conduction and permeability, Heterogeneity and Anisotropy of Hydraulic conductivity, porosity and void ratio, unsaturated flow and water table, Transmissibility and storability, specific storage, specific yield.

UNIT-II

Flow Nets: Flow nets by Graphical construction, Homogenous, Isotropic System, Flow nets by numerical simulation, potential steam function, Flow nets by Laplace's equation solution in inhomogeneous and anisotropic aquifers.

UNIT-III

Ground Water Occurrence: Steady- State Regional ground water flow, Recharge area, Discharge areas, Ground water divide, Effect of topography on regional flow, Effect of Geology on Regional Flow, Fluctuation in Ground water Table. Well hydraulics and well construction, geophysical explorations, groundwater quality and management of groundwater resources,

UNIT-IV

Ground Water Evaluation: Well yield, Aquifer yield and Basin yield, Explorations for aquifers, Surface and Subsurface investigations - Geologic methods; remote sensing; geophysical explorations; electrical resistivity and seismic refraction.

UNIT-V

Flow to Aquifers: Types of aquifers. Aquitard and Aquiclude, confined and unconfined aquifer, steady state flow and transient Flow, Equation of Ground water flow to aquifers, Radial flow. Their solution, Measurements of parameters pumping Tests, prediction of Aquifer yield by Numerical simulation, Finite difference method.

Course outcome: The student will be able to:

1. Explain the types and different parameters of aquifers, and permeability of aquifers.
2. Compute flow in aquifers and explain the salient features of various types of wells including the losses.
3. Derive the unsteady flow equation by various methods and obtain the solutions.

4. Explain the types and construction of wells, pumping tests in wells, working principles, and estimate power requirements of pumps and yield of wells.
5. Explain ground water recharge, ground water runoff, ground water budget, and harvesting techniques **Text Books:**

1. David Keith Todd, Ground water Hydrology.
2. W.Fetter, Printice Hall, Applied Hydrology.

Refrence Books:

1. Fletcher G.D, Ground water & Wells
2. Rastogi, Numerical Ground water Hydrology.
3. Bower H Ground Water Hydrology – 1978 McGraw Hill.
4. Garg,Satyaparakash Ground Water and Tube Wells, 1982 Oxford & IBH
5. Dr. P.N. Modi Irrigation Water Resources and Water Power – 2008 Standard book house Delhi. **Note for Paper Setter:** The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

SEMESTER-VIII

Professional Elective Course-V (PEC-V)

Course Title: Architecture and Town Planning **Max. Marks: 100**

Course Code: PEC-CE-864 **University Examination: 60**

Duration of Exam: 3 Hrs **Internal Assessment: 40**

Credits 3(2-1-0)

Objectives: The objective of this subject is to study the principles of architecture design and functional planning of buildings. It also aims to realise the process of resource mobilization, organization of land-use, transportation and infrastructure networks both for efficient functioning and creation of pleasant and well ordered environment.

UNIT–I

Introduction to Architecture: Origin & definition, factors affecting Architecture, Aesthetics – Principles, Elements of Aesthetics point, Line, Plane, figure, form, shape, size, Background. Composition-focus, unity, balance, rhythm, harmony, discord, textures, contrast, scale, proportions and character. Colourpsychological impact and other fractures, Circulation.

UNIT–II

Basic Principles: Orientation of building, temperature, effect of sun and wind on orientation, climate- cool, temperate & arid season. Ventilation in buildings, space. Modern concept of building. Comfort, factors affecting planning. Vertical space and shelter, Landscape-architecture. Planning of Buildings – Aims, factors affecting, site selection.

UNIT–III

Town Planning: Introduction to town planning, evolution, objects, principles & importance of town planning. Origin & growth of towns, stages in town development, Planning of modern towns& military towns. Town planning in ancient India & present position. Zoning- Objects, Principles, importance and aspects.

UNIT–IV

Slums, Parks and Industries: Slums-Causes, Characteristics, effects, clearance, re-housing and prevention of slum formation. Parks- classification, park systems design, Park ways, Playgrounds, Industries-Classification, requirements and townships, Classification and principles of design of public buildings, objects of re-planning, garden city.

UNIT–V

Building Bye-laws and Regulation: Building bye-laws, underlying principles. Functions of local authority, applicability of bye-laws, set back, light plane, floor space off-street parking. Building bye-laws for residentional area of a town scheme. Master plan- objects, importance and features. Stages of preparation of development plan. Urban roads, street system and traffic management.

Couse Outcome:- After completion of course students will be able to

1. Know about the history of Architecture.
2. Understand the basic principle of Architecture.
3. Understand the different phases in town planning.
4. Know about the different settlements.
5. Acquire knowledge about the building by law and regulations.

Reference Books:

1. Satish Chandra Agarwala, Architecture &Town Planning, Dhanpat Rai & Co. 2.
Gurcharan Singh and Jagdish Singh, Building Planning and Scheduling,
3. Standard Publishers and Distributers.
4. Lewis Keeble, Town Planning Made Plain & town & country planning association;London, 1983
5. Rangwala,S.C.,Town Planning, Charotar Publishing House, Anand India.
6. Hiraqskar, G.K., Fundamentals of Town Planning, Dhanpat Rai & Sons., Delhi Curriculum & Syllabi (B.tech Civil Engineering)
7. Pickering, E., Architecture Design, John Wiley and Sons, London.

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

Semester–VIII

Professional Elective Course-VI (PEC-VI)

Course Title: Geographical Information System and Science **Max. Marks: 100**
Course Code: PEC-CE-865 **University Examination: 60**
Duration of Exam: 3 Hrs **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: Students will learn how to compile, analyze, and present geospatial data while emphasizing the value of visual communication. Students will learn these basic geospatial concepts while working with

ESRI's Arc GIS software.

Unit-I

Introduction: History and development of GIS, components of GIS, applications of GIS; Coordinate systems –datum's, latitudes, longitudes, Geographical Coordinate Systems, WGS84, Projected Coordinate System and UTM; Geospatial data.

Unit-II

Data Models

Data format: Raster and Vector data formats; Spatial Data Models –Vector and Raster data models, Non- Spatial Data Models, Topology models, Grid model, TIN model, Network model,

Unit-III

Data Sources and Data Entry

Data Sources-collection; capture and Geo-processing, input methods, editing, re-projection, geometric transformation, Digitizing, GPS, Remote Sensing, Attribute Data: Queries and Analysis; Spatial Data: Spatial Queries and Basic Spatial Analysis; Raster and Vector data Inputs

Unit-IV

Data Analysis

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilization.

Unit-V

GIS Modelling and analysis: Basic elements of GIS modeling; Coupling-Loose, Tight coupling; Spatial interpolation; Vector data analysis:-buffering, overlay; Raster data analysis–local operations, neighborhood operations, zonal operations; Terrain mapping and analysis-DEM and TIN.

Course Outcome:- After completion of course student Will be able to

1. Describe what geography and GIS are;
2. Understand the importance of scale, projection, and coordinate systems in GIS;
3. Understand vector and raster data structures and the appropriate use of each of these data structures;
4. Understand the basics of data capture, storage, analysis, and output in a GIS; and
5. Understand typical uses of GIS in business, government, and resource management.

Text Books:

1.A First Text on Geographic Information Systems (2nd edition), by Paul Bolstad,published by Eider Press.

References Books:

1.*ArcGIS Desktop*(2nd edition), by Tim Ormsby et al., published by Environmental Systems Research
Inc. (ESRI)

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The students have to attempt five questions, selecting one from each Unit.

Semester–VIII

Professional Elective Course-VI (PEC-VI)

Course Title: Structural Geology **Max. Marks: 100**
Course Code: PEC-CE-866 **University Examination: 60**
Duration of Exam: 3 Hrs **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The objective is to teach material on structural geology critical to practicing geologic professionals, including recognition of structural features, and an enhanced understanding of earth dynamics and mechanics.

Unit-I Introduction: Description, classification, and origin of earth structures.

Unit-II

Crust: Different ways in which the continental crust can deform; link scales of structure from the field, outcrops, hand specimen, thin section by integrating analytical techniques with practical examples.

Unit-III

2D strain &3D strain: Theoretical and meso to microscale analysis of structures developed through a linked series of lectures and practicals; practical 2D strain analysis; 3D strain concepts; incremental strain, kinematics and polyphase deformations.

Unit-IV

Fold and Fault Techniques and Plate Tectonics: - fold construction and classes; fault evolution and section balancing; fault rock microstructures; fault and fold mechanics, current concepts in plate tectonics, cross-section construction techniques.

Unit-V

Tectonic Settings and structural Geology for reservior:- structural interpretation of seismic data, structural styles in different tectonic settings (thrust and fold belts, rifts, strike and slip, gravity tectonics, inversion), structural geology of reservoir units

Course Outcome: Students will be able to

1. Acquire knowledge on the geometry and type of structures present in earth.
2. Understand and describe the features formed in rocks when subjected to stress.
3. Understand the impact of structural geology to active tectonic settings
4. Understand micro and macro scale deformation mechanisms (viz., brittle, ductile).
5. Portray 2D and 3D strain analysis for various deformation behaviours.

Text Books:

1.Twiss, Robert J., and Eldridge M. Moores. *Structural Geology*. New York, NY: W. H. Freeman, 1992. ISBN: 9780716722526.

References Books:

1.Ghosh, S.K., Structural Geology: Fundamentals and Modern Developments, Elsevier

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The students have to attempt five questions, selecting one from each Unit.

SEMESTER–VIII

Professional Elective Course-VI (PEC-VI)

Course Title: Water Resources Field Methods **Max. Marks: 100**
Course Code: PEC-CE-867 **University Examination: 60**
Duration of Exam: 3 Hrs **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: The objective of this course is to identifying and evaluating multiple-purpose, multi-objective water quantity and quality planning and management issues.

Unit-I

Introduction: Scientific principles of measurement technologies and protocols used for water-resources measurements.

Unit-II

Design Studies:-Experimental design of field-scale water-resources and environmental studies

Unit-III

Planning field studies:- Planning field studies related to instruments and protocols for surface-water, ground-water, and water-quality sampling.

Unit-IV

Data Quality and different monitoring Systems (Part-I):-Description of data quality and One-half-day laboratory field trips to stream flow monitoring stations and

Unit-V

Data Quality and different monitoring Systems (Part-II):-Groundwater monitoring wells related systems.

Course Outcomes: Students will be able to

1. Use the various optimization methods for future water demand allocation under different scenarios.
2. Efficient water use to satisfy rising water demands using optimization techniques can be inherently applied by
3. Students for any irrigation, industrial cluster, municipal or watershed water distribution project.
4. Real life field application challenges like reservoir water allocation for different activities like irrigation, bio diversity maintenance, and environmental flows can be addressed with knowledge of optimization methods.
5. Students will be skilled so that they assess and evaluate water demand in such a way that all water resources

Text Books:

1. Water Resource Systems Planning and Management Authors: **Loucks**, Daniel P., **van** Beek,

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The students have to attempt five questions, selecting one from each Unit.

Semester–VIII

Professional Elective Course-VI (PEC-VI)

Course Title: Environmental Impact Assessment **Max. Marks: 100**
Course Code: PEC-CE-868 **University Examination: 60**
Duration of Exam: 3 Hrs **Internal Assessment: 40**
Credits 3(2-1-0)

Objective: This course introduces the methodology of environmental impact assessment (EIA) as a vital tool for sound environmental management and decision-making. The course provides an overview of the concepts, methods, issues and various forms and stages of the EIA process.

UNIT-I

Environmental assessment: Evolution of environmental impact assessment (EIA), EIA at project, regional and policy level; strategic EIA, EIA process, screening and scoping criteria, rapid and comprehensive EIA, specialized areas like environmental health impact assessment, environmental risk analysis, economic valuation methods, cost benefit analysis, expert system and GIS applications, uncertainties.

UNIT-II

Environmental policies and legislation: Legislative and environmental clearance procedures in India and other countries, sitting criteria, public participation, resettlement and rehabilitation.

UNIT-III

Methodologies: Practical applications of EIA, EIA methodologies, baseline data collection, prediction and assessment of impacts on physical, biological and socio-economic environment, environmental management plan, post project monitoring, EIA report and EIS, review process.

UNIT-IV

Environmental systems Modelling: Principles of modelling, classification; introduction to air quality models, meteorology, atmospheric stability and turbulence, Gaussian plume model and modification, numerical models.

UNIT-V

Transport and fate of pollutant in aquatic system: introduction to river, estuarine and lake hydrodynamics, stratification and eutrophication of lakes, dissolved oxygen model for streams.

Course Outcome:-Students will be able to

1. Explain the major principles of environmental impact assessment in Australia
2. Understand the different steps within environmental impact assessment
3. Discuss the implications of current jurisdictional and institutional arrangements in relation to environmental impact assessment
4. Communicate both orally and in written form the key aspects of environmental impact assessment
5. Understand how to liaise with and the importance of stakeholders in the EIA process

Text Books

1. Environmental Impact Assessment for Developing Countries: Asit K. Biswas
2. Environmental Impact Analysis Handbook: G.J. Rau and C.D. Wooten
3. Environmental Impact Assessment: L. Canter

Reference Books

1. Air Pollution: J.H. Seinfield
2. Principles of Surface Water Quality Modelling and Control : R.V. Thomann and J. A. Muller

Note for paper setter: The question paper shall comprise of 10 questions. Two questions shall be set from each Unit. The students have to attempt five questions, selecting one from each Unit.