OP Jindal University
Raigarh-Chhattisgarh

Scheme and Syllabus of
Bachelor of Technology
School of Engineering
Session- 2017-2021

Program Outcomes

PO-1: Knowledge and Problem Solving: Acquire in-depth scientific knowledge of their discipline both in theory and practical, demonstrate basic skills, investigate, apply, and solve the problems in a variety of contexts related to science and technology.

PO-2: Communication and Teamwork: Develop skills to communicate effectively to diverse platforms and contribute meaningfully to different capacities as a leader, team member or individual.

PO-3: Modern tools and techniques for Scientific Experiments: Apply modern tools and techniques to carry out scientific experiments accurately, record, analyze and predict the result for valid conclusion with clear understanding of limitations.

PO-4: Logical thinking: Develop logical thinking and expertise with precision, analytical mind, innovative thinking, clarity of thought, and systematic approach for proving or disproving the facts after mathematical formulation. with precision, analytical mind, innovative thinking, clarity of thought, expression, and systematic approach

PO-5: Skill development and Employability: develop elementary computing and soft skills to prepare students for industry, entrepreneurship and higher education with precision, analytical mind, innovative thinking, clarity of thought, expression, and systematic approach.

PO-6: Ethics and citizenship: Able to recognize different value systems and ethical principles; and commit to professional ethics, norms, and responsibilities of the science practice and act with informed awareness to participate in civic life activities.

PO-7: Society, Environment and Sustainability: Enhance ability to elicit views of others and understand the impact of various solutions in the context of societal, economic, health, legal, safety and environment for sustainable development.

PO-8: Life-long learning: Acquire fundamental knowledge for lifelong learning to participate in the extensive context of socio-technological change as a self-directed member and a leader.

Programme Specific Outcome (PSO)

PSO_1: Design and develop infrastructural facility using concepts of Mathematics, Civil Engineering and other related disciplines to meet end users' objectives.

PSO_2: Test and analyze the quality of various civil engineering materials and to integrate the same to assure quality in construction.

PSO_3: Ensure the holistic growth through the awareness of effective communication, ethical responsibilities and physical/mental fitness.

PSO_4: Build a solid foundation in the domain of Civil Engineering for developing analytical, technical, professional & management skills

Core Course (CC) Papers (2014-2017)

Semester	S. N.	Subject Code	SUBJECT	Credit
1st	1	MAT1101	Math	5
	2	CHM1101	Chemistry	4
	3	PHY1101	Physics	4
	4	CSE1101	Basic Computing	4
	5	CSE1102	C-Programming	
	6	MME1101	Engineering Drawing	4
	7	PFD1101	Professional Development	3
	8	PHY1102	Physics Lab	1
	9	CHM1102	Chemistry Lab	1
2nd	10	MAT1202	Math	5
	11	PHY1203	Physics- II	4
	14	CHM1203	Environmental Studies	4
	15	CSE1202	C Programming	4
	16	CSE1203	Programming with C++	
	17	WSP1201	Workshop Practice	2
	18	PFD1202	Professional Development	3
	19	HSS1201	Humanities	1

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SEMESTER III

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
				L	T	P	PRE**		ESE*	Total Marks	(L+P+T)
							Mid Sem	TA			
1	CIE2101	CIVIL	Surveying-I	3	1	0	30	20	50	100	4
2	CIE2102	CIVIL	Strength of Materials	3	1	0	30	20	50	100	4
3	CIE2103	CIVIL	Building Material and Construction	3	1	0	30	20	50	100	4
4	MAT2103	MATH	Engineering Mathematics-III	3	1	0	30	20	50	100	4
5	CIE2104	CIVIL	Surveying Lab	0	0	2	0	30	20	50	2
6	CIE2105	CIVIL	Material Testing Lab	0	0	2	0	30	20	50	2
7	CIE2106	CIVIL	Civil Engineering Drawing Lab	0	0	2	0	30	20	50	2
8	HSS2102	HUMANITIES	Humanities & social Science	1	0	0		30	20	50	1
9	PFD2103	HUMANITIES	Professional Development	2	0	0		30	20	50	2
			TOTAL	**15**	**4**	**9**	**120**	**230**	**400**	**750**	**25**

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SEMESTER IV

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	CIE2207	CIVIL	Theory of Structures- I	3	1	0	30	20	50	100	4
2	CIE2208	CIVIL	Fluid Mechanics	4	1	0	30	20	50	100	5
3	CIE2209	CIVIL	Transportation Engineering-I	3	1	0	30	20	50	100	4
4	MAT2208	MATH	Numerical Methods and Computing	3	1	0	30	20	50	100	3
5	CIE2210	CIVIL	Theory of Structures Lab	0	0	3	0	30	20	50	2
6	CIE2211	CIVIL	Fluid Mechanics Lab	0	0	3	0	30	20	50	2
7	CIE2212	CIVIL	Transportation Engineering Lab	0	0	3	0	30	20	50	2
8	PFD2204	HUMANITIES	Professional Development	2	0	0	0	30	20	50	2
			TOTAL	**15**	**4**	**9**	**150**	**250**	**350**	**750**	**25**

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SEMESTER V

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
				L	T	P	PRE**		ESE*	Total Marks	(L+P+T)
							Mid Sem	TA			
1	CIE3113	CIVIL	Theory of Structures –II	3	0	0	30	20	50	100	3
2	CIE3114	CIVIL	Structural Engineering Design-I	3	1	0	30	20	50	100	4
3	CIE3115	CIVIL	Geotechnical Engineering-I	3	1	0	30	20	50	100	4
4	CIE3116	CIVIL	Transportation Engineering-II	3	0	0	30	20	50	100	3
5	CIE3117	CIVIL	Concrete Technology Lab	0	0	3	0	30	20	50	2
6	CIE3118	CIVIL	Structural Engineering Design-I Lab	0	0	3	0	30	20	50	2
7	CIE3119	CIVIL	Geotechnical Engineering-I Lab	0	0	3	0	30	20	50	2
8	CIE3120	CIVIL	Industrial training & Seminar	0	0	2	0	25	25	50	1
9	HSS3103	CIVIL	Humanities & social Science	1	0	0	0	25	25	50	1
10	PFD3105	CIVIL	Professional Development	0	0	1	0	25	25	50	1
TOTAL				**13**	**2**	**12**	**120**	**245**	**335**	**700**	**23**

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SEMESTER VI

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	CIE3221	CIVIL	Structural Engineering Design-II	3	1	0	30	20	50	100	4
2	CIE3222	CIVIL	Geotechnical Engineering-II	3	1	0	30	20	50	100	4
3	CIE3223	CIVIL	Environmental Engineering I	3	1	0	30	20	50	100	4
4	CIE3224(1-9)	CIVIL	Professional Elective -I (**CIE Annexure - I**)	3	1	0	30	20	50	100	4
5	CIE3225	CIVIL	Structural Engineering Design-II Lab	0	0	3	0	30	20	50	2
6	CIE3226	CIVIL	Geotechnical Engineering-II Lab	0	0	3	0	30	20	50	2
7	CIE3227	CIVIL	Environmental Engineering Lab	0	0	3	0	30	20	50	2
8	PFD2103	CIVIL	Professional Development	0	0	1	0	25	25	50	1
TOTAL				**12**	**4**	**10**	**120**	**185**	**270**	**575**	**23**

Professional Elective-I (CIE Annexure - I)

Sr. No	Courses	Name of the Courses
1	CIE3224(1)	Design of Bridge Structures
2	CIE3224(2)	Traffic Engineering
3	CIE3224(3)	Solid Waste Management
4	CIE3224 (4)	Computer Methods in Structural Analysis
5	CIE3224 (5)	Maintenance, Repair and Rehabilitation of Civil Engineering Structures (MRCS)
6	CIE3224 (6)	Remote Sensing and GIS in Civil Engineering
7	CIE3224 (7)	Urban Infrastructure
8	CIE3224 (8)	Town Planning
9	CIE3224 (9)	Systems Approach in Civil Engineering

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SEMESTER VII

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
				L	T	P	PRE**		ESE*	Total Marks	(L+P+T)
							Mid Sem	TA			
1	CIE4128	CIVIL	Water Resources Engineering	3	1	0	30	20	50	100	4
2	CIE4129	CIVIL	Professional Practice	3	1	0	30	20	50	100	4
3	CIE4130(1-8)	CIVIL	Professional Elective -II (CIE Annexure - II)	3	0	0	30	20	50	100	3
4	CIE4131	CIVIL	Professional Practice Lab	0	0	3	30	20	50	100	2
5	CIE4132	CIVIL	Minor Project	0	0	8	0	30	20	50	6
6	CIE4133	CIVIL	Industrial Training & Seminar	0	0	2	0	30	20	50	1
9	HSS4104	CIVIL	Humanities & social Science	1	0	0	0	25	25	50	1
10	PFD4107	CIVIL	Professional Development	0	0	1	0	25	25	50	1
TOTAL				**10**	**2**	**14**	**120**	**245**	**335**	**700**	**22**

Professional Elective-I (CIE Annexure - II)

Sr. No	Courses	Name of the Courses
1	CIE4130(1)	Design of Earthquake Resistant Buildings
2	CIE4130(2)	Transportation Planning and Management
3	CIE4130(3)	Quality Control and Assurance in Construction
4	CIE4130(4)	Modern Construction Materials & Methods
5	CIE4130(5)	Advanced Reinforced Concrete Design
6	CIE4130(6)	Industrial Waste Management
7	CIE4130(7)	Foundation Engineering
8	CIE4130(8)	Air Pollution & Control

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SEMESTER VIII

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
				L	T	P	PRE**		ESE*	Total Marks	(L+P+T)
							Mid Sem	TA			
1	CIE4234	CIVIL	Structural Engineering design-III	3	1	0	30	20	50	100	4
2	CIE4235	CIVIL	Software Applications in civil Engineering	3	1	0	30	20	50	100	4
3	OPE42(01-38)	CIVIL	Open Elective -I (OE Annexure - I)	3	0	0	30	20	50	100	3
4	CIE4236	CIVIL	Structural Engineering design Lab-III	0	0	3	30	20	50	100	2
5	CIE4237	CIVIL	Major Project	0	0	10	0	30	20	50	7
10	PFD4208	CIVIL	Professional Development	0	0	1	0	25	25	50	1
TOTAL				**9**	**2**	**14**	**120**	**245**	**335**	**700**	**21**

Open Elective (OE Annexure - I)

Sr. No	Courses	Name of the Courses
1	OPE4201	Disaster Management
2	OPE4202	Construction Management
3	OPE4203	Ecology and sustainable Development

Programme:	**B. Tech**	**Semester :**	**I**
Name of the Course:	**MATH**	**Course Code:**	**MAT 1101**
Credits :	**5**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description:

Learning Objective

1. Find limits, continuity and differentiability of functions of one variable, Successive Differentiation.
2. Solve Expansion of functions by Taylor's and Maclaurin's Theorem, Curvature and Radius of Curvature.
3. Find Partial Differentiation, Euler's theorem.
4. Lagrange's method of undetermined multipliers.
5. Integration of functions having nth power, double and triple integral and applications.
6. Gradient, divergence and curl, line integral, Surface integral and Volume integral.
7. Relation between line integral, Surface integral and Volume integral.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Review of limits, continuity and differentiability of functions of one variable, Successive Differentiation, Leibnitz Theorem.
CO2	Understand Expansion of functions by Taylor's and Maclaurin's Theorem, Curvature and Radius of Curvature.
CO3	Understand Introduction to limits, continuity and differentiability of functions of several variables, Partial Differentiation, Euler's theorem.
CO4	Understand Maxima and minima of functions of two and three variables, Lagrange's method of undetermined multipliers, Differentiation under integral sign.
CO5	Understand Review of Integrals involving functions of one variable.
CO6	Understand Important Reduction formulae and their applications to quadrature and rectification.
CO7	Understand Double & triple integrals, change of order of integration
CO8	Understand Beta & Gamma functions, application to area & volume.
CO9	Understand Vector operator ∇ , directional derivative, gradient, divergence, curl, line integral, surface and volume integrals
CO10	Understand Green's, Gauss's & Stoke's theorem and their applications.

Syllabus

UNIT: 1

Review of limits, continuity and differentiability of functions of one variable, Successive Differentiation, Leibnitz Theorem, Expansion of functions by Taylor's and Maclaurin's Theorem, Curvature and Radius of Curvature.

UNIT: 2
Introduction to limits, continuity and differentiability of functions of several variables, Partial Differentiation, Euler's theorem, Maxima and minima of functions of two and three variables, Lagrange's method of undetermined multipliers, Differentiation under integral sign.

UNIT: 3
Review of Integrals involving functions of one variable, Important Reduction formulae and their applications to quadrature and rectification.

UNIT: 4
Multiple Integrals: Double & triple integrals, change of order of integration, Beta & Gamma functions, application to area & volume.

UNIT: 5
Vector Calculus: Vector operator ∇ , directional derivative, gradient, divergence, curl, line integral, surface and volume integrals, Green's, Gauss's & Stoke's theorem and their applications.

REFERNECE BOOKS:

1. Advanced Engineering. Mathematics by Erwin Kreyszig (8th edition) – John Wiley & Sons.
2. Higher Engineering. Mathematics by B.S. Grewal (38th edition)-Khanna Publishers.
3. Applied mathematics for Engineers & Physicists by Louis A. Pipes – Mc Graw Hill.
4. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar – Narosa Publishing House.

CO-PO&PSO Correlation

Course Name: Calculus												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1		1		1		1	1			1	1	
CO2	2			1	2	1		1	2	1		1
CO3		2					1				1	
CO4	1		1	1	2	1			3	1		
CO5	1			1				1				1
CO6		1	2		1				1		3	
CO7			2			2				2		
CO8	2			2	2		2		2		2	
CO9			1									
CO10	1			2		1		1		1		1

Note: 1: Low 2.: Moderate 3: High

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Programme :	**B. Tech.**	**Semester :**	**I**
Name of the Course:	**Chemistry**	**Course Code :**	**CHM1101**
Credits :	**4**	**No of Hours :**	**50**
Max Marks :	**100**		

Course Outline:
The cornerstone of OP Jindal University is pursuit of knowledge through experience, where students learn by doing and real-world challenges find practical solutions and innovation happens not by chance, but by design.

Aims
Keeping in view the philosophy of experiential learning the Chemistry courses would aim to:

- Enable students to apply and use knowledge, methods and techniques that characterize science and technology
- Develop an ability to analyse, evaluate and synthesize scientific information
- Develop and apply the ICT skills in the study of Chemistry
- Develop an appreciation of the possibilities and limitations associated with science and scientists
- Provide opportunities for scientific study and creativity within a global context that will stimulate and challenge students
- Instill curiosity and interest in students to pursue research for the creation of new materials with useful properties

Course Objectives:
This course aims at giving students theoretical understanding about the basic concepts of Chemistry and to acquire the skills required for an engineer. The concept of acids and bases, solid state and its applications, reaction rates and factors that influence the reactions and the importance & utility related to it is introduced. The elementary idea of organic reactions, importance of water in industrial usage, significance of corrosion control to protect the structures, polymers and their usage as an important material to be studied. The students will gain knowledge about fuel, characteristics and ranking.

Course Outcomes (CO)
Students will be able to

CO Number	Course Outcome
CO 1	Demonstrate an understanding of scientific facts and concepts, scientific methods and techniques, scientific terminology, and methods of presenting scientific information
CO 2	Apply and use scientific facts and concepts, scientific methods and techniques, scientific terminology to communicate effectively and apply appropriate methods to present scientific information
CO 3	Facilitate the application of chemical principles in engineering and technology for future technopreneurs and researchers

Prerequisite

Basic Chemistry at 12th Standard or equivalent level. In addition, a review on the following topics is required:

- Kinetics, Acids & Bases
- Application of mole concept calculation and Solution Chemistry
- Electrochemical Cells
- Fundamentals of organic chemistry
- Fundamental & theoretical Concept of Chemical energetic (Bond enthalpy & Hess's law)

- Syllabus Outline

		Teaching hrs (50
UNIT 1	Acid and Base	5
1.1	Theories of Acids and Bases	
1.2	Arrhenius theory	
1.3	Bronsted-Lowry	
1.4	Buffer Solution	
1.5	Lewis concept	
UNIT 2	Solid State	6
2.1	**UNIT** cell	
2.2	Crystal system	
2.3	Space lattice (only cubes)	
2.4	Bragg's Law	
2.5	Bonding in Ionic crystals	
2.6	Imperfection and defects in ionic solids	
UNIT 3	Reaction Kinetics	7
3.1	Factors affecting reaction rates	
3.2	Rate Law, Order and Molecularity	
3.3	Methods determining Rate law and Order	
3.4	Half Life and Radioactive Decay	
3.5	Collision Model of Chemical Kinetics	
3.6	Catalysis	
UNIT 4	Corrosion Chemistry	6
4.1	Corrosion fundamentals	
4.2	Theories of corrosion	
4.3	Forms of corrosion	
4.4	Factors influencing corrosion	
4.5	Corrosion control	
UNIT 5	Polymers	6
5.1	Introduction & Classification of polymers	
5.2	Types of polymerization	

5.3	Preparation, properties and technical application of Major Polymers (Polythelene, PVC,Teflon, Nylon 6,6	
5.4	Resins & their Industrial Application	
UNIT 6	Organic Chemistry	6
6.1	Nucleophilic substitution reactions	
6.2	Elimination reactions	
6.3	Reaction pathways	
UNIT 7	Water Chemistry	8
7.1	Specifications of boiler feed water	
7.2	Alkalinity	
7.3	Hardness	
7.4	Water softening processes	
7.5	Boiler problems	
7.6	Water conditioning	
UNIT 8	Fuels	6
8.1	Calorific values & its determination	
8.2	Proximate and ultimate analysis of coal	
8.3	Carbonization of Coal	
8.4	Coke, its manufacturing Process	

Assessment Outline

Component	Weightage(%)
Quizzes & home work	20
Mid semester exam	30
End semester exam	50

Exam Question paper specifications

Component	**Weightage (%)**	**Duration**		**Format**
		Mid sem	**End sem**	
Sec-A	20	30 min	30 min	30 multiple choice questions
Sec-B	30	1 hour 45 min	2 hour 30 min	Sec-B One data based question and several short answer questions (All
Sec-C	50			Sec-C Two extended-response questions from a choice of three questions(mid sem) and four questions(end sem)

RESOURCES AND REFERENCES

Text books:

1. Advanced Inorganic Chemistry, by Cotton, F.A., Wilkinson G., Murrillo, C.A. and Bochmann, M., Wiley, 1999.
2. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.

4. Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
5. Solid State Chemistry By Lesley E. Smart, Elaine A. Moore

References books:

1. Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.
2. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.
3. Corrosion Engineering by M.G. Fontana McGraw Hill Publications.

Online Resources:

1. http://www.chemcollective.org/
2. https://global.oup.com/academic/category/science-and-mathematics/chemistry/?cc=in&lang=en
3. http://www.chem.illinois.edu/clcwebsite/clctutorials.html
4. http://www.organic-chemistry.org/namedreactions/
5. http://chemwiki.ucdavis.edu/Organic_Chemistry/Named_Reactions
6. http://global.oup.com/uk/orc/chemistry/burrows2e/
7. http://global.oup.com/uk/orc/chemistry/

Syllabus of Chemistry CHM 1101

1. Acids & Bases:

Properties of Acids & Bases, Conjugate Acid & Base, Strong& weak Acids/Bases, Arrhenius Theory, Bronsted-Lowry Theory, Calculating PH & POH, Lewis concept, Buffer solution- types, mechanism & calculations

Texts/ References:

- Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
- Brown, Theodore E.; Lemay, H. Eugene; Bursten, Bruce E.; Murphy, Catherine; Woodward, Patrick, 2009.

2. Solid State:

Introduction & definition, Unit Cell, Crystal system, Bravais Lattice, space lattice (only cubes), Bragg's Law, bonding in Ionic crystals, Schottky Defect, Frenkel Defect.

Texts/ References:

- Advanced Inorganic Chemistry, by Cotton, F.A., Wilkinson G., Murrillo, C.A. and Bochmann, Wiley, ehichester, 1999.
- Solid State Chemistry, Lesley E. Smart, Elaine A. Moore, 2008.

3. Reaction Kinetics:

Reactant concentrations, Temperature, Physical states and surface areas of reactants, Solvent and catalyst properties, Mathematical expression, **UNIT**s, Instantaneous Rate, Differential & Integrated Rate law, Order and Molecularity, Isolation Method, Differential method, Integral method, Half-life method, Using Graphs to Determine Rate Laws, Rate Constants, and Reaction Orders, Half-Lives and Radioactive Decay Kinetics, Activation energy, Arrhenius equation.

Texts/ References:

- Laidler, K.J., Principles of Chemistry, Harcourt, Brace & World, New York, 1966. Moore, W.J., Physical Chemistry, Prentice-Hall, 1962.
- Moeller, T., Inorganic Chemistry, John Wiley, 1982.

4. Corrosion Chemistry:

Why Corrosion, Causes of Corrosion, Consequences of corrosion, Dry/ Chemical Corrosion, Wet/Electrochemical corrosion, Galvanic Corrosion, Concentration Cell / Differential aeration corrosion, Waterline corrosion, Pitting Corrosion, Crevice Corrosion, Stress Corrosion Cracking, Corrosion Fatigue, Caustic, Embrittlement, Microbial, Corrosion, Nature of the Metal, Nature of the corroding environment, Design, Materials Selection, Protective Coatings, Use of Inhibitors, Modifying/ Alteration of Environmental, Corrosion Allowances, Cathodic Protection.

Texts/ References:

- Corrosion for Science and Engineering (Trethewey and Chamberlain), 2nd Edition, Pearson Education 1998.
- Corrosion Engineering (Fontana), 3rd Edition, McGraw Hill 1986. Corrosion Engineering (Roberge), McGraw Hill 2008.

5. Polymer Chemistry:

Introduction & Classification of polymers, Addition Polymerization, Condensation Polymerization, Co-polymerization, Preparation properties and technical application of Major Polymers (Polythelene, PVC, Teflon, Nylon6, 6 Bakelite), Introduction to Resin, Types of Resin, Differentiation between thermoplastic & thermosetting Resin, Industrial application of resin.

Texts/ References:

- Engineering Chemistry by P.C. Jain & Monica Jain, 2008.

6. Organic Reactions:

What is a substitution and nucleophilic reaction, features of nucleophilic substitution reaction, Requirements of SN reaction- a. Nucleophile, b. Substrate, c. leaving group, Mechanism of SN reaction- a. SN1, b. SN2, what is Elimination reaction and how it differs from substitution reaction, Mechanisms of Elimination reaction- a. E2, b. E1, deduce reaction pathways given the starting materials and the product with not more than two stages?

Texts/ References:

- Engineering Chemistry by B.S. Chauhan, 2005

7. Water Chemistry:

Introduction, Sources of water, Impurities present in water, Requirement of boiler feed water, Alkalinity-Definition, Types, Determination, Numerical, Hardness-Definition, Types, Determination, Numerical, Lime and Soda Process, Zeolite Process, Ion Exchange Process, Numericals based on them, Sludge and scale, Caustic embrittlement, Boiler corrosion, Priming and foaming, Carbonate conditioning, Phosphate conditioning, Colloidal conditioning, Calgon conditioning.

Texts/ References:

- Engineering Chemistry by P.C. Jain & Monica Jain, 2008.

8. Fuels:

Introduction, Classification of Fuels, Characteristics of a good fuel, Combustion, GCV & NCV (with Numericals), determination by Bomb Calorimeter, Proximate and ultimate analysis of coal and their importance, Carbonization of Coal, Coke, its manufacturing by Otto Hoffman oven

Texts/ References:

- Engineering Chemistry by P.C. Jain & Monica Jain, 2008.

CO- PO & PSO Correlation

Course Name: Chemistry												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	1							2	1		2
CO2	1	2							1	2		1
CO3		1	1							1	1	

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Physics-I**	**Course Code:**	**PHY 1101**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description:

Applied Physics is a science course for students interested in the technical fields. This course is designed for the student who needs a broad understanding of physics and the ability to apply those principles in the work force. The Physics-I course is basically fundamentals of mechanics, concepts of heat & thermodynamics, parameter of Mechanics, theory of relativity, basics of quantum and atomic physics and its engineering applications. The purpose of studying Physics-I is to introduce the mind to the scientific method of analysis through which, the practical problems can be identified, explanations generated and logical solutions selected which in essence are requisites for the development of good engineering sense.

COURSE OUTCOMES:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand basics of Mechanics.
CO2	Know the fundamental principles of relativity
CO3	Understand the theory of heat and thermodynamics and know its applications in engineering
CO4	Acquire knowledge and understanding of fundamental principles of modern physics relevant to problems of Engineering

Syllabus

Unit 1. Mechanics-I:

Vectors: Types, addition, subtraction, multiplication, linear combination and resolution of vectors, scalar and vector product of two vectors, triple product

Force and Motion: Graphical representation of force, addition, triangle law, parallelogram and polygon law of forces, Speed and velocity, acceleration, Speed time graph, Turning effect of a force, Couple, Friction, Angle of friction and coefficient of friction

Unit 2. Mechanics-II:

Kinematics: Coordinate system, Cartesian, Circular motion, Angular momentum and Angular velocity, relation between angular and linear velocity, Angular acceleration, uniform circular motion, Centripetal and centrifugal force, projectile, equation of motion Dynamics: Rotational motion, Central forces, Satellites, time period of satellites

Surface Tension and Viscosity: Surface tension, surface energy, Pressure difference across a liquid surface, Viscosity and coefficient of viscosity, Streamline and turbulent flow, Poiseuille's equation, Stokes's law

Unit 3. Heat & Thermodynamics:

Heat, Temperature, work, comparison of heat and work, law of conservation of energy, Isothermal and adiabatic expansion of a gas, Change in Internal energy of a gas, Zeroth law of thermodynamics, First law of thermodynamics, Second law of thermodynamics, Cycles, Heat Engine, Carnot's theorem, PV diagram, TS diagram, Concept of entropy, Change in entropy in reversible and irreversible process, Entropy and disorder-Third law of thermodynamics

Unit 4. Theory of Relativity:

Frame of reference , Galileo's Transformations, Michelson-Morley experiment and its negative result, Einstein's theory of relativity (postulates), Lorentz Transformation, Time dilation, Length contraction, Twin's Paradox, Doppler's effect, Addition of Velocities, Relativistic mass- Variation of Mass with Velocity, Equivalence of mass and energy

Unit 5. Atomic and Quantum Physics:

Planck's Quantum Hypothesis, Photoelectric effect, X-rays, Properties of X-rays, Bragg's law, Bragg's X-ray spectrometer, Bragg's law and crystal structure, Compton Scattering, Characteristic X-ray spectrum, Moseley's law, Daune-Haun't criteria, Wave particle duality, De Broglie Hypothesis, Properties of matter waves, Davission-Germer Experiment, Heisenberg Uncertainty principle and its elementary proof.

Texts/ References:

1. Goldstein, Classical Mechanics, Narosa, New Delhi, 1998.
2. J. R. Taylor, Classical Mechanics,University ScienceBooks, 2003.
3. H. Goldstein, Classical Mechanics, Addison Wesley, 2nd ed., 1980.
4. N. C. Rana and P.S. Joag, Classical Mechanics, Tata McGraw Hill, 1991.
5. L. D. Landau and E.M. Lifhitz, Mechanics, Pergamon Press, 1960.
6. W. Pauli, Thermodynamics and kinetic theory of gases, Dover Publications, 2010
7. M. W. Zeemansky and R. H. Dittman, Heat and thermodynamics, McGraw Hill, 1997 F. W. Sears and G. L. Salinger, Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Narosa, New Delhi, 1975.
8. C. Kittel and H. Kroemer, Thermal Physics, W. H. Freeman & Co., 1980.
9. S. H. Patil, Elements of Modern Physics, Tata McGraw Hill, 1989.
10. H. S. Mani and G. K. Mehta, Introduction to Modern Physics, Affiliated East West, 1988.
11. Beiser, Perspectives in Modern Physics, McGraw Hill, 1969.
12. K. Krane, Modern Physics, 2nd ed., John Wiley, 1998.

CO-PO Correlation

Course Name: Physics-I (PHY1101)												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	1	1	2	1	2	2	1	2	3	1	2
CO2	2	3	2	1	2	3	1	2	1	1	2	1
CO3	1	3	1	3	1	1	2	1	1	3	1	2

Note: 1: Low 2.: Moderate 3: High

Programme:	**B. Tech**	**Semester:**	**I**
Name of the Course:	**Basic Computing**	**Course Code:**	**CSE1101**
Credits:	**4**	**No of Hours:**	**50**
Max Marks:	**100**		

Course Description:
This course will expose students to developments in computer technology and understand the working of a computer system. It will introduce end-user computing and build problem solving skills by using C programming.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Makes students gain a broad perspective about the uses of computers in engineering industry.
CO2	Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO3	Develops the ability to analyze a problem, develop an algorithm to solve it.
CO4	Develops the use of the C programming language to problem solving and develops the basic concepts and terminology of programming in general.
CO5	Introduces the more advanced features of the C language for implementation in diverse platforms.

Syllabus:

UNIT I Introduction to Computers
Basic Concepts, Evolution, Computer Organization, Peripheral Devices, Software – System Software, Application Software, Computer Languages – Low Level, Machine Level and High Level Languages, Compiler and Assembler, Microprocessors, Memory, Technological Trends. Algorithms and Flow Chart: Algorithm and its characteristics, flowchart, Algorithm involving Decisions and Loops, Problem solving methods. Pseudo code, top down & bottom up approaches of program design

UNIT II Introduction to C
History of C, Features of C Language, Structure of a C program, Basic Input Output Execution of C Program- Compiling, Linking, debugging, and running a program. Variables, Constants and Operators: C character set – Tokens, Constants Keywords, identifiers, and Variables. Data types – Data type Qualifiers, Declaration of variables, Arithmetic, Logical, Assignment, Relational, Increment and Decrement, Conditional, Bit wise, Special Operator, Precedence and Associativity

UNIT III Looping and Functions
Branching & Looping: Introduction – Simple if statement, if-else, else-if ladder, nested if-else, Switch statement, go to statement. Loops - while, do-while, for loop, nested loops infinite loops Functions: Introduction to functions – Declaration,

definition and calling of function, Function arguments and return value, scope and lifetime of variables call by value, call by reference. Storage classes. Recursion. Library functions

UNIT IV Arrays and Pointers
Arrays: Declaration and initialization of one dimensional, two dimensional and character arrays, accessing and manipulating array elements, array applications - matrix operations, searching, sorting. String manipulations. Pointers: Pointers concepts, pointers and function arguments, pointer arithmetic

UNIT V Structures and File Handling Structure
Structure declaration, definition, initialization and accessing. Structure Assignment, Nested Structure, Structures and Functions, Structures and arrays. File Handling: Concept of a file – Data Organization, reading, writing, manipulating and troubleshooting, file types, file opening modes.

Textbooks
1. "Let us C" by Yashvant Kanetkar, BPB Publications.
2. Raja Raman V., "Fundamental of Computers" (4th edition.), Prentice Hall of India, New Delhi.
3.

Reference Books
1. "C Programming Language" by B. W. Kernighan & D.M. Ritchie.
2. "Programming with C (SCHAUM's Outlines Series)" by Byron Gottfried.

CO-PO&PSO Correlation

Course Name: Basic Computing												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2			1	3				2		2	2
CO2	1		2	2					1	1		
CO3	3		1	1	2		2		3	3	1	
CO4	2			1					2			
CO5		1			1		2	3		1		1

Note: 1: Low 2.: Moderate 3: High

Programme:	**B. Tech**	**Semester:**	**I**
Name of the Course:	**C Programming**	**Course Code:**	**CSE 1102/1202**
Credits:	**4**	**No of Hours:**	**50**
Max Marks:	**100**		

Course Description:
This course will expose students to developments in computer technology and understand the working of a computer system. It will introduce end-user computing and build problem solving skills by using C programming.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Makes students gain a broad perspective about the uses of computers in engineering industry.
CO2	Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO3	Develops the ability to analyze a problem, develop an algorithm to solve it.
CO4	Develops the use of the C programming language to problem solving and develops the basic concepts and terminology of programming in general.
CO5	Introduces the more advanced features of the C language for implementation in diverse platforms.

Syllabus:

UNIT I Preliminary Concepts
Introduction to C: History of C, Features of C Language, Structure of a C program, Basic Input Output Execution of C Program- Compiling, Linking, debugging and running a program.

Variables and Constants: C character set – Tokens, Constants, Keywords, identifiers and Variables. Data types – Data type Qualifiers, Declaration of variables, assigning values to variables, Escape sequences, Defining symbolic constants.
Operators: Arithmetic, Logical, Assignment, Relational, Increment and Decrement, Conditional, Bit wise, Special Operator. Precedence and Associativity. C Expressions – Arithmetic expressions, Evaluation of expressions, Type conversions and Type casting.

UNIT II Control Structure & Looping
Branching: Introduction – Simple if statement, if-else, else-if ladder, nested if-else, Switch statement, go to statement.

Looping: Loops - while, do-while, for loop, nested loops infinite loops. break & continue statement, structured programming.

UNIT III Functions and Pointer

Functions: Introduction to functions – Declaration, definition and calling of function, Function arguments and return value, Scope and Lifetime of variables, call by value, call by reference. Storage classes. Recursion. Library functions.

Pointers: Pointers concepts, pointers and function arguments, pointer arithmetic, passing by address, pointers to pointers, pointers and arrays, dynamic memory management functions, command line arguments.

UNIT IV Array & Strings

Arrays: Declaration and initialization of one dimensional, two dimensional and Character arrays, Accessing and manipulating array elements, array applications - Matrix Operations, Searching, Sorting.

Strings: Declaration and initialization of strings, Reading, Writing and manipulating strings, String handling functions.

UNIT V Structures and File Handling

Structure: structure declaration, definition, initialization and accessing. Structure Assignment, Nested Structure, Structures and Functions, Structures and arrays.

File Handling: Concept of a file – Data Organization, Reading, writing, manipulating and troubleshooting, File types, file opening modes, character and string I/O in files, Record I/O in files, Database management.

Textbooks

1. "Let us C" by Yashvant Kanetkar, BPB Publications.
1. Raja Raman V., "Fundamental of Computers" (4th edition.), Prentice Hall of India, New Delhi.

Reference Books

1. "C Programming Language" by B. W. Kernighan & D.M. Ritchie.
2. "Programming with C (SCHAUM's Outlines Series)" by Byron Gottfried.

CO-PO&PSO Correlation

Course Name: C Programming												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2			1	3				2			1
CO2	1		2	2					1		2	2
CO3	3		1	1	2		2		3		1	1
CO4	2			1					2			1
CO5		1			1		2	3		1		

Note: 1: Low 2.: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**I**
Name of the Course:	**Engineering Drawing**	**Course Code:**	**MEE1101**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description:
The course in Engineering Graphics is aimed at inculcating the ability of imagination in the mind of the students, to improve their visualization skills and logical thinking, to build in them a capability of communicating through this unique language of engineers by learning conventional graphical techniques as well as computer-aided drawing skills, to develop interpretation competencies of professional drawings, to transfer an abstract object onto the paper through drawing.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Gain knowledge of Fundamentals of Engineering drawing.
CO2	Draw orthographic projections of lines, planes, and solids
CO3	Draw sections of solids and development of lateral surfaces including cylinders, cones, prisms, and pyramids.
CO4	Construct isometric scale, isometric projections, and views.
CO5	Draw projections of lines, planes, solids, and sections of solids including cylinders, cones, prisms, and pyramids using AutoCAD.

Syllabus:

UNIT 1 :

Fundamentals of Engineering Drawing
Introduction to Drawing instruments & their uses, Engineering Lettering, Drawing sheet - Layout of drawing sheets, sizes of drawing sheets, Line – Types of lines and their applications in Engineering Drawing, Dimensioning. Introduction to scales
Engineering Curves
Conic sections and Basic construction of Cycloid, Involutes
Introduction to Computer-Aided Drafting (CAD):
Basic Drawing and Editing Commands, Dimensioning, Knowledge of setting up layers, Text. **(To be covered with CAD package)**

UNIT 2 :

Projections of Points
Introduction to projections, Projection of points in all four quadrants.
Projections of Lines
Projections of lines (by First angle projection method only) parallel to one or both the reference planes, perpendicular to one of the reference planes. Projections of

lines inclined to either horizontal plane or vertical plane and both the planes i.e., oblique lines. Trace of a line.

UNIT 3 :

Projection of Planes
Projections of planes (by First angle projection method only) inclined to either horizontal plane or vertical plane and both the planes i.e., Oblique planes. Use change of positions or Auxiliary plane method.
Projection of Solids
Introduction to Solids, Types of Solids, Projection of Solids inclined to one and both the reference plane. Use change of positions or Auxiliary plane method.

UNIT 4 :

Section of Solids
Projections of geometric solids cut by plane perpendicular to at least one reference plane (Exclude Curved section Plane).
Development of Surfaces
Methods of development of lateral surfaces of various solids, development of surfaces of cut solids.
UNIT 5 :

Orthographic Projection
Orthographic projections of given pictorial view by First angle method of projections only. Drawing of orthographic projections using Auto CAD **(only for Term Work)**
Isometric Projection
Introduction, Isometric scale, Isometric projection and Isometric views of solids and objects.

Text books:
1. N. D. Bhatt and V.M. Panchal, Engineering Drawing, Plane and Solid Geometry, Charotor Publication House, Anand, Gujarat, India.
2. Dhaanjay A. Jolhe, Engineering Drawing with an Introduction to Auto CAD, Tata Megraw-hill Publishing Co. Ltd, New Delhi, India.
3. Basant Agrawal and C.M. Agrawal, Engineering Drawing, Tata Megraw-hill Publishing Co. Ltd, New Delhi, India.
4. K. L. Narayana and P.L. Kannaiah, Engineering Drawing, Second Edition, Scitech Publications (India) Pvt. Ltd. Chennai.
5. K. C. John, Engineering Graphics for Degree, PHI Learning Pvt. Ltd. New Delhi, 2009
6. R. Bapat, Engineering Graphics, Allied Publications, New Delhi, India.
7. D. N. Johle, Engineering Drawing, S. Chand and Company Ltd., New Delhi, India.

Reference Books:
- W. J. Luzadder, Fundamental of Engineering Drawing, Prentice Hall of India.
- Basudeb Bhattacharyya, Machine Drawing Include Auto CAD Supplements, Oxford University Press, India.
- French and Vierck, Graphic Science, Mc- Graw Hill international
- K. Venugopal, Engineering Drawing and Graphics, New Age Publication.

- R. K. Dhawan, Engineering Drawing, S. Chand and Company Ltd., New Delhi, India.
- N. B. Shaha and B. C. Rana, Engineering Drawing, Person Education.
- C. Jensen, J. D. Helsel and D. R. Short, Engineering Drawing and Design, Tata Megraw-hill Publishing Co. Ltd, New Delhi, India.
- T. Jeyaproovan, Engineering Drawing and Graphics by using Auto CAD, Vikas Publication house, Pvt. Ltd. New Delhi, India.
- M. L. Dhabhade, Engineering Graphics, Association of technical Authors, Pune India.
- B. V. R. Gupta, M. Raja Roy, Engineering Drawing, I. K. International Pvt. Ltd, India.
- R. K. Dhawan, Engineering Drawing, S. Chand and Company Ltd., New Delhi, India.

CO-PO&PSO Correlation

Course Name: Engineering Drawing												
	Program Outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**		**2**	**3**	**3**				**2**			**1**
CO2	**3**	**3**	**2**	**3**	**2**				**1**		**2**	**2**
CO3	**3**	**3**	**2**	**3**	**2**				**3**		**1**	**1**
CO4	**3**	**3**	**2**	**3**	**2**				**2**			**1**
CO5	**3**	**2**	**2**	**3**	**3**					**1**		

Note: 1: Low 2: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Professional Development**	**Course Code:**	**PFD1101**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Objectives:

- Speak about their career plan for 2 minutes in a language they prefer (this would help the trainer assess the level of self esteem and goal clarity of the participant)
- Introduce himself/herself in front of a small group for 2 minutes using correct words and phrases
- Identify his/her reading speed and reading style
- Write a paragraph on any topic of their interest using correct words and sentences
- Give a 3 minutes speech on any topic (chosen) without anxiety and stage fear in front of the class
- Overcome their anxiety of facing an interview through a mock interview taken by the trainer
- Distinguish between responsibility and accountability they hold by giving suitable examples
- Develop creative thinking
- Present a flowchart to perform an activity given by the trainer
- List the characteristics of a good team member and a team leader
- Define different types of team in their own words
- List the common skill sets required to work at any industry

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Speak about their career plan for 2 minutes in a language they prefer (this would help the trainer assess the level of self esteem and goal clarity of the participant)
CO2	Introduce himself/herself in front of a small group for 2 minutes using correct words and phrases
CO3	Identify his/her reading speed and reading style
CO4	Write a paragraph on any topic of their interest using correct words and sentences
CO5	Give a 3 minutes speech on any topic (chosen) without anxiety and stage fear in front of the class
CO6	Overcome their anxiety of facing an interview through a mock interview taken by the trainer

CO7	Distinguish between responsibility and accountability they hold by giving suitable examples
CO8	Develop creative thinking
CO9	Understand about Team, team member, team leader and its characteristics
CO10	List the common skill sets required to work at any industry

Course Detail:

1. Introduction: The participant will be able to introduce himself/herself before a small group for 2 minutes using correct words and phrases.
2. Self Esteem: This would help to assess the level of self esteem and goal clarity of the participants
3. Setting the goals: Participants should be able to speak about their career plan for 2 minutes using SMART criterion.
4. Inspiration: Having a positive outlook on life.
5. Communication: Effective communication and tools of effective communication.
6. Importance of communication: Barriers of communication, ways to overcome barriers.
7. Reading and comprehension: Participants should be able to identify their processing speed (WPM) while reading a context.
8. Vocabulary Building: How to use dictionary, Techniques to improve vocabulary.
9. Writing skills: Participants will be able to write a simple paragraph on any given topic using basic rules of writing a paragraph.
10. Punctuation: Participants will be able to use appropriate punctuation in passages.
11. Public speaking skills: Participants will be able to overcome their anxiety or stage fear and should be ready to face audience
12. Body language during public speaking: Participants will be able to use correct body language during speech.
13. Conversational English: Correct Usage of Auxiliary verbs, conditional If.
14. Conversational English: Correct Usage of Modals.
15. Conversational English: Correct Usage of Pronouns, different ways to say “I like”
16. Improved learning skills: Participants should be able to distinguish between various learning patterns (auditory, visual and kinaesthetic)
17. Learning tips: Participants will be able to know and apply the learning style by which they learn fast.
18. Responsibility and accountability: The participant should be able to distinguish between responsibility and accountability.
19. Responsibility and accountability: The participant should be able to give suitable example of responsibility and accountability which they hold in their own life.
20. Team and project management: Participants should be able to define different types of team in their own words.
21. Characteristics of Effective Teams: Participants should be able to list the characteristics of a good team member and a team leader.
22. Creativity: Participants will be able to develop creative thinking
23. Interview Skill: Participants will be able to overcome their anxiety and fear while facing an interview.
24. Interview Introduction: Participants should be able to tell the interviewer something about themselves in an effective manner.

25. Career growth & job readiness: Participants will be able to list the common skill sets required to work at any industry and write a statement of purpose for the career path they aspire to choose.

Reference Books:

1. Oxford Dictionary & Thesaurus (South Asia Edition)
2. One minute manager by Spencer Johnson
3. The present by Spencer Johnson
4. You can win by Shiv Khera

CO-PO & PSO Correlation

Course Name: Professional Development [PFD1101]												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1		3			2			1				1
CO2		3			1			1			2	2
CO3		2						2			1	1
CO4		3						2				1
CO5		3			3			3	1	2		2
CO6		3			3			3			2	1
CO7		1				3		3		1		
CO8	2			3				2	1		1	2
CO9		3						2				1
CO10		2			2						2	

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109

Department of Civil Engineering

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Physics Lab**	**Course Code:**	**PHY1102**
Credits :	**1**	**No of Hours :**	**30**
Max Marks:	**100**		

Course Description

- Physics I Lab is a **one credit course** that requires students to complete laboratory experiments that illustrate the principles studied in Physics I.

Course Outcomes

Upon completion of this course, students should be able to:

CO Number	Course Outcome
CO1	Explain the concept of geometrical properties such as moment of inertia, centre of gravity.
CO2	Explain the concepts of solid mechanics, thermal engineering and fluid mechanics.
CO3	Evaluate velocity and pressure variations in various types of fluid flows.

Syllabus Outline

List of experiments (students have to attempt any 10)

1. To verifying the laws of triangle, parallelogram and polygon of forces.
2. Determination of acceleration due to gravity "g" by free fall.
3. Determination of coefficient of viscosity of water by Poiseuille's apparatus.
4. Determination of terminal velocity of a steel ball in glycerin medium by Stokes's method.
5. Determination of thermal conductivity of a bad conductor by Lee's disc method.
6. To study the laws of friction.
7. Determine the mechanical equivalent of heat by Calendar and barn's constant flow method.
8. To verify the Newton's law of cooling.
9. Determination of the total work done by enclosed gas in various thermodynamic cyclic processes.
10. Determination of moment of inertia of a flywheel about its own axis of rotation.
11. Determination of plank's constant.
12. To study the photoelectric effect.

CO-PO & PSO Correlation

Course Name: Physics-I Lab												
	Program Outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	1	2	3	1	3	2	1	2	3			3
CO2	1	3	1	2	2	2	1	3	1			
CO3	1	1	2	1	2	1	1	2			3	

Note: 1: Low 2.: Moderate 3: High

Programme :	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Chemistry Lab**	**Course Code :**	**CHM1102**
Credits :	**1**	**No of Hours :**	**30**
Max Marks :	**100**		

Course Outline: Chemistry Lab [CHM 1102]

The cornerstone of OP Jindal University is pursuit of knowledge through experience, where students learn by doing and real world challenges find practical solutions and innovation happens not by chance, but by design.

Aims

Keeping in view the philosophy of experiential learning the Applied Chemistry courses would aim to:

- Enable students to apply and use knowledge, methods and techniques that characterize science and technology
- Develop an ability to analyze, evaluate and synthesize scientific information
- Create curiosity and interest in students to pursue research for the creation of new materials with industrial applications
- Develop experimental and investigative scientific skills
- Provide opport**UNIT**ies for scientific study and creativity within a global context that will stimulate and challenge students

Objectives

Being an experimental chemistry course, it is the intention that our students achieve the following objectives:

- Demonstrate an understanding of data logging, error analysis and method development and calibration
- Apply and use scientific facts and concepts, scientific methods and techniques, scientific terminology to communicate effectively and apply appropriate methods to present scientific information.
- To facilitate the application of chemical principles in engineering and technology for future technopreneurs and researchers

Course Outcomes (CO)

Students will be able to

CO Number	Course Outcome
CO 1	Understand the use of instruments, sensors and methods for analyzing various parameters
CO 2	Collect, process and analyze data using ICT tools

Prerequisite

Basic chemistry at 12th Standard or equivalent

In addition, a review on the following topics is required

- Kinetics, Acids & Bases
- Fundamentals of sampling & Error Analysis
- Application of mole concept, molar calculations and water chemistry

- Basic concepts of electro chemistry
- Fundamentals of physical chemistry like rate law, enthalpy, entropy etc

Subject Code	Subject Name	Teaching Scheme			Credit Assigned
		Theory	Practicals	Tutorials	
CHEM LAB 1102	CHEMISTRY (Lab)	00	02	00	01

List of Experiments:

1. Determination of the chloride content in a given water sample by Mohr's method ($AgNO_3$, Cl^- titration)
2. Determination of the Dissolved Oxygen in a given water sample by Wrinkler's method (Std. thiosuphate solution titration using starch as indicator)
3. Determination of temporary & permanent hardness of water sample by EDTA method (EDTA titration using EBT Indicator)
4. Study of the kinetics of acid decomposition of Thiosulfate Ion with HCl
5. Determination of the concentration dependence of the electric conductivity in aqueous solutions of a strong electrolyte at room temperature (**using data loggers with conductivity probe and drop counters)**
6. To study the neutralization titration curves for strong acid and base (**using data loggers with pH probe and drop counters)**
7. **ICT Exercise in Chemistry**: Determination of order and rate constant of reaction using a spreadsheet and graphical techniques

Instruments Involved:

1. Data Loggers
2. pH Sensor probes
3. Conductivity probes
4. Temperature Probes
5. pH Meters
6. Digital balances
7. Bomb calorimeter
8. Spectrophotometer
9. Water distillation assembly
10. Titration assembly

RESOURCES AND REFERENCES BOOKS:

Text books:

1. Laboratory manual on Engineering Chemistry by Dr. Sudha Rani (S. Chand and Company).
2. A Textbook on Experiments and Calculations in Engineering Chemistry by S.S. Dara (Dhanapat Rai Publishing Company Pvt. Ltd.).
3. Experimental in General Chemistry; C.N.R. Rao & U. C. Agrawal, East–West Press.

References books:

1. Advance Practical Chemistry, by ILPC, Wilkinson G., Murrillo, C.A. and Bochmann, Wiley.

2. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
3. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
4. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.Text Book of Chemical Science by F.W. Billmeyer, John Wiley & sons, 1994.
5. Vogel's Texbook of Quantitative Chemical Analysis (Latest ed.), Revised by G.H. Jeffery, J. Bassett, J. Mendham & R.C. Denney.
6. Applied Chemistry: Theory and Practice (Latest ed.), by O.P. Vermani and A. K. Narula.

Online Resources:

1. http://www.chemcollective.org/
2. https://global.oup.com/academic/category/science-and-mathematics/chemistry/?cc=in&lang=en
3. http://www.chem.illinois.edu/clcwebsite/clctutorials.html
4. http://www.organic-chemistry.org/namedreactions/
5. http://chemwiki.ucdavis.edu/Organic_Chemistry/Named_Reactions
6. http://global.oup.com/uk/orc/chemistry/burrows2e/
7. http://global.oup.com/uk/orc/chemistry/

CO- PO & PSO Correlation

Course Name: Chemistry Lab												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2							1			1
CO2	1	1								1		

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109
Department of Civil Engineering

Programme:	**B. Tech**	**Semester :**	**II**
Name of the Course:	**MATH**	**Course Code:**	**MAT1202**
Credits :	**5**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description:

Learning Objective

1. Evaluate first order differential equations including separable, homogeneous, exact, and linear.
2. Show existence and uniqueness of solutions.
3. Solve second order and higher order linear differential equations.
4. Create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillator and circuits.
5. Solve differential equations using variation of parameters
6. Solve linear systems of ordinary differential equations.

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Understand ordinary differential equation.
CO2	Understand applications in Engineering Problems
CO3	Understand higher order differential equation with constant coefficient.
CO4	Understand simultaneous linear equations with constant coefficients.
CO5	Understand Linear partial differential equation of first order.
CO6	Understand Non-homogeneous linear partial differential equations
CO7	Understand Euler's Formula, Functions having points of discontinuity Understand Fourier series, Linear and quasi linear equations
CO8	Understand Harmonic analysis.
CO9	Understand Method of separation of variables; Solution of heat equation;
CO10	Understand Wave equation; Laplace equation & Poisson's equation

Syllabus

UNIT: 1

Review of ordinary differential equation of first order, non linear differential equation of first order and their applications to engineering problems.

UNIT: 2

Differential Equations of higher order: Linear differential equations of higher order with constant coefficients, method of variation of parameters; Cauchy's & Legendre's linerar equations; simultaneous linear equations with constant coefficients.

UNIT: 3

Formation of partial differential equation, Linear partial differential equation of first order, Standard forms, Charpit's method, Homogeneous linear partial differential equations with constant coefficients, Non-homogeneous linear partial differential equations, Method of separation of variables.

UNIT: 4

Euler's Formula, Functions having points of discontinuity, Change of interval, Even and odd functions, Half range series.

UNIT: 5

Method of separation of variables, solution of heat equation, wave equation, Laplace equation & Poisson's equation.

Textbook:

REFERNECE BOOKS:

1. Advanced Engineering. Mathematics by Erwin Kreyszig (8th edition) – John Wiley & Sons.
2. Higher Engineering. Mathematics by B.S. Grewal (38th edition)-Khanna Publishers.
3. Applied mathematics for Engineers & Physicists by Louis A. Pipes – Mc Graw Hill.
4. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar – Narosa Publishing House.

CO-PO&PSO Correlation

Course Name : Applied Differential Equation												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1	1		1		1	1			1		
CO2		2		1	2	1		1				1
CO3		2					1		1		1	
CO4	1		1	1	2	1						1
CO5	1			1				1		1		
CO6		1	1		1		1				2	
CO7			2			2		1	2			
CO8	2			1	2		2					1
CO9			1							2		
CO10	1		1	2		1		1	1		2	

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Physics-II**	**Course Code:**	**PHY1203**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description:

Applied Physics is a science course for students interested in the technical fields. This course is designed for the student who needs a broad understanding of physics and the ability to apply those principles in the work force. The Physics-II course is basically fundamentals of X-rays ,its characteristics,its production method and uses, basics of nuclear energy and nuclear reactor, concepts of relativity its applications, formulation and solving the engineering problems on electromagnetism, Introduction to quantum physics and application in 1D and Various interpretations about the origin of Universe. The purpose of studying Physics-II is to develop the basic knowledge on the development and time-to-time applications of physics in diverse field.

COURSE OUTCOMES:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Acquire knowledge of laser and fibre optics and explore their technological applications in diverse fields.
CO2	Acquire knowledge of Nuclear physics and able to know the radioactivity.
CO3	Knowledge of phenomenon of Interference, diffraction and production of US waves.
CO4	Gain basic knowledge of Electricity & Magnetism and know the applications of engineering materials.

Syllabus

Unit I Laser and Fiber optics:

Laser :Light & Laser, Process in Laser: Absorption, Spontaneous emission, Stimulated emission, Principle of laser, laser characteristics, Population Inversion, Metastable State, Pumping, Components of laser: Active medium, Pumping, Optical resonator, Ruby laser, He-Ne laser, Semiconductor diode laser, Applications,
Holography: Basic principle, Recording and reconstruction
Fiber optics: Principle of optical fiber, propagation, Types of optical fiber, Acceptance angle & cone, V-number, Numerical aperture for an optical fiber.

Unit II Nuclear Physics:

Structure of atomic nuclei, its properties, Mass defect,Binding energy,Packing fraction,Q value of energy, Criteria of Critical mass, Nuclear cross section, Nuclear

fission, Controlled and uncontrolled chain reaction, Nuclear reactor and its site selection, Nuclear fusion, stellar energy(C-N cycle and P-P cycle)
Radioactivity: Properties of alpha, beta and gamma rays, Natural and artificial radioactivity, Laws of radioactive disintegration, Half life period, Mean life period, Measurements of rate of decay and half life, Age of the rocks and Earths

Unit II Optics and Ultrasonic:

Interference: Criteria for good interference, Interference by division of amplitude, Wedge film, Newton's Ring, its application, Interference by division of wave front, Fresnel's biprism and determination of fringe width,
Diffraction: Fresnel's and Fraunhofer's diffraction, Diffraction grating
Ultrasonic waves, Production of ultrasonic waves, Properties, Determination of wavelength of ultrasonic waves, Applications of ultrasonic waves

Unit IV Electricity and Magnetism:

Gauss's law, Electric field around a charged straight conductor, Electric field around a plane sheet of conductor, Electric field around a charged sphere, Electric potential, Potential at a point due to point charge, Equipotential surfaces, Potential gradient,
Electric currents, Kirchhoff's law,
Hall effect, Hall voltage and Hall coefficient, Hall mobility, Magnetic field due to a circular loop, Magnetic field due to a solenoid, Ampere's law, Biot-Savart's law, Determination of direction of force on the current carrying conductor in a magnetic field, Torque on a current loop.

Uunit V Engineering Materials:

Semiconductors: P-N diode, Biasing of a diode, Voltage-Ampere characteristic, Applications, Zener diode, Solar Cell
Dielectrics: Dielectric constant, Dielectric Polarization, Dielectric Susceptibility, Relation between P and E, Types of Polarization, Claussius-Mosotti equation, Piezoelectricity, Ferroelectricity, Pyroelectricity
Magnetic Materials: Diamagnetic materials, Paramagnetic materials, Ferromagnetic materials, Magnetostriction, Antiferromagnetism, Ferrimagnetism, Ferrites, Hystresis loss, Soft and hard magnetic materials
Superconductivity: Properties of Superconductors, Type I and Type II Superconductors, BCS theory

Texts/ References:

1. B. A. Lengyel, Introduction to Laser Physics, Wiley Interscience 1971.
   A. E. Siegman, An Introduction to Laser and Masers, McGraw Hill 1971.
2. W. V. Smith and P P Sorokin, The Laser, McGraw Hill, 1966.
3. Born and E. Wolf, Principles of Optics Pergamon, N.Y., 1975.
4. W. T. Cathey, Optical information processing and holography, Wiley interscience, N.Y., 1974.
5. S. H. Lee, Optical Information Processing Fundamentals,Springer, N.Y., 1974.
6. S. R. J. Collier, C.D. Burkhardt and L.H. Lin, Optical Holography, Academic Press, 1971.
   A. R. Shulman, Optical Data Processing, John Wiley, 1970.

7. M.A. Preston and R.K. Bhaduri, Structure of the nucleus, Addison- Wesley, 1975.
8. M.K. Pal, Theory of Nuclear Structure, Affiliated East West Press, 1982.
9. H. Frauenfelder and E.M. Henley, Sub atomic Physics, Prentice Hall, 1974.
10. H.A. Enge, Introduction to Nuclear Physics, Addison-Wesley, 1971.
11. B.L. Cohen, Concepts of Nuclear Physics, McGraw Hill, revised ed., 1988.
12. S.S.M. Wong, Introductory Nuclear Physics, Prentice Hall, 1990.
13. J. W. Goodman, An Introduction of Fourier Optics, McGraw Hill,N.Y., 1968.
14. M G. B. Fowles, Introduction to Modern Optics, Holt Reinhart and Winston, 1975.
15. M. Born and E. Wolf, Principles of Optics, McMillan,1974.
16. S. C. Lipson and H. Lipson, Optical Physics, Cambridge University Press, 1969.
    A. S. Mahajan and A. Rangawala, Electricity and Magnetism, Tata McGraw Hill, 1989.
17. D. Griffiths, Introduction to Electrodynamics, 2nd ed., Prentice Hall, 1989.
18. K.V.V. Murthy and M.S.Kamath, Basic Circuit Analysis, 1st edition (reprinted with corrections) Jaico Publishing, 1998.
19. W.H. Hayt and J.E. Kemmerley, Engineering Circuit Analysis, Int.St.Ed.(4th).
20. Michael Sayer & Abhai Mansingh, "Measurement, Instrumentation and experiment design in physics and engineering", Prentice Hall of India Pvt. Ltd., New Delhi – 110 001, 2003.
    A. P. Malvino, "Electronic Principles", Tata McGraw-Hill, 1979.
21. H. V. Malmstadt, "Electronics for Scientists", New York : W. A. Benjamin, 1962.
22. H. V. Malmstadt, "Digital Electronics for Scientists", New York : W. A. Benjamin, 1969.
23. J. Millman & C. Halkias, "Integrated Electronics : analog & digital circuits and systems", Tokyo: McGraw-Hill Kogakusha, 1972.
24. C. Kittel, Introduction to Solid State Physics, 6th Edition, John Wiley, 1991.
25. N.W. Ashcroft and N.D. Mermin, Solid State Physics, Holt Rinehart and Winston, 1976.
26. S. Wang, Solid State Electronics, McGraw Hill, 1966.
27. F. Wooten, Optical Properties of Solids, Academic Press, 1972.

CO-PO Correlation

Course Name : Physics-II (PHY1203)												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	1	3	2	3	3	2	1	2	1	2	
CO2	1	2	2	1	2	1	2	2		2		1
CO3	1	3	1	2	2	1	2	2	1		1	
CO4	3	2	2	3	1	2	1	3		3		1

Note: 1: Low 2.: Moderate 3: High

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Environmental Studies**	**Course Code :**	**CHM1203**
Credits :	**4**	**No of Hours :**	**50**
Max Marks :	**100**		

Course Objectives:

The course will empower the undergraduate students by helping them to Gain in-depth knowledge on natural processes and resources that sustain life. Understand the consequences of human actions on the web of life and quality of human life. Develop critical thinking for shaping strategies for environmental protection, conservation of biodiversity, environmental equity, and sustainable development. Acquire values and attitudes towards understanding complex environmental-economic-social challenges, and active participation in solving current environmental problems and preventing the future ones. Adopt sustainability as a practice in life, society, and industry.

Course Outcomes (CO)

Students will be able to

CO Number	Course Outcome
CO 1	Gain in-depth knowledge on natural processes and resources that sustain life.
CO 2	Understand the consequences of human actions on the web of life and quality of human life.
CO 3	Develop critical thinking for shaping strategies for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
CO 4	Acquire values and attitudes towards understanding complex environmental-economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.

Syllabus Outline: Environmental Studies [CHM 1203]

		Teaching hrs (50 hrs)
UNIT 1	ECOLOGY AND BIO-DIVERSITY	4
1.1	Ecology & Ecosystem	
1.2	Energy Flow in Ecosystem	
1.3	Ecological succession, Food Chain & Food Web, Ecological Pyramids	
1.4	Bio-diversity: Threats & Conservation	
1.5	Ecology & Ecosystem	
UNIT 2	ENVIRONMENT AND NATURAL RESOURCES	3
2.1	Environment	
2.2	Renewable and Non-renewable Resources	
2.3	Study of major Resources on Earth (overview)	

2.4	ENVIRONMENT AND NATURAL RESOURCES	
UNIT 3	ENVIRONMENTAL POLLUTION	28
3.1	.Introduction & definition: Environmental Pollution	
3.2	Air pollution	
3.3	Acid Rain, Green House effect	
3.4	Ozone Layer Depletion, Peroxy Actyl Nitrate (PAN)	
3.5	Temperature inversion, Ambient Air Quality standard	
3.6	Control Techniques for Gaseous Air Pollutants	
3.7	Control Techniques for Particulate Air Pollutants	
3.8	Water Pollution	
3.9	Water Quality measurement	
3.10	Waste water management	
3.11	Soil Pollution	
3.12	Sources of Soil pollution	
3.13	Solid Waste Management Process	
3.14	Disposal Techniques for Solid Waste	
3.15	Noise Pollution	
3.16	Thermal Pollution	
UNIT 4	Social Issues and the Environment	9
4.1	Urban problems related to energy	
4.2	Sustainable development	
4.3	Water conservation-rain water harvesting	
4.4	Watershed management, Problems related to rehabilitation	
4.5	Case studies	
4.6	Wasteland reclamation, consumerism and waste products	
4.7	Environment protection act air, water conservation act	
4.8	Wildlife and forest conservation act	
4.9	Environmental legislation and public awareness	
IT 5	HUMAN POPULATION & ENVIRONMENT	7
5.1	POPULATION GROWTH, variation among nations	
5.2	Population explosion—Family Welfare Programme	
5.3	Environment and human health	
5.4	Human rights	
5.5	Role of Information Technology in	

	environment and human health	
5.6	Case Studies:	

Assessment Outline

Component	Weightage(%)
Quizzes & home work	20
Mid semester exam	30
End semester exam	50

Exam Question paper specifications

Component	Weightage (%)	Duration		Format
		Mid sem	End sem	
Sec-A	20	30 min	30 min	30 multiple choice questions
Sec-B	30	1 hour 45 min	2 hour 30 min	Sec-B One data based question and several short answer questions (All compulsory)
Sec-C	50			Sec-C Two extended-response questions from a choice of three questions(mid sem) and four questions(end sem)

RESOURCES AND REFERENCES

Text books:

1. Kurian Joseph & R. Nagendran, "Essentials of Environmental Studies", 1st Edition, Pearson Education, 2004.
2. A. K. Dey “Environmental Chemistry”, New Age International Publishers
3. Smriti Srivastava. “Environment & Ecology” S.K. Kataria & Sons, New Delhi

References books:

1. Keerthinarayana & Daniel Yesudian, "Environmental Science and Engineering", Hi-Tech publications, 2004.
2. Erach Bharucha, “A Text Book for Environmental Studies”, Text Book of University Grants Commission, 2004.
3. Peavy, H.S., D.R. Rowe & T.George, “Environmental Engineering”, New York: Mc Graw Hill, 1987.
4. Metcalf & Eddy,"Wastewater Engineering: Treatment and Reuse", New Delhi, Tata McGraw Hill, 2003.
5. Principles of Environmental Science Inquiry & Applications by W.P.Cunningham & Mary Ann Cunningham (Tata Mc Graw Hill Publishing Company Ltd.).

Online Resources:

- http://ourworldindata.org/data/population-growth-vital-statistics/world-population-growth/2
- http://www.howmany.org/big_picture.php
- http://www.powershow.com/view/3bbe79-NGIxM/Hazardous_Waste_Training_Environmental_Health_Safety_May_powerpoint_ppt_presentation

- http://www.who.int/topics/environmental_health/en/
- http://www.livestrong.com/article/497730-bad-effects-of-chemicals-in-our-food
- https://www.plannedparenthood.org/learn/stds-hiv-safer-sex/hiv-aids
- http://www.slideshare.net/contactnitika1/women-and-child-welfare
- http://agridr.in/tnauEAgri/eagri50/ENVS302/pdf/lec17.pdf
- http://www.yourarticlelibrary.com/essay/role-of-information-technology-in-environment-and-human-health/30230/

CO- PO & PSO Correlation

Course Name: Environmental Studies												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1						1		1			
CO2							1	1				
CO3	1		1			1		1		2		
CO4				1				1	1			1
CO5			1			1		1			1	

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109
Department of Civil Engineering

Programme:	**B. Tech**	**Semester:**	**II**
Name of the Course:	**Programming with "C++"**	**Course Code:**	**CSE1203**
Credits:	**4**	**No of Hours:**	**50**
Max Marks:	**100**		

Course Description:
This course will expose students to developments in computer technology and understand the working of a computer system. It will introduce end-user computing and build problem solving skills by using C++ programming.

COURSE OUTCOMES:
On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.
CO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc
CO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
CO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
CO5	Demonstrate the use of various OOPs concepts with the help of programs.

Syllabus:

UNIT-1: Introduction to OOPs
Evolution of C++, Object-Oriented Technology, Comparison of procedural and Object Oriented Programming, Preface to Object-Oriented Programming, Key Concepts of Object- Oriented Programming, Advantages of OOP, Input and Output In C++, Streams in C++, Formatted and Unformatted Data, Tokens, Keywords, Identifiers, Data Type, Constants, Operators, Control Statements and Loop, functions in C++, Function Overloading

UNIT-2: Classes and Objects
Structures in C++, Classes in C++, The public, Private and Protected Keyword, Inline Functions, Static Member Variables and Functions, Static Object, Array of Objects, Objects as Function Arguments, Friend Functions, Constructors and Destructors, Characteristics and application of Constructors and Destructors, Constructors with Arguments, Overloading Constructors, Constructors with Default Arguments, Copy Constructors, Destructors, Pointers , Pointer Declaration, Void Pointers, Wild Pointers, Pointer to Class, Pointer to Object, this Pointer, The New and Delete Operators.

UNIT-3: Polymorphism and Inheritance
Operator Overloading, Keyword Operator, Rules for Overloading Operators, Overloading Unary and binary Operators, Operator Return Type, Overloading with Friend Function

Access Specifiers and Simple Inheritance, Protected Data with Private Inheritance, Types of Inheritances, Virtual Base Classes, Constructors, Destructors and Inheritance, Object as a Class Member, Advantages and disadvantages of Inheritance, Binding in C++, Pointer to Derived Class Objects, Virtual Functions, Pure Virtual Functions, Abstract Classes, Object Slicing

UNIT-4 Streams and Files

File Stream Classes, hierarchy of file stream classes, Steps of File Operations, Checking for Errors, End of a File, File Opening Modes, File Pointers and Manipulators, Sequential Read and Write Operations, Binary and ASCII Files, Random Access Operation, Updating files, Type Conversion, basic type to class type, class type to basic type, class type to another class type

UNIT-5 Exception Handling and Templates

Principles of Exception Handling, The Keywords Try, Throw and Catch, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions, Re throwing Exception, Specifying Exception, Need of Template, Definition of Class Template, Normal Function Template, Working of Function Templates, Class Template with More Parameters, Function Templates with More Arguments, Member Function Templates, Guidelines for Templates, Difference Between Templates and Macros

Text Books:

1. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill.
2. Lafore R., Object Oriented Programming in C++, Waite Group.

Reference Books:

1. R. S. Salaria, Mastering Object-Oriented Programming with C++, Salaria Publishing House
2. A.N. Kamthane, Object Oriented Programming with ANSI and Turbo C++, Pearson Education
3. BjarneStroustrup, The C++ Programming Language, Addison Wesley.
4. Herbert Schildt, The Complete Reference to C++ Language, McGraw Hill-Osborne.
5. Lippman F. B, C++ Primer, Addison Wesley.
6. R. S. Salaria, Test Your Skills in Object-Oriented Programming With C++, Salaria Publishing House

CO-PO&PSO Correlation

Course Name: Environmental Studies												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2			1	3				1		1	
CO2	1		2	2				1				2
CO3	3		1	1	2		2	1		2		

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester:**	**II**
Name of the Course:	**Work Shop Practice**	**Course Code:**	**WSP1201**
Credits:	**2**	**No of Hours:**	**30**
Max Marks:	**100**		

Course Description:

It allows to study the basic workshop practices which enables the students to carry out/understand the day to day work easily with the application of Engineering knowledge through machine tools and equipment. Further, it includes identification of different parts of electrical machines, Semiconductor materials and P-N junction diode.

COURSE OUTCOMES:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Graduates will gain a strong foundation in machine tool engineering.
CO2	Acquire knowledge and hands-on competence in applying the concepts of manufacturing science in the development of mechanical systems.
CO3	Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.
CO4	Identify and understand importance of various electrical and electronics components.
CO5	Introduce the components of low voltage electrical installations and analyze basic electric and magnetic circuits.

Syllabus:

Week	Content	Practical (Hrs)
1 & 2	**CARPENTRY SHOP** 1. Introduction. 2. Various types of woods. 3. Different types of tools, machines and accessories. 4. Demonstration of different wood working tools / machines. 5. Demonstration of different wood working processes, like planning, marking, chiseling, grooving, turning of wood etc. 6. One simple job involving any one joint like mortise and tenon dovetail, bridle, half lap etc.	4
3 & 4	**WELDINGSHOP** 1. Introduction 2. Types of welding, ARC welding, Gas welding, Gas Cutting. 3. Welding of dissimilar materials, Selection of welding rod material Size of welding rod and work piece. 4. Different types of flame. 5. Elementary symbolic representation,	4

	6. Safety precautions in welding safety equipment's and its use in welding processes. 7. Demonstration of different welding tools / machines. 8. Demonstration on Arc Welding, Gas Welding, gas cutting and rebuilding of broken parts with welding. 9. One simple job involving butt and lap joint	
5 & 6	**MACHINE SHOP** 1. Introduction about various machine tools 2. Principal parts of a lathe 3. Measuring instruments 4. Cutting parameters 5. Tool materials 6. Lathe operations 7. Safety precautions 8. One simple job involving lathe operations.	4
7 & 8	**EEE Lab** 1. Study of Electrical Safety Precautions. 2. Identification of Electrical Tools (Screw Drive, Tester, Combination Plier, Wire Stripper etc.) 3. Identification and Testing of various Electrical and Electronics component (Resistor, Inductor, Capacitor, Diode, Transistor (PNP & NPN),Transformer, Bread board) 4. To calculate the value of resistance using color coding 5. To study & perform different types of wire joints.	4
9 & 10	**EEE Lab** To study & perform house/staircase wiring. To study single phase and three-phase power, types of earthlings, neutral. Designing of clipper/clamper circuit on breadboard. Study of PCB designing. 10. Designing of DC power supply. 11. To study the different part of Electrical machines.	4

TEXT BOOKS:

1. Manufacturing Technology (Vol. – I & II) – P.N. Rao – Tata McGraw Hill Pub. Company, New Delhi.
2. A Text Book of Production Technology (Manufacturing Processes) – P.C. Sharma – S. Chand and Company Ltd., New Delhi.
3. Machine Tool Engineering – G.R. Nagpal – Khanna Publishers, New Delhi.
4. A course in workshop Technology (Vol- I & II) – B.S. Raghuvanshi – Dhanpat Rai & Sons, New Delhi.

REFERENCES BOOKS:

1. Kent's Mechanical Engineering Hand book, John Wiley and Sons, New York.
2. Workshop Technology by H.S.Bawa,Tata McGraw Hill Publishers.
3. Workshop Technology by S.K. Hajara Chaudhary, Media Promotors and Publishers.
4. Chapman, W.A.J. and Arnold E., "Workshop Technology" Vol. I & III, Viva Low price student Edition, 1998.

5. Chaudhary, Hajra, "Elements of Workshop Technology" Media Promoters & Publishers, 1997.
6. Raghuwanshi, B.S., "Workshop Technology" Vol I 7 II, Dhanpat Rai and Sons 1998.
7. Dr. N.K. Jain, ., "Electrical Engineering" , Dhanpat Rai and Sons 1998.
8. S.K. Bhalla Harmesh Kumar," Electrical Workshop Practice -II (Practical Manual)" Scandinavian Languages Edition 2021

CO-PO/PSO Correlation

Course Name: Workshop Practice												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	3		1	1		1		1	
CO2	3	2	2	2	2	1	2	2		1		2
CO3	3	2		2	2	1		2	2			1
CO4	2	3	2		3	2		3			1	
CO5	2	3	1	2		1		2		2		

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Professional Development**	**Course Code:**	**PFD1202**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Objectives:

- Identify their achievements in life and tell their success story in class
- Use advanced and conversational English by understanding correct usage of-Modal, auxiliary verbs, phrasal, prepositions and some common yet confusing words.
- Control and manage their voice tone as per the situation given by the trainer.
- Encouraged to become a responsible person through various motivational stories and examples.
- Read a book and quote 5 facts and fiction from the book by stating page numbers, Identify and tell meanings of 50 difficult words they come across in the book, write a descriptive summary and analyze the author's purpose and intent of the book.
- Write creatively on a given topic or images using the four square strategy.
- Participate in a group discussion to derive a conclusion for the given topic.
- Demonstrate their responsibility by contributing individually and helping the team accomplish the task.
- Think out of box and device creative solutions for the puzzles or problems given.
- Work in a group and solve problems and demonstrate collaborative learning skills in a team.
- Identify and list accurately various career avenues in different streams of engineering. Spot various team dynamics and group them into categories based on similarity.

COURSE OUTCOMES:

After Completion of the course Students will be able to:

CO1	Identify their achievements in life and tell their success story in class
CO2	Use advanced and conversational English by understanding correct usage of-Modal, auxiliary verbs, phrasal, prepositions and some common yet confusing words.
CO3	Encouraged to become a responsible person and Demonstrate their responsibility through various motivational stories and examples
CO4	Read a book and quote 5 facts and fiction from the book by stating page numbers, Identify and tell meanings of 50 difficult words they come across in the book, write a descriptive summary and analyze the author's purpose and intent of the book.
CO5	Write creatively on a given topic or images using the four square strategy.
CO6	Participate in a group discussion to derive a conclusion for the given topic.
CO7	Think out of box and device creative solutions for the puzzles or problems given.
CO8	Work in a group and solve problems and demonstrate collaborative

	learning skills in a team.
CO9	Identify and list accurately various career avenues in different streams of engineering. Spot various team dynamics and group them into categories based on similarity.

Course Detail:

1. Persistence: Participants will be able to understand the value of being persistent and apply the same in their life.
2. Positive Thinking and achievements: Participants will be able to drain negative thoughts by showcasing their achievements.
3. Conversational English: Participants will be able to indentify difference between common words.
4. Reading Skills: Reading any one book (chosen) from the list, the participant would be able to perform required tasks.
5. Writing Skills: Participants will be able to write creative essays, prose or articles using their thoughts and imaginations and following the correct format as described in four square strategy.
6. Writing Skills: Some common mistakes students make while writing like: using an inappropriate word or incorrect punctuations. It further explains some rules and practices to avoid these mistakes.
7. Public Speaking: Participants will be able to learn different prospects of delivering a good public speech.
8. Elevator Speech: Participants will be able to learn and practice the best way to describe themselves in the limited time.
9. Responsibility and Accountability: Participants will be able to understand things in life that they are accountable for.
10. Teamwork: Participants will be able to differentiate between good team and bad team.
11. Creativity: Participants would be able to devise creative solutions by thinking out of the box.
12. Interview Skills: Given a GD topic the participants will be able to speak at least 2-3 points confidently with in a group constituting of 6 members.
13. Career Growth: Participants will be able to know about different career avenues that they can choose after engineering.
14. Mime: Participants will be able to demonstrate their innate confidence, extreme creativity and taking their own responsibility.

Reference Books:

1. Oxford Dictionary & Thesaurus (South Asia Edition)
2. Habits of highly effective people by Stephen Covey
3. Who moved my cheese by Spencer Johnson

CO-PO/PSO Correlation

Course Name: Professional Development [PFD1202]												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1		3	1			1		3	1		1	
CO2	1	3						2				2
CO3		2	1	1		3		2		2	1	
CO4	2	2		1	2				1			1
CO5	2	3		1	2			2		2		
CO6	1	2		2	1						2	
CO7	1	1		3	1			2				1
CO8	1	2		2	2	1	1		2	1		
CO9	1	1		1	3	1	1	2				2

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109

Department of Civil Engineering

Programme:	**B.Tech.**	**Semester :**	**II Sem**
Name of the Course:	**Humanities (Visual Arts)**	**Course Code:**	**HSS1201**
Credits :	**1**	**No of Hours :**	**20**
Max Marks:	**100**		

Course Description

Through lectures, documentary films, reading materials and hands-on activities, students will develop an understanding of the functions of art; a basic vocabulary for describing visual art, a general understanding of the role art has played in society.

The students' creative processes will be emphasized.

Duration -2 days
Sessions 9am -1 pm and 2-5 pm
Short tea break at 11am
Projected Dates:
April 22 & 23 for Sections A, B & C1
April 225 & 26 for Sections C2, D & E

Objectives:

Upon completion of this course, students should be able to ---

- Apply working knowledge of the vocabulary necessary for objective description of art objects, media, techniques and styles.
- Apply basic visual critical thinking and visual literacy techniques towards art and objects in everyday life.
- Discuss the formal elements and principles of design used in a work of art
- Identify the basic media and techniques of two and three-dimensional art forms
- Gain an insight into the significance of creativity through their art works

COURSE OUTCOMES:

On successful completion of this course, students will be able to:

CO Number	Course Outcome
CO1	Apply working knowledge of the vocabulary necessary for objective description of art objects, media, techniques and styles.
CO2	Apply basic visual critical thinking and visual literacy techniques towards art and objects in everyday life.
CO3	Discuss the formal elements and principles of design used in a work of art
CO4	Identify the basic media and techniques of two and three-dimensional art forms
CO5	Gain an insight into the significance of creativity through their art works

Syllabus outline:

		Teaching hours 20
Day 1	**Introduction to art –theory** **Scribble –art exercise, individual exercise** *What is art? How is art, craft and design interrelated? What are the developmental stages in childrens' art? Which are the common stereo types and bias about art? What is doodling? What is Zentangle?* *Understanding the works of Jackson Pollock, Rabindranath Tagore and few other artists. Students will create their own art based on doodles.* **Formal elements of art –theory** **Creating a composition –individual exercise** *How to read a painting? What are the formal elements of art* ***(pattern**, **colour**, **texture**, **tone**,* *form, **shape** and **line**)?* *Students will create drawings using 6 B pencils. They will learn value scale and how to create basic observational drawings applying knowledge of contour, proportion and composition.*	7 hours
Day 2	Power of images Art as document Image as record of cultural transformation ,history, growth of civilization . **Art for social change.** *What is the relationship between art and society? What is the value of art and culture in society? Students learn about works of selected artists.* *Students will work in groups to create a poster with relevant social issues.* **Exploring a theme.** *The groups will present their works as others will assess the presentation (peer group assessment).*	7 hours

CO-PO/PSO Correlation

Course Name: HSS 1201 VISUAL ARTS												
	Program Outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	1	3	3				3		1	1	
CO2	3	2	1	3				3				2
CO3	2	2	2	3	1			3		2		1
CO4	2	1	1	3				3	2		1	
CO5	3	1	1	2	1			3		2		

Note: 1: Low 2.: Moderate 3: High

Programme:	**B. Tech.**	**Semester:**	**III**
Name of the	**Surveying**	**Course Code:**	**CIE2101**
Credits:	**4**	**No of Hours:**	**60**
Max Marks:	**100**		

Course Description:

This subject emphasizes on the study of Chain and Compass Surveying, linear and angular measurements, adjustment of closing error. Different methods of surveying and levelling, use of Theodolite, triangulation, EDM instruments, total station and global positioning system.

Course Outcome:.

Students will be able to:

CO Number	Course Outcome
CO 1	Determine elevations by applying different techniques.
CO 2	Set out various curves with the field problems.
CO 3	Deal with the various aspects of Trilateration and Triangulation.
CO 4	Gain and apply the knowledge of Tacheometry, various systems, instruments etc.

Syllabus

UNIT- I

Chain and Compass Surveying- Definition, principles and classification of surveying, instruments for surveying, linear measurements, chain surveying principles, offsets, types of compass, measurement of directions and angles, meridians and bearings, local attraction, magnetic declination, traversing with a chain and compass, plotting of traverse, adjustment of closing error.

UNIT-II

Plane Table Surveying, Levelling and Contouring- Principle and methods of plane table surveying, principle and classification of levelling, bench marks, level computations, longitudinal and cross- sectional levelling, plotting the profile, characteristics of contours, methods of contouring, interpolation, contour gradient, contour maps.

UNIT- III

Theodolite Surveying, Tacheometric Surveying- Principle of Theodolite, linear and angular observations, traverse computations, principle and methods of tacheometry, Subtense bar and Tangential Systems. Construction and use of reduction tacheometers, theory of errors.

UNIT-IV

Curve Setting- Types of curves, elements of a curve, setting out a simple curve, setting out a compound curve, checks on field work, reverse curve, super elevation, deflection angles, transition curves, characteristics of transition curves, types of vertical curves, setting out vertical curves.

UNIT-V

Triangulation and Advanced Instruments- Geodetic surveying, Principle of triangulation and trilateration, purpose and classification of triangulation surveys, triangulation stations, satellite station, triangulation computations, EDM instruments, global positioning system and Introduction to Total Station, introduction to photogrammetric surveying and remote sensing.

Text Books:

1. B.C. Punmia, A.K.Jain, Arun Jain, Surveying I and II, Laxmi Publications.
2. R. Subramanian, Surveying and Levelling, Oxford University Press.
3. Surveying (Vol. II & III) – Agor, R (Khanna publications, Delhi, 1995)

Reference Books:

1. Surveying (Vol. II & III) – Arora, K.R. (Standard Book House, Delhi, 1993)
2. Surveying (Vol. I & II) – S.K. Duggal (Tata McGraw Hill)
3. Surveying (Vol. I & II) – Kanetkar T.P. (Pune VidyarthiGrihaPrakashan, Pune)
4. Surveying (Vol. I & II) – C Venkataramaih (Universitires Press Hyderabad)

Assessment:

Assessment includes attendance, class work, tutorials, assignments, quizzes, exams.

CO-PO & PSO Correlation

Course Name : Surveying												
Program Outcome (PO)									Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	1	2	2	2			2	1	1	2
CO2	3	2	1	2	1	2			3	2	2	2
CO3	2	2	1	2	2	2			2	2	1	3
CO4	2	2	1	1	2	2			2	2	1	2

Note: 1: Low 2.: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Strength of Materials**	**Course Code:**	**CIE2102**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description

The subject of strength of materials involves analytical methods for determining the strength, stiffness and stability of the various load carrying structural members. A thorough understanding of the underlying principles is useful to civil engineers with several applications.

Course Outcome:

Students will be able to:

CO Number	Course Outcome
CO 1	Determine the stresses and strains in the members subjected to axial, bending and torsional loads. The basic concepts of Mechanics of Solids are clear to students.
CO 2	By knowing the stresses and strains developed in a structure, the student is able to find out at which point structure is strong and at which point it requires strengthening.
CO 3	The bending moments and shear force at any cross section of the beam can be easily found out with the help of BMD and SFD, which enables the student now to study and design the beam.
CO 4	Knowing the analysis of dams and retaining walls, the stresses at different points of dam and retaining can be known and these structures can be designed.
CO 5	The student is now ready to learn designing of different structures. The base of study of structural analysis and designing is formed, which are the subjects of higher semesters.

Syllabus

UNIT- I

Introduction to Engineering Mechanics–Concept of Force system, reaction; Types of supports; General equilibrium equations; Equilibrium of a member; Concept of free body diagrams; Centre of gravity; Moment of Inertia; Concept of friction and frictional forces with some simple examples.

UNIT- II

Simple Stress and Strains- Introduction; Concept of stress and strain; Stress-strain curves for ductile, brittle materials; Generalized Hooke's law, Stress-strain diagram of ductile and brittle material, statically determinate and indeterminate

problems, compound and composite bars, thermal stresses. Elastic constants, relations between various elastic constants and its use; Lateral strain, volumetric strain, poisons ratio; Stress and strains in thin cylinders subjected to internal pressures.

UNIT-III

Complex Stress and Strains-Introduction; Normal stress, tangential stress; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress; Concept of principal stress and its computation; Mohr's circle; Principal strains, computation of principal stresses from the principal strains.

UNIT- IV

Shear Force and Bending Moment Diagrams-Introduction to the concept of reaction diagrams- shear force and bending moment; Role of sign conventions; Types of load, beams, supports; Shear force and bending moment diagrams: simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed and varying load, and moment; Relationship between load, shear force and bending moment; Different methods for plotting a bending moment and shear force diagrams.

UNIT-V

Columns and Combined Stresses- Stability of Columns; Buckling load of an axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load. Kern of rectangular sections, middle third rule, stability of gravity dams & retaining walls.

Text Books

1. Strength of Materials – R.K. Rajput (S. Chand & Co.)
2. Mechanics of Materials – B.C. Punmia (Laxmi Publication)

Reference Books

1. Mechanics of Structures (Vol. – I) – Junarkar (Charotar Publications)
2. Strength of Materials – Timoshenko, S. & Gere (CBS Publishers)
3. Introductions to Solid Mechanics –Shames &Pitarresi (Prentice Hall of India)
4. Engineering Mechanics of Solid – Popov (Pearson Publication)
5. Strength of Materials – S. Ramamurtham (DhanpatRai Publications)
6. Strength of Materials (Part-I) – Timoshenko (CBS Pubishers)

Assessment

Assessment will be based on combination of class work, tutorials, assignments, laboratory work, quizzes, project work and exams.

CO-PO & PSO Correlation

Course Name: Strength of Materials												
Program Outcome (PO)									Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	1	1	3			3	1	1	3
CO2	2	1	2	2	1	2			2	2	1	2
CO3	3	1	2	1	1	2			2	2	1	3
CO4	2	2	2	1	1	2			1	3	1	2
CO5	2	1	2	2	1	2			1	2	1	3

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

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Department of Civil Engineering

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Civil Engineering Materials**	**Course Code:**	**CIE2103**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description

The subject Building Materials and Construction involves types of materials used in construction, their properties and applications. It involves the various components of building and their construction techniques and the building services which are important for any building or structure. The study of this subject will develop the clear understanding of building material and construction techniques.

Course Outcome:

Students will be able to:

CO Number	Course Outcome
CO 1	Study of building material will provide the students the knowledge to understand the properties and use of materials in buildings.
CO 2	By knowing the various components of building and their construction technique, will help to easy understanding of construction projects.
CO 3	Student will be able to understand the types of circulation and services required in building.
CO 4	The study of this subject will provide a foundation for subjects of higher semesters.

Syllabus

Unit-I

Cement & Cement Concrete

Introduction- Role of materials in construction

Properties of materials: ductility, brittleness, strength, stiffness, durability, hardness, toughness; Weakness of materials.

Cement- Different types of cements, Hydration of cement, chemical reaction, structure of cement paste, consistency and setting. Lime and supplementary cementitious materials.

Aggregate: Coarse and fine aggregates, Influence of aggregate on the properties of concrete, aggregate selection, alkali-aggregate reaction.

Unit-II

Concrete- As a material and its ingredients, concrete production process.

Fresh Concrete: Role of aggregates and water in fresh concrete, Batching, Mixing, workability, tests for workability, role of admixtures, segregation and bleeding.

Hardened Concrete: Physical characteristics, mechanical properties of hardened concrete, Water-cement ratio, Porosity, Curing of concrete.

Design of concrete mix: IS code recommendation, British code and ACI code, Deterioration of concrete, Corrosion, chloride and sulphate attack on concrete, acid aggregate reactions.

Unit-III
Masonry & Construction Materials
Brick Masonry- Technical terms, bonds in brick work- English bond, Flemish bond, garden wall bond, raking bond, Dutch bond.
Composite Masonry - Stone facing with brick backing, brick facing with concrete backing.
Walls - Introduction, types of walls - load bearing walls, partition walls, cavity walls.
Metals with reference to structural steel - Structure and its role in properties of steel, use of metals in civil engineering, reinforcement steel, paints,
Timber: Seasoning and conversions, properties, tests, defects in timbers,
Glass: Chemical compositions, mechanical and optical properties.

Unit -IV
Building Components
Foundations- Definition, need, importance & types of foundations.
Typical roof construction and foundations, plastering, pointing and damp proofing, Water proofing materials.
Doors, Windows, Lintels and Ventilation: types, importance & construction.
Floorings- Introduction, types, essential requirements of a floor, factors affecting selection of flooring material.

Unit –V
Building Services
Modes of transportation in building
Horizontal: Passages, corridors, travelators.
Vertical: Stairs and staircases, lifts & ramps, escalators.
Lighting, electrification, plumbing, septic tanks, soak pits.
HVACD: Heating, ventilation, air conditioning and ducts.
External Beautification: Gardening, street lighting, landscaping.

Text Books

1. M. S. Shetty, Concrete Technology, S. Chand and Company Ltd. 2005
2. Building Construction by Dr. B. C. Punmia and AK Jain, Laxmi Publication
3. Building Construction by Sushil Kumar, Standard Publisher Distributors

Reference Books

1. Building Construction and Materials by Gurcharan Singh, Standard Book House

2. Engineering Materials by S.C. Rangwala, Charotar Publications

3. Materials of Construction by D N Ghose, Tata McGraw Hill Publications.

Assessment

Assessment will be based on combination of class work, tutorials, assignments, quizzes, project work and exams.

CO-PO & PSO Correlation

Course Name: Building Materials & Construction												
Program Outcome (PO)									Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	1	1	3			3	1	1	3
CO2	2	1	2	2	1	2			2	2	1	2
CO3	3	1	2	1	1	2			2	2	1	3
CO4	2	2	2	1	1	2			1	3	1	2

Note: 1: Low 2.: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Engineering Mathematics-III**	**Course Code:**	**MAT2103**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Outcome:

Students will be able to:

CO Number	Course Outcome
CO 1	Use the mathematical concepts of Discrete and Continuous Probability Distributions to formulate and solve the real-life problems.

Syllabus Outline

Unit: 1

Functions of a complex variable, Limits, continuity and differentiability of functions of complex variables, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Application to fluid flow problems, Complex integration, Cauchy theorem, Morrera's theorem and Cauchy integral formula.

Unit: 2

Expansion in Taylor's and Laurent's series, Singularities and their classifications, Residues, Cauchy-Residue's theorem and Contour Integration

Unit: 3

Laplace Transform, Definition & Existence, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic functions, Application to solution of ordinary differential equations.

Unit: 4

Fourier Integrals and Fourier Transform, Definition, Properties of Fourier transform, Inverse Fourier transform, Fourier sine and cosine transforms, Application of Fourier transform to solution of ordinary differential equations.

Unit: 5

Random variables, Expectation, Mean, Standard Deviation of Discrete & Continuous Random Variables, Probability Distributions, Discrete & Continuous Probability Distributions, Binomial, Poisson and Normal distributions.

Recommended Text Books

1. Advanced Engineering. Mathematics by Erwin Kreyszig (8th edition) – John Wiley & Sons.
2. Higher Engineering Mathematics by B.S. Grewal (38th edition)-Khanna Publishers.
3. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar – Narosa Publishing House.
4. Advance Engineering Mathematics by R. R. Greenberg- Pearson Publication.
5. Higher Engineering Mathematics by B. V. Rammana-Tata Mc Graw Hill.
6. Advanced Engineering Mathematics by S. S. Sastry-PHI Publication.
7. Engineering Mathematics Volumes-I & II by S. S. Sastry-PHI Publication.

Assessment:
Assessment includes attendance, class work, tutorials, assignments, quizzes, exams.

CO-PO & PSO Correlation

Course Name : Engineering Mathematics-III												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	3	2	1	2			3	2	1	2

Note: 1: Low 2: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109
Department of Civil Engineering

Programme:	**B. Tech.**	**Semester:**	**III**
Name of the	**Surveying Lab**	**Course Code:**	**CIE2104**
Credits:	**2**	**No of Hours:**	**30**
Max Marks:	**50**		

Description: This course emphasizes on hands-on practice on various survey instruments, linear and angular measurements, data generation and processing and adjustment of closing error.

Course Objectives:
Students will be able to:

CO Number	Course Outcome
CO 1	Use different survey instruments.
CO 2	Operate plane table, theodolite and tachometer as per standard procedure.
CO 3	Laid down curve layout on actual ground.

List of Experiments
(At least ten experiments are to be performed by each student)

1. Plotting of an area by chain survey.
2. Plotting of an area by compass traversing.
3. Plane table survey by methods of radiation and intersection.
4. Traversing by plane table survey.
5. Differential levelling.
6. Profile levelling for roads (Longitudinal section and cross sections).
7. Measurement of horizontal and vertical angles by using theodolite.
8. Determination of tacheometric constants.
9. Setting out of a curve by using a tachometer.
10. Setting out of a curve by ordinates or offsets from long chord.
11. Setting out of a horizontal transition curve by theodolite.
12. Setting out of a curve by Rankine's method.

Note: Drawings to be prepared with the help of computer.

Recommended Books:
1. Surveying I and II, B.C. Punmia, A.K. Jain, Arun Jain, (2016), Laxmi Publications (Seventeenth Edition).
2. Surveying and Leveling, R. Subramanian, (2012) Oxford University Press, Second Edition.
3. Surveying (Vol. II & III), R. Agor, (1995), Khanna publications, Delhi, First Edition.

Assessment:
Assessment includes Attendance, Performance, Record work and Exams.

CO-PO & PSO Correlation

Course Name: Surveying Lab												
Program Outcome (PO)									Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	3		3	3	3			3	1	1	3
CO2	3	3	2	3	3	3			2	2	1	2
CO3	3	2	2	3	3	3			2	2	1	3

Note: 1: Low 2: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109

Department of Civil Engineering

Programme:	**B. Tech.**	**Semester:**	**III**
Name of the Course:	**Material Testing Lab**	**Course Code:**	**CIE2105**
Credits:	**2**	**No of Hours:**	**30**
Max Marks:	**50**		

Course Description:
This course gives a broad understanding of common materials related to civil engineering with an emphasis on the fundamentals of structure-property-application relationships of the materials.

Course objectives:
Students will be able to:

CO Number	Course Outcome
CO 1	Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear, and torsion.
CO 2	Identify, formulate, and solve engineering problems of structural elements subjected to flexure.
CO 3	Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding the failure of structures due to unsuitable materials
CO 4	Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear, and torsion.

List of Experiments

(At least ten experiments are to be performed by each student)

1. Determination of fineness of cement by sieving method.
2. Determination of compressive strength of cement.
3. Determination of tensile strength of cement.
4. Determination of consistency of cement.
5. Determination of the initial and final setting time of cement.
6. Determination of soundness of cement.
7. Determination of specific gravity of cement.
8. Determination axial tensile strength of mild steel.
9. Determination impact value by Izod and Charpy of mild steel specimen material.
10. Determination of the Rockwell Hardness of mild steel specimen material.
11. Determination of compressive strength of wood: (a) Along with the fiber and (b) Across the fiber.
12. Determination of specific gravity of aggregates.
13. Determination of abrasion value of tiles.
14. Determination of impact value of tiles.
15. Determination of flexural strength of tiles.

Material Studio:
Students have to present a report and PowerPoint presentation and model / charts on topics given below.

1. Cement
   (Contents/ chemical composition of cement, cement types, hydration of cement, chemical reaction, the structure of cement paste, consistency, and setting.)
2. Aggregate.
   (Origin, types, sizes, uses, effects on workability, tests on aggregates)
3. Concrete.
   (Constituents of concrete, transition zones, batching, mixing, curing)
4. Workability of concrete.
   (workability of fresh concrete and harden concrete, testing on fresh concrete and harden concrete)
5. Brick Masonry
   (Technical terms, bonds in brick work- English bond, Flemish bond, garden wall bond, raking bond, Dutch bond.)
6. Admixtures.
   (Details of admixture like its types, chemical composition, Uses of it)
7. Structural Steel.
   (Structure and properties of steel, use of metals in civil engineering, reinforcement steel)

Recommended Books:

1. Concrete Manual: Laboratory Testing for Quality Control of Concrete, M.L Gambhir, (1992), Dhanpat Rai and Sons, Delhi, Fourth Edition.
2. Concrete Technology: Theory and Practice, M.S. Shetty and S.K.Jain, (2018), S. Chand Publication, Eight Edition.

Assessment:
Assessment includes attendance, performance, record work, and exams.

CO-PO & PSO Correlation

Course Name: Material Testing Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	2	2	3			2	1	2	2
CO2	2		2	2	1	2			2	2	1	2
CO3	3		2	2	2	2			1	1	2	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester:**	**III**
Name of the Course:	**Civil Engineering Drawing Lab**	**Course Code:**	**CIE2106**
Credits:	**2**	**No of Hours:**	**30**
Max Marks:	**50**		

Course Description:

Integrated Approach of Planning of Buildings, salient features of a building, site integration, and benefits of building. Line plan and its development, elevation, section. Building rules and bye-laws (as per National Building Code of India). The necessity of building rules and bye-laws, plot sizes, road widths, open spaces, floor area ratio (FAR), floor space index (FSI).

Course Objectives:
Students will be able to:

CO Number	Course Outcome
CO 1	The planning process of building and bye-laws.
CO 2	Detailing of building drawing.
CO 3	Implementation of building drawing in AutoCAD.
CO 4	Principles of perspective drawings.

Syllabus
(The students are required to complete any two exercises from each lab work using Auto CAD).

Lab Work I
Introduction: Civil engineering drawing and its importance.

Doors and Windows: Definition of technical terms, installation of doors and window frames, and their size specifications, fixtures, and fastenings.

1. To draw section and elevation of the flush shutter, panelled shutter doors and windows.
2. To draw section and elevation of fully glazed, half glazed, half glazed and half paneled doors and windows.
3. To draw section and elevation of M.S. collapsible door, rolling steel shutter.

Lab Work II
(Anyone one from Foundation and staircase each)

Foundation: Types of foundation, detailing of foundation components.

1. To draw different types of footing.
2. To draw the foundation details of internal and external walls.

Staircase: Types and details of the stair case.

1. To draw detailing of Dog-Legged staircase.
2. To draw detailing of the Straight staircase.

Lab Work III

Residential Buildings: Aspects, Prospects, Circulation, Grouping, Roominess, Economy, Elegance, Furniture requirements, Flexibility, Privacy. Municipal and national building code regulations and Bye-laws for residential buildings.

1. To draw the working plan, elevation, and section of the single storey residential building (Load Bearing Structure).
2. To draw the working plan, elevation and section of single-storey residential building (Framed Structure).
3. To draw the working plan, elevation and section of double-storey residential building (Framed Structure).

Lab Work IV

Public Buildings: Site selection and requirements of different public buildings drawing typical line plans of such public buildings.

1. To draw the line plan of a primary school building.
2. To draw the line plan of a hostel building.
3. To draw the line plan of a hospital building.

Lab Work V

Perspective: Elements of Perspective Drawing (single and double point)

General activities

1. To draw the perspective view of simple blocks and combinations.
2. Collection and interpretation of brochures/information/literature for housing schemes.
3. To draw the perspective view of the building.

Text Books:

1. A course in Civil Engineering Drawing, V.B. Sikka, S.K. Kataria and Sons, (2015), Eleventh Edition.
2. Civil Engineering Drawing and Design, D.N. Ghose, CBS Publisher, (2015), Second Edition.
3. AutoCAD Release 2012 2D and 3D Design - A. Yarwood. (Pearson Educations).

Reference Books:

1. Building Construction, Sushil Kumar, Standard Publisher and Distributors, (2010), Tenth Edition.

2. Building Construction, Punmia B.C, Jain, Ashok Kumar and Jain, Arun Kumar, Laxmi Publications, (2008), Tenth Edition.
3. National Building Code, BIS, New Delhi.
4. Building Drawing, Shah M.H, and Kale C.M, Tata McGraw Hill New Delhi, (2001), Fourth Edition.
5. Planning and Designing Building, Y.S.Sane, Poona, Allied Book Stall, (1975), Third Edition.

Assessment
Assessment will be based on a combination of assignments, quizzes, project work and exams.

CO-PO & PSO Correlation

Course Name : Civil Engineering Drawing Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	2	2	3	3		2	3	1	3	3
CO2	3	3	3	2	3	3		2	3	1	2	2
CO3	3	3	3	2	3	3			3	1	1	2
CO4	3	3	3	2	3	3			3	1	1	1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester:**	**III**
Name of the Course:	**Engineering Professionalism and Ethics**	**Course Code:**	**HSS2102**
Credits:	**1**	**No of Hours:**	**30**
Max Marks:	**50**		

COURSE DESCRIPTION

The society places a great deal of responsibility on its professionals and requires that they conduct themselves in a manner fitting to the place of prominence accorded to them by the community. Studying and understanding professional ethics is a part of students' development as an engineer.

This course is designed to introduce undergraduate engineering students to the concepts, theory and practice of engineering ethics. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.

Course Outcome:

Students will be able to:

CO Number	Course Outcome
CO 1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field;
CO 2	Assess their own ethical values and the social context of problems;
CO 3	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects;
CO 4	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work;
CO 5	Demonstrate knowledge of a professional code of ethics;
CO 6	Demonstrate ethical practice.

COURSE CONTENT

UNIT- I: Engineering Ethics

Introduction to ethics, Comparison of ethics and engineering ethics, Ethics at personal level – Variety of moral issues and Moral dilemmas, Kohlberg's theory, Gilligan's theory.

UNIT- II: Importance of Ethics And Professionalism

The importance of ethics in science and engineering, The role of codes of ethics, Professions and Professionalism, Professional responsibilities of engineers.

UNIT- III: Engineer's Responsibility For Safety
Safety and Risk – Assessment of Safety and Risk, Risk Benefit Analysis, Reducing Risk – Risk management.

UNIT- IV: Engineer's Responsibilities and Rights
Loyalty – Respect for Authority, Confidentiality, Conflicts of Interest; Professional Rights, Plagiarism and Intellectual Property Rights (IPR).

UNIT –V: Global Issues
Globalization and international concern, Multinational Corporations and ethical issues, Engineers as Expert Witnesses and Advisors, Sample Code of Conduct.

RECOMMENDED TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, 2000.
3. Seebauer, E.G. and Barry, R.L. *Fundamental of Ethics for Scientists and Engineers,* New York: Oxford University Press, 2001.

REFERENCE BOOKS

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

CO-PO & PSO Correlation

Course Name: HSS												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	3	1	3			2		2	3
CO2	2		1	2	1	2			1		2	2
CO3	1		1	2	1	2			1	1	2	2
CO4	2		2	3	1	2			1		2	2
CO5	2	2	3	2	1	2			1		2	2
CO6	2			3	1	2			1	1	2	2

Note: 1: Low 2: Moderate 3: High

OP JINDAL UNIVERSITY

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Department of Civil Engineering

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Business Writing Skills**	**Course Code:**	**PFD2103**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Outcome:

Students will be able to:

CO Number	Course Outcome
CO 1	Able to communicate effectively
CO 2	Understand business writing
CO 3	Understand business correspondence
CO 4	Able to prepare reports

COURSE CONTENT

UNIT- I COMMUNICATION IN BUSINESS

Business Communication-functions and principles of communication (7C's of communication), Types of Communication, Context of communication, Medium of communication, Barriers to communication.

UNIT – II ELEMENTS OF BUSINESS WRITING

Business letter -principles of business writing; Elements of letter writing and styles of writing, Resume, covering letter, Grammar in Use.

UNIT – III BUSINESS CORRESPONDENCE

Business letters - circulars, e-mails, agendas, minutes, sales letter, enquiries, orders, Letters of complaint- claims and adjustments, Notice, Quotation and Tenders.

UNIT – IV BUSINESS PROPOSALS AND REPORTS

Project proposals- characteristics and structure, Project reports – types- characteristics –structure,

Process and mechanics of report writing- visual aids- abstract - executive summary- recommendation

writing- definition of terms.

UNIT-V EFFECTIVE COMMUNICATION

Communication in organization, different kinds of texts for different purposes, reading between the lines. Comprehension of Unseen Passages, Précis writing..

CO-PO & PSO Correlation

Course Name: PD												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	3	1	3			2		2	3
CO2	2		1	2	1	2			1		2	2
CO3	1		1	2	1	2			1	1	2	2
CO4	2		2	3	1	2			1		2	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Theory of Structures -I**	**Course Code:**	**CIE2207**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description

This course covers the basics of structural analysis with the central focus on energy methods. Deflections, effect of sinking of supports, rolling loads and influence lines, strain energy and analytical interrelations of them with different methods will be covered. The subject also covers analysis of determinate and indeterminate structures.

Course Outcome:

Students will be able to:

CO Number	Course Outcome
CO 1	Analyze determinate and indeterminate structures.
CO 2	Apply various energy methods for analyzing different structures like bridges of suspension and arches.

Syllabus:

UNIT- I

Determinate Structures- Introduction to determinate and indeterminate structures, static indeterminacy, external and internal indeterminacy, rules for determining degree of indeterminacy, degree of freedom per node, kinematic indeterminacy. pin jointed determinate space trusses, distinction between determinate and indeterminate space trusses and simple and complex space trusses, Analysis of simple and determinate space trusses, method of tension coefficient.

UNIT-II

Fixed and Continuous beams: Statement of Clapeyron's theorem of three moments, analysis of fixed and continuous beams for shear force and bending moment- deflection of fixed beams - effect of sinking of supports.

UNIT- III

Slope and Deflection - Moment curvature relation, the elastic curve, relation between loading, SF, BM, slope and deflection, deflection and slopes of statically determinate beams by double integration method, Macaulay's method, moment rea method, basics of conjugate beam method.

UNIT-IV

Rolling Loads and Influence Lines- Introduction to rolling loads - concept of influence lines - influence lines for reaction, shear force and bending moment in simply supported beams - influence lines for forces in trusses – analysis for different types of rolling loads - single concentrated load - several concentrated loads – uniformly distributed load shorter and longer than the span, absolute maximum bending moment.

UNIT-V

Strain Energy- Strain energy due to axial load, bending, shear and torsion, Castigliano's theorems for deflection, Betti's theorem - Maxwell's law of reciprocal deflections, unit load and strain energy method for determination of deflections of statically determinate beams - pin-joined trusses and rigid frames.

Text Books:

1. Basic Structural Analysis (Vol. I & II) – Bhavikatti S.S. (Vikas Publishing)
2. Theory of Structures – B.C. Punmia (Laxmi Publication)

Reference Books:

1. Theory & Analysis of Structures (Vol. – I & II) – Jain, O.P. and Jain B.K. (Nem Chand)
2. Structural Analysis – R.C. Hibbeler (Pearson Publication)
3. Structural Analysis – Ghali, A. & Neville, M. (Chapman & Hall Publication. 1974)
4. Elementary Structural Analysis – Willbur and Norris (Tata McGraw Hill)
5. Structural Analysis – Negi L.S. & Jangid R.S. (Tata McGraw Hill)
6. Theory of Structures – Ramamrutham S. & Narayan R. (Dhanpat Rai Publications)

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Theory of Structures -I												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	2	1	1	2			1	2	1	2
CO2	2	2	2	1	1	2			1	1	1	2

Note: 1: Low 2: Moderate 3: High

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Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the	**Fluid Mechanics**	**Course Code:**	**CIE2208**
Credits :	**5**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description

This course covers the basics of static and dynamic fluids. The course covers necessary aspects of fluid flow, mass and energy transfer, various types of fluid flow, open and closed conduit flow, simple devices to measure different parameters of flow. It also gives the students knowledge of various hydraulic devices and machines like pumps and turbines.

Course Outcomes:

Students will be able to:

CO Number	Course Outcome
CO 1	Understand various flow types, their occurrence in practice and analysis of them.
CO 2	Apply the principles of hydraulics for getting various energy conversions and use them for mechanical and electrical energy.

Syllabus

UNIT- I

Fluid Statics: Introduction and scope of fluid mechanics, classification of fluids. Physical properties of fluids like density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, incompressibility and bulk modulus. Fluid classification, fluid static pressure, Pascal's law, pressure variation for incompressible fluids, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, manometer, hydrostatic pressure on submerged surface, force on a horizontal, inclined and vertical submerged plane surface. Buoyancy and flotation, Archimedes' principle, stability of immersed and floating bodies, determination of metacentric height.

UNIT-II

Fluid Kinematics: Introduction, description of fluid flow, classification of fluid flow. Acceleration of fluid particles, flow rate and continuity equation, differential equation of continuity. Flow through pipes, flow through open channels, laminar and turbulent flows, rotational and irrotational flow.

UNIT- III

Fluid Dynamics : Introduction, Euler's equation analog a streamline, energy equation, Bernoulli's equation, Applications of Bernoulli's equation, Analysis of finite control volumes and its application to siphon, venturimeter, orifice, mouthpiece.

UNIT-IV

Hydraulic Machines:

Turbines: Classification of reaction, impulse, outward flow, inward flow and mixed flow turbines, Francis, Kaplan and Pelton wheel turbines. Physical description, principle of operation and governing of hydraulic turbines.

Pumps: Centrifugal pump, principles and classification, blade angles, velocity triangle, efficiency, specific speed, characteristics of performance curves. Reciprocating pump, principles of working, slip, work done, effect of acceleration, frictional resistance and separation.

UNIT-V

Dimensional Analysis and Similitude: Dimension reasoning, dimensional homogeneity, dimensional analysis using Rayleigh's method, Buckingham π-theorem, significance and use of dimensionless numbers in experimental investigation, geometric similarity, dynamic similarity, kinematic similarity, model testing-model laws, undistorted and distorted models.

Text Books:

1. Hydraulics and Fluid Mechanics by Modi and Seth, Standard Publishing Company
2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K.Kataria & Sons
2. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand & Co.
3. Fluid Mechanics by Frank .M. White, McGraw Hill Publishing Company Ltd.
4. Fundamentals of Fluid Mechanics by Munson, Wiley India Pvt. Ltd

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name : Fluid Mechanics												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3			1		2			3	1	1	3
CO2	2	1	1	1		2			2	2	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Transportation Engineering.-I**	**Course Code:**	**CIE2209**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

COURSE DESCRIPTION:

This course emphasizes on the basics of highway elements and their design including practical applications. Further it gives a fair idea of materials being used in the modern road construction techniques and practices. It also covers the transportation planning and traffic studies.

Course Outcomes:

Students will be able to understand:

CO Number	Course Outcome
CO 1	Highway planning & design.
CO 2	Proper selection of highways construction material.
CO 3	Concepts of pavement design.
CO 4	Advanced traffic studies

SYLLABUS

UNIT I

Geometric Elements of Highways

Introduction to various modes of transportations, classification of roads - typical cross sections of roads in urban and rural area, requirements and factors controlling alignment of roads. Engineering surveys for highway locations, pavement surface characteristics - camber and width requirements, sight distances - stopping and overtaking sight distances, overtaking zone requirement, sight distances - stopping and overtaking sight distances, overtaking zone requirement, design of horizontal alignment - speed, radius, super elevation, methods of providing super elevation, extra widening of pavements, transition curves, design of vertical alignment - gradient, grade compensation, summit curves and valley curves.

UNIT II

Pavement Material & Design

Desirable properties and testing of highway materials, road aggregates, bituminous materials and sub grade soil , factors influencing the design of pavements - CBR method and IRC guidelines of flexible pavements design, design of rigid pavements using IRC charts - stress calculations using Westergaard's analysis, different types of pavement joints.

UNIT III

Different Types of Pavement

Embankment, soil stabilization, non- bituminous and bituminous sub base and base courses, bituminous surface courses, construction of earth roads, WBM roads,stabilized roads, bituminous pavements, cement concrete roads and joints in cement concrete roads, types and causes of failures in flexible & rigid pavements, drainage, evaluation and maintenance of highways.

UNIT IV

Transportation Planning

Transportation planning process, introduction-definition-factors to be considered, land use transportation planning; systems approach-stages-inventory of existing conditions-difficulties in implementation, transport surveys: basic movements-study area-zones-surveys, planning of different types of surveys and interpretation, travel demand, traffic surveys for mass transit system planning, case study of Singapore city.

UNIT V

Traffic Studies

Road user, vehicle and traffic characteristics - speed and volume studies, principles of design of at-grade intersections -simple layouts, objectives, classification and uses of traffic signs and markings, design of isolated signals by Webster's method.

Text Books:

1. Khanna. S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand
   Publishers, 2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech
   Publications (India), Chennai, 2010.
3. Indian Road Congress (IRC), Guidelines and Special Publications of Planning and Design.

References Books:

1. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical
   Publications, 8th edition Delhi, 2013.
2. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, 9th Impression, South Asia, 2012.
3. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, 1st Edition, USA, 2011.
4. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011.
5. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010.
6. O'Flaherty. C.A "Highways", Butterworth – Heinemann, Oxford, 2006.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Transportation Engineering. -I												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	3	2	2	2	1		2	1	2	2
CO2						2				1	1	2
CO3	1	1	1		1	1					1	1
CO4	2	1	3		2	2			3		1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Numerical Methods and Computing**	**Course Code:**	**MAT2208**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Outcomes:

Students will be able to

CO Number	Course Outcome
CO 1	Numerically estimate the roots of algebraic and transcendental equations.
CO 2	Solve the system of linear algebraic equations by direct and iterative methods.
CO 3	Approximate the tabulated function by a polynomial.
CO 4	Find the derivatives and integrals of a tabulated function.
CO 5	Obtain the numerical solution of Ordinary Differential Equations.
CO 6	Fit the linear and non linear curves to the tabulated data.

Syllabus Outline:

Unit: 1 (Solution of algebraic and transcendental equations)

Roots of Algebraic and Transcendental Equations, Bisection, Regula- Falsi and Newton-Raphson Methods, System of linear algebraic equations, Consistency and Existence of Solutions, Direct Methods: Gauss Elimination and Gauss-Jordan Methods, Iterative Methods: Jacobi's, Gauss-Siedal & Successive Over Relaxation Methods. C Programming of Newton's iterative method.

Unit: 2 (Finite Differences and Interpolation)

Finite Differences and Interpolation, Interpolation with equally and unequally spaced points, Interpolation Formulae based on forward, backward, central and divided differences, Lagrange's Interpolation formula, Inverse Interpolation.

Unit: 3 (Numerical Differentiation and Integration)

Numerical Differentiation, Derivatives using Forward, Backward and Central Difference Formulae, Numerical Integration, Newton-Cote's quadrature formula, Trapezoidal rule, Simpson's rules, Boole's rule, Weddle's rule. C Programming of Trapezoidal, Simpson's 1/3 and 3/8th rule.

Unit: 4 (Numerical Solution of Ordinary Differential Equations)

Numerical Solution of Ordinary Differential Equations, Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Range-Kutta Methods, Predictor-corrector Methods, Milne's Method, Adams-Bashforth Method. C Programming of Euler's and Runge-Kutta method of order 4.

Unit: 5 (Curve Fitting and Regression analysis)

Curve Fitting, Method of Least Squares and group averages, fitting a Straight Line, Parabolic Curve, Fitting the Nonlinear Curves, Regression and Correlation.

Recommended Text Books:

1. Advanced Engineering. Mathematics by Erwin Kreyszig (8th edition) – John Wiley & Sons.
2. Higher Engineering Mathematics by B.S. Grewal (38th edition)-Khanna Publishers.
3. Numerical Methods in Engineering and Science by Dr. B.S. Grewal, Khanna Publishers.
4. Numerical Methods for Scientific and Engineering Computation by M .K. Jain, S. R. K. Iyengar& R. K. Jain, Wiley Eastern Limited
5. Higher Engineering Mathematics by B. V. Rammana-Tata Mc Graw Hill.
6. Numerical Methods for Scientists and Engineers by K. Shankar Rao, Prentice Hall of India.
7. Numerical Methods, by S. S. Sastry, Prentice Hall Inc. India.

CO-PO & PSO Correlation

Course Name: Numerical Methods and Computing												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2		1	2			1	1	1	2
CO2	2	1	2		1	2			1		1	2
CO3	2	1	1			2			1	1		2
CO4	2	1	1		1	2			1	1	1	2
CO5	2	1	1			2			1	1		2
CO6	2	1	1		1	2			1	1	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Theory of Structures Lab**	**Course Code:**	**CIE2210**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description

The course covers flexural rigidity of beams, verification of Maxwell's theorem, deflection of curved beams, analysis of determinates and indeterminate beams, determinate pin-jointed frames, determinate rigid frames and multistoried rigid frame using STAAD.Pro.

Course Outcomes

Students will be able to understand:

CO Number	Course Outcome
CO 1	Determination of flexural rigidity of beams and verification of Maxwell's theorem.
CO 2	Evaluation of deflections of curved bars.
CO 3	Analysis of determinate and indeterminate beams.
CO 4	Analysis of determinate pin-jointed frames, determinate rigid frames and multistoried rigid frame.

List of Experiments:

(At least ten experiments are to be performed by each student)

1. To determine the flexural rigidity (EI) for a given beam.
2. To verify the Maxwell's theorem of reciprocal deflection.
3. To determine the vertical deflections of a variety of curved bars.
4. Analysis of determinate beams on a standard structural analysis package such as STAAD.Pro V8i.
5. Analysis of indeterminate beams on a standard structural analysis package such as
   STAAD.Pro V8i.
6. Analysis of determinate pin-jointed frames on a standard structural analysis package such as STAAD.Pro V8i.
7. Analysis of indeterminate pin-jointed frames on latest version of a standard structural analysis package such as STAAD.Pro V8i.
8. Analysis of determinate rigid frames on latest version of a Standard Structural Analysis
   package such as STAAD.Pro V8i.
9. Analysis of indeterminate rigid frames on latest version of a standard structural analysis
   package such as STAAD.Pro V8i.
10. Analysis of multistoried rigid frame on latest version of a standard structural analysis
    package such as STAAD.Pro V8i.
11. Analysis of multistoried pin-jointed frame on latest version of a standard structural analysis package such as STAAD.Pro V8i.

12. Analysis of industrial structure on latest version of a standard structural analysis package such as STAAD.Pro V8i.
13. Analysis of composite structure on latest version of a standard structural analysis package such as STAAD.Pro V8i.

Equipment/Machines/Instruments/Tools/Software Required:

1. Elastic properties of beam apparatus.
2. Maxwell's law of reciprocal deflection apparatus.
3. Universal frame with variety of curved bars.
4. Dial gauges for measuring deflections.
5. Weights and hangers to apply loads.
6. Latest release of software Package STAAD.Pro

Recommended Books:

1. Structural Analysis-I, II, S. S. Bhavikatti, (2010), Vikas Publishing, Fourth Edition.
2. Verification Manual of STAAD.Pro Software.

Assessment:

Assessment includes attendance, performance, record work and exams.

CO-PO & PSO Correlation

Course Name: Theory of Structures Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2		2	2		2			1	2		2
CO2	1		1	1		2			1	1	1	2
CO3	3		2	2	1	2			2	2	1	2
CO4	3		2	2	1	2			1	2	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Fluid Mechanics Lab**	**Course Code:**	**CIE2211**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description

The course covers different pressure measuring devices, metacentric height, verification of Bernoulli's Theorem, pitot tube, venturi meter, orifice meter, impact of jet through nozzle, coefficient of discharge through triangular notch and rectangular notch, Reynolds's experiment, friction factor for different pipes, loss coefficients for different pipe fittings, viscosity of fluid by viscometer,efficiency of centrifugal/reciprocating pump and efficiency of impulse/reaction turbine.

Course Outcomes

Students will be able to:

CO Number	Course Outcome
CO 1	Use of different pressure measuring devices.
CO 2	Determine of metacentric height and applications of various principles.
CO 3	Know the application of pitot tube, venturimeter, orifice meter and jet through nozzle.
CO 4	Know the application of different hydraulic machines like pumps and turbines

List of laboratory experiments:

(At least ten experiments are required to be performed by each student**).**

1. To measure pressure with the help of different pressure measuring devices.
2. To determine metacentric height of floating body.
3. To verify Bernoulli's theorem experimentally.
4. To measure the velocity of flow using pitot tube.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge of orifice meter.
7. To determine the impact of jet through nozzle.
8. To determine the coefficient of discharge through open channel flow over a triangular notch.
9. To determine the coefficient of discharge through open channel flow over a rectangular notch.
10. To determine the different types of flow patterns by Reynolds's experiment.
11. To determine the friction factor for different pipes.
12. To determine the loss coefficients for different pipe fittings.
13. To determine the viscosity of fluid by viscometer (Redwood or Saybolt).
14. To determine efficiency of centrifugal/reciprocating pump.
15. To determine efficiency of impulse/reaction turbine.

Equipment/Machines/Instruments/Tools/Software Required:

7. Bourden's tube pressure gauge, manometers.

8. Bernoulli's theorem apparatus.
9. Various notches, orifices, mouthpieces.
10. Model of ship.
11. Turbines and pumps.

Recommended Books:

1. Hydraulics: Laboratory Manual, S.K. Likhi, (1995), New Age International, Delhi Wiley Eastern, reprint.
2. Hydraulics and Fluid Mechanics including Hydraulic Machine. P.N. Modi, S.M.Seth, (2013), Standard Book House, New Delhi, 20th edition.

Assessment:

Assessment includes attendance, performance, record work and exams.

CO-PO & PSO Correlation

Course Name: Fluid Mechanics Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	0	1	2	2			1	2	1	2
CO2	3		2		1	1			1	2	2	1
CO3	2	2	3	2	1	2			1	1	1	2
CO4	3	2	2	2	2	2			1	1	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Transportation Engineering Lab**	**Course Code:**	**CIE2212**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description

This course covers the basics of highway materials, their test, and applications in the field. Abrasion value and attrition value of aggregates, the shape of aggregates, softening point of bitumen, ductility of bitumen, flash and fire point of bitumen, impact value of aggregates performs.

Course Outcome:

The student will be able to

CO Number	Course Outcome
CO 1	Identify the functional role of different materials of highway engineering.
CO 2	Understand the test procedures and recommended standards for limiting values of highway materials
CO 3	Understand the quality of various pavement materials and their suitability in highway construction

List of Experiments:

(At least ten experiments are to be performed by each student)

1. Determination of 10 percent fines value of aggregates.
2. Determination of crushing value of aggregates.
3. Determination of abrasion value of aggregates by Los Angele's machine.
4. Determination of attrition value of aggregates by Deval's attrition machine.
5. Determination of impact value of aggregates.
6. Determination of specific gravity and water absorption of aggregates.
7. Determination of softening point of bitumen.
8. Determination of ductility value of bitumen.
9. Determination of viscosity value of bitumen.
10. Determination of Flash and Fire point of bitumen.
11. Determination of Shape of aggregates(a) Elongation index (b) Flakiness index.
12. Determination of penetration value of bitumen.
13. Determination of the angularity index of aggregates.
14. Determination flash and fire point of bitumen.
15. Study of Marshal Stability test of bitumen.

Equipment/Machines/Instruments/Tools/Software Required:

- Standard penetrometer
- Ring and ball apparatus
- Los Angele's abrasion machine
- Deval's abrasion machine
- Ductility testing machine

- Tar viscometer
- Sieve shaker
- Standard I.S. sieves for fine and coarse aggregate
- Length gauge
- Thickness gauge
- Crushing value cylinder and mould with plunger
- Aggregate impact testing machine
- Flash and fire point apparatus
- Hot air oven
- Water bath
- Marshall stability machine and with mould
- Proving ring and dial gauge
- Weighing balance up to 10 kg capacity

Recommended Books:

1. Principle and Practices of Highway Engineering, Kadiyali, (2005), Khanna Publishers, Delhi, Tenth Edition.
2. Highway Engineering, S. K. Khanna and C.E.G. Justo, (2015), Khanna Publishers, Delhi, Tenth Edition.
3. Air-port planning and Design, Khanna and Arora, (2017), Khanna Publishers, Delhi, Sixth Edition.
4. Principles of Transportation Engineering, ParthaChakroborty and Animesh Das, (2011), Prentice Hall India Learning Private Limited, Sixth Edition.

Assessment:
Assessment includes attendance, performance, record work, and exams.

CO-PO & PSO Correlation

Transportation Engineering Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2		1	1	1	2			1	1		2
CO2	2		1	1	1	2		1		1	1	2
CO3	2			1	1	1	2			1	1	1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**PROFESSIONAL DEVELOPMENT**	**Course Code:**	**PFD2204**
Credits :	**2**	**No of Hours :**	**3 hrs / week**
Max Marks:	**50**		

Course Description

'Effective Speaking Skills' course is designed to teach students to apply theories and principles of effective interpersonal and public speaking. This course provides instruction and experience in preparation and delivery of speeches within a public setting and group discussion. Emphasis is on research, preparation, delivery, and evaluation of informative, persuasive, and special occasion public speaking. Upon completion, students should be able to prepare and deliver well-organized speeches and participate in group discussion with appropriate audiovisual support. Students should also demonstrate the speaking, listening, and interpersonal skills necessary to be effective communicators in academic settings, in the workplace, and in the community.

Course Outcomes:

Students will be able to:

CO Number	Course Outcome
CO 1	Choose a topic and formulate the speech according to the purpose, audience, and time constraints
CO 2	Employ vocal variety in rate, pitch, and intensity as suitable to the message, occasion, and audience;
CO 3	Use strategies and skills to manage communication anxiety;
CO 4	Present speeches using an extemporaneous style with effective transitions that, establish connectedness, movement from one idea to another, and clarify relationships;
CO 5	Use knowledge of digital presentation tools to create and make effective presentations;
CO 6	Participate in GD effectively; and to face interviews confidently.

Course Content

UNIT- I: SPEAKING: AN OVERVIEW

Speaking: An Overview, Listening Effectively, Non-Verbal Communication, Art of Persuasion.

UNIT- II: DYNAMICS OF PROFESSIONAL SPEAKING

Introduction, Combating Stage Fright, Describing Objects/Situations/People, Delivering Just-a-minute Sessions, Delivering Different Types of Speeches.

UNIT- III: PROFESSIONAL PRESENTATIONS
Planning of a Presentation, Designing of a Presentation, Preparing Power Point Slides for Presentations, Individual and Group Presentations, Making Presentation.

UNIT- IV: GROUP DISCUSSIONS
Introduction, GD and Debate, Types of GD, Personality Traits to be evaluated, Dynamics of Group Behaviour, DOs and DON'Ts of GD.

UNIT –V: JOB INTERVIEWS
Introduction, Process, Stages in Job Interviews, Types, Desirable Qualities, Preparation, Tips for Success

RECOMMENDED TEXT BOOKS

1. Jeff Butterfield, *Soft Skills for Everyone,* CENAGE LEARNING, Delhi, 2014.
2. Sanjay Kumar and Pushp Lata, *Communication Skills*, New Delhi: Oxford University Press, 2011
3. Pushp Lata and Sanjay Kumar, *Communicate or Collapse: A Handbook of Effective Public Speaking, Group Discussion and Interviews*, New Delhi: Prentice Hall of India, 2007
4. Dale Carnegie, The Art of Public Speaking, New Delhi: Ocean Paperbacks, 2016

REFERENCE BOOKS

Stephen E. Lucas, *The Art of Public Speaking*, Third Edition, Singapore: McGraw-Hill, 1989.
1. Sonya Hamlin, *How to Talk so People Listen*, New York: Throson, 1993
2. Jeff Davidson, *The Complete Guide to Public Speaking*, Manjul Books PVT. Bhopal, 2006
3. Turk, Cristopher, *Effective Speaking,* Second Indian Reprint, Taylor and Francis Group, Delhi, 2010

CO-PO & PSO Correlation

Course Name: Professional Development												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	3	1	3			2		2	3
CO2	2		1	2	1	2			1		2	2
CO3	1		1	2	1	2			1	1	2	2
CO4	2		2	3	1	2			1		2	2
CO5	2	2	3	2	1	2			1		2	2
CO6	2			3	1	2			1	1	2	2

Note: 1: Low 2: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109

Department of Civil Engineering

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Theory of Structures -II**	**Course Code:**	**CIE3113**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description

This course covers topics such as structural response with use of basic principles and more emphasis is placed on the methods of analyzing structures. This course develops further the structural principles introduced in Theory of Structures I. It deals with analysis of statically indeterminate elastic structures using slope-deflection methods, moment distribution and Kani's Method. The course also involves introduction to some structural design and analysis software packages.

Course Objectives

Students will be able to:

CO Number	Course Outcome
CO1	Capable of analyzing different kinds of structures such as determinate, indeterminate, rigid jointed or pin-jointed plane frames.
CO2	Capable of understanding about the suitable method for a given structure.
CO3	Ready to proceed for designing of analyze structure.

Syllabus:

UNIT- I

Method of Moment distribution - Moment Distribution Method, Application to indeterminate beams and rigid frames without sway and with sway problem.

UNIT-II

Force Method of Analysis using Strain Energy Concept - Strain Energy theorems of analysis of statically indeterminate structures-beams, frames and trusses, Lack of fit. Qualitative and Quantitative Influence lines of indeterminate beams by Muller Breslau Principle and its use.

UNIT- III

Method of three moments - Indeterminate beams, Principle of superposition. Analysis by consistent deformation method.

UNIT-IV

Method of Slope deflection and Column analogy - Slope deflection method, Application to indeterminate beams and rigid frames without sway and with sway problem. Basics of Column analogy method and application for fixed beams.

UNIT-V

ILD - Qualitative and Quantitative Influence lines of indeterminate beams by Muller Breslau Principle and its use.

Text Books:

1. Intermediate Structural Analysis – Wang C.K. (Tata McGraw Hill)
2. Mechanics of Structures Vol 1 & Vol.2 - Junarkar. S. B and Shah H.J
3. Basic Structural Analysis – C.S. Reddy (Tata McGraw Hill)
4. Analysis of Structures Vol-II , Vazirani V N- Paperback

Reference Books:

1. Structural Analysis Vol-1&Vol-II, Bhavikatti .S.S., Vikas Publishing House Pvt
2. Fundamentals of Structural Analysis – Harry H. West and Louis F. Geschwindner
3. Theory of Structures (Vol. I & Vol. II) – G. Pandit, S. Gupta & R. Gupta (Tata McGraw Hill)
4. Structural Analysis – Hibbeler (Pearson Education)

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Theory of Structures -II												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	3	1	1	3		2	2	2	1	1
CO2	3	2	2	1	1	3		1	1	1	1	2
CO3	3	2	3	1	1	3		2	3	2	2	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Structural Engineering Design I**	**Course Code:**	**CIE3114**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description

This course on Structural Engineering Design I aim at understanding Basic designing in the framed structure. Introduction to the Working stress method which is used from the last hundred's years. The new introduction is the Limit State Method which recently used in the designing and covers all overcomes and makes structure safe from all the loads. Based on the Limit State method there are list of designs like, singly reinforced beam, doubly reinforced beam, slab (one-way and two- way), staircase etc. this all designing is purely based on the Limit state Method which involves safety factors use of the various IS code the practice and the drawing detailing.

Course Outcome:

Students will be able to:

CO Number	Course Outcome
CO1	To understand conceptually the difference between Working stress method, Ultimate load theory method & Limit state Design method.
CO2	To design the structural elements like RCC beam, slab, column, and footings by limit state Design method as per I.S.456-2000.
CO3	To design two way slab & one way continuous slabs.
CO4	To design columns & footings for eccentric loads.

Syllabus:

UNIT- I

Working Stress Method - Introduction to various design philosophies R.C structures: Historical development Properties of Concrete and reinforcing steel, stress-strain curves, permissible stresses, modular ratio, loads on structure, Basis for design by working stress method. Analysis and design of singly reinforced and doubly rectangular reinforced sections by working stress method, conceptually the difference between Working stress method, Ultimate load method & Limit state method

UNIT-II

Limit State Method – Flexural Member - Introduction to limit state method, characteristic loads, partial safety factor, limit state of flexure – assumptions, stress block parameters, neutral axis, analysis and design of singly and doubly reinforced section, shear in beams, bond and development length.

UNIT- III

Limit State Method – T-Beam and Slabs - Properties of T-section, moment of resistance and design of singly reinforced T-beam. Design of one-way slab and two-way slabs.

UNIT-IV

Limit State Method – Columns - Axially loaded short columns, minimum eccentricity, longitudinal and transverse reinforcement, and effective length of column, safe load on columns, circular columns, Pu – Mu interaction curves, combined axial load and uni-axial bending, combined axial load and bi-axial bending.

UNIT-V

Limit State Method – Staircases and Column Footings - Design of stairs – dog legged stair, General principle of design of reinforced concrete footing, proportioning of footings, edge thickness, depth of footing, design of isolated column footings – square and rectangular footings.

Text Books:

1. Reinforced Concrete Design, S. U. Pillai and D. Menon, 2017, Tata McGraw, Third Edition.
2. Limit State Theory and Design of Reinforced Concrete (IS:456-2000), V. L. Shah and S. R. Karve,2017, Structures Publications, Pune, Eight Edition.
3. Relevant IS codes IS: 456:2000, IS 875, Part 1, 2.
4. Design Aids for Reinforced Concrete to I.S.-456-1978 (SP-16), 1980, Bureau of Indian Standards, New Delhi.
5. Limit State Design of Reinforced concrete, P. C.Varghese, 2008, PHI Learning.

Reference Books:

1. Illustrated Reinforced Concrete Design, Dr. V.L.Shah and Dr. S.R. Karve ,2018, Structures Publications Pune, Ninth Edition.
2. Reinforced Concrete Limit State Design, A. K. Jain, 2012, Nem Chand and Bros. Roorkee, Seventh Edition.
3. Fundamentals of Reinforced Concrete Design, M. L. Gambhir, 2008, PHI Learning.
4. Limit State Design of Reinforced Concrete, B. C. Punmia, A. K. Jain and A. K. Jain, 2016, Laxmi Publications.
5. Design of Reinforced Concrete, B. C. Punmia and A. K. Jain, Laxmi Publications.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Structural Engineering Design I												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	3	1	1	3		1	3	1	1	2
CO2	3	2	3	1	1	3		1	3	3	1	3
CO3	3	2	3	1	1	3		1	3	2	1	3
CO4	3	2	3	1	1	3		1	3	2	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Geotechnical Engineering - I**	**Course Code:**	**CIE3115**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

Every Civil Engineering structure consists of main two components i.e. foundation and superstructure. The foundations of buildings, roads, dams etc. rest on soil whose behavior plays an important role to transfer their loads, therefore, the knowledge of the properties & behavior of the soil below foundations is essential for their safe design.

Course Outcomes;
Students will be able to:

CO Number	Course Outcome
CO1	Comprehend the soil as three-phase materials.
CO2	Understand various engineering parameters of soil.
CO3	Acquire a basic understanding of soil mechanics required for designing of geotechnical systems.

Syllabus:

UNIT- I
Physical Properties - Overview of soil formation, Soil structure and clay mineralogy, Soil phase relationships, Index properties of granular and fine grained soils, Soil classification systems. Soil structure and Clay mineralogy.

UNIT-II
Permeability and Seepage - Permeability of soils, Darcy's law, Equivalent permeability in stratified soils, In-situ and laboratory permeability test, Types of heads and seepage forces, Total and effective stress, Two-dimensional Laplace's equation, Flow nets, Uplift pressure, Exit gradient and piping, Filter criteria.

UNIT- III
Compaction - General principles, Factors affecting compaction, Standard and modified Proctor tests, Effect of compaction on engineering properties, Field compaction.
Compressibility and Consolidation - Components of total settlement, Compressibility of granular and fine grained soils, Terzaghi's 1-D consolidation theory, Consolidation test, Determination of preconsolidation stress, Over consolidation ratio, Computation of settlement, Secondary consolidation.

UNIT-IV

Shear Strength - Mechanism of shear resistance, Mohr-Coulomb failure criterion, Measurement of shear strength: Direct shear test, Unconfined compression test, Vane shear test, Triaxial shear test (CD, CU, UU), Pore-pressure parameters, Stress path, Shear strength of clays and sands.

UNIT-V

Stress Distribution - Boussinesq's equation, Vertical stress due to line load, strip load, uniformly loaded circular area, Westergaard's approach, Pressure bulb concept, Approximate methods.

Soil Exploration, Various Method of field Exploration, Undisturbed Soil Sampling equipments. a Field tests, Static & Dynamic Penetration Test, Field Vane Shear Test, modern electronic test of site characterization.

Text Books:

1. Ranjan, G. and Rao, A.S.R. (2016). Basic and Applied Soil Mechanics, 3rd Edition, New Age International Publishers, India.
2. Arora, K.R. (2020) .Soil Mechanics And Foundation Engineering - Geotechnical Engineering. Standard publisher dist.
3. Murthy, V.N.S. (2006). Geotechnical Engineering, Marcel Dekker Inc, New York, USA.

Reference Books:

1. Lambe, T.W. and Whitman, R.V. (1991). Soil Mechanics, John Wiley & Sons.
2. Budhu, M. (2010). Soil Mechanics and Foundations, John Wiley & Sons.
3. Gulhati S.K. and Datta, M. (2005). Geotechnical Engineering,Tata McGraw-Hill Publishing Company Limited, New Delhi,

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Geotechnical Engineering - I												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO2	3	2	3	1	1	3		1	3	2	1	3
CO2	3	2	3	1	1	3		1	3	2	1	3
CO3	3	2	3	1	1	3		1	3	2	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Transportation Engineering – II**	**Course Code:**	**CIE3116**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description

This course gives Introduction to different modes of transportation .It is principally aimed to introduce the students about various elements of railway track, railway bridges, ports, harbor and airport. It makes student aware about the concepts of Geometric design of Railway Engineering, Tunnel, Bridges and Harbor. It also emphasized on the safe, efficient and economical design of some major elements of the infrastructure required for above mentioned mode of transportation.

Course Outcomes:
Students will be able to:

CO Number	Course Outcome
CO1	A person with broad vision and knowledge of different means of Transportation Engineering.
CO2	The students will be able to make safe geometric design for railway track with high speed.
CO3	The students will be able to understand methods of construction of Tunnel, Bridges and Harbor.

Syllabus:

UNIT- I

Railway Engineering - Historical background of Railways in India. Railway track cross- section, coning of wheels, rail cross-section, weight of rail, length of rail, wear of rails, creep of rails, rail joints and welding of rail.

Sleepers - Functions and requirements of sleepers, classification of sleepers, timber, metal and concrete sleeper, comparison of different types of sleepers, spacing of sleepers and sleeper density.

Ballast - Function and requirements of ballast, types, comparison of ballast materials.

UNIT-II

Geometric Design of railway track - Alignment, horizontal curves, super elevation, equilibrium, cant and cant deficiency, length of transition curve, gradients and grade compensation, Negative super elevation, transition curves, widening of gauges on curves. Point and crossing, design of turn outs various types of track junctions, signaling and interlocking, signals, and control on movements of trains.

UNIT- III

Tunnel Engineering - Consideration in tunneling shape and size, methods of tunnel, constructions, tunneling in soft soil and rocks, lining of tunnels, ventilation, drainage of tunnels.

UNIT-IV

Bridge Engineering - Bridge site investigation and planning, selection of bridge site, alignment, collection of bridge design data, economic span, scour depth, depth of foundation afflux, clearance, and free board.

UNIT-V

Harbor & Dock Engineering - Harbor layout, harbor works, break water, jetties, wharves, piers and berthing facilities, navigational aids, port facilities, docks; Dry and Wet docks, transit sheds and ware houses, general layout of a port.

Text Books:

1. Railway Engineering – S.C. Saxena and S.P. Arora, "A textbook of Railway Engineering", (Dhanpat Rai Publications)
2. Railway Engineering – S.C. Rangwala, "Railway Engineering", (Charotar Publishing House Pvt. Ltd.)
3. Bridge Engineering – S.P. Bindra, "Principles and practice of bridge engineering", (Dhanpat Rai Publications)
4. Tunnel Engineering – S.C. Saxena (Dhanpat Rai Publications)
5. Harbour Engineering – R. Srinivasan (Charotar Publishing House Pvt. Ltd)

Reference Books:

1. Tunnel and Harbour – Seetharaman S. (Umesh Publication)
2. Harbour Engineering – R. Srinivasan (Charotar Publishing House Pvt. Ltd.)

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Transportation Engineering – II												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	3	3	3	3	3	3	2	1	3	3
CO2	3	3	2	2	2	3	1	3	3	2	3	3
CO3	3	3	2	2	2	3	1	2	3	2	2	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Concrete Technology Lab**	**Course Code:**	**CIE3117**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description

This course covers the basics of fresh concreate, their test, and applications in the field. Workability of fresh concrete, strength of the hard concrete, sieve analysis of sand, mix design by IS code method of concrete.

Course Outcome:
Students will be able to:

CO Number	Course Outcome
CO1	Chemistry, properties, and classification of cement, fly ash, aggregates and admixtures, and hydration of cement in concrete.
CO2	Prepare and test the fresh concrete.
CO3	Test hardened concrete with destructive and nondestructive testing instruments.
CO4	Get acquainted to concrete handling equipment's and different special concrete types.
CO5	Design concrete mix of desired grade.
CO6	Predict deteriorations in concrete and repair it with appropriate methods and techniques.

Syllabus:

List of Experiments
(At least ten experiments are to be performed by every student)

1. Determine the Fineness modulus by sieve analysis of fine aggregate.
2. Determine the Fineness modulus by sieve analysis of sand.
3. Determination of Soundness test on aggregate
4. Determine water absorption test of aggregate.
5. Determine the Mix Design by I.S. Code method (with OPC /PPC Cement)
6. Determine the Workability of concrete by slump test,
7. Determine the Workability of concrete compaction factor,
8. Determine the Workability of concrete Vee Bee test,
9. Determine the Workability of concrete Flow table test
10. Determine the Compressive strength test of concrete by crushing
11. Determine the Flexural strength of hardened concrete
12. Determine the soundness of fly ash.
13. Determine the Compressive strength test of concrete by non-destructive test - Rebound hammer.
14. Study Mix Design by I.S. Code method (with Slag Cement)

Recommended Books:

1. Concrete Technology Theory and Practice, M. S. Shetty, 2018, S. Chand and Company Ltd. Delhi, Eighth Edition.
2. Concrete Technology, M.L. Gambhir, 2017, Tata McGraw Hill, Fifth Edition.
3. Concrete Technology, A. M. Neville, and J. J. Brooks, 2019, Pearson Education India; Second edition.
4. Design of concrete Mixes, N. K. Raju, 2018, CBS, Fifth edition
5. Light Weight Concrete Academic Kiado, Rudhani G., Publishing Home of Hungarian Academy of Sciences.
6. Concrete Technology, R.S. Varshney, Oxford, IBH Publishers.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Concrete Technology Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	2	1	1	3		2	2	2	1	2
CO2	3	2	3	1	1	3		3	3	2	1	2
CO3	3	2	3	1	1	3		3	3	2	1	2
CO4	3	2	2	1	1	3		2	2	3	1	2
CO5	3	2	2	1	1	3		2	2	2	1	2
CO6	3	2	2	1	1	3		3	2	2	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Structural Engineering Design-I Lab**	**Course Code:**	**CIE3118**
Credits :	**2**	**No of Hours**	**30**
Max Marks:	**50**		

Course Description

This course covers the basics of design by limit states methods. The structural elements design based on the IS 456:2000. Details of the beam, slabs, footings, staircase etc

Course Outcomes:
Students will be able to:

CO Number	Course Outcome
CO1	Design the Reinforced Concrete beams using limit state and working stress methods.
CO2	Design Reinforced Concrete slabs.
CO3	Design the Reinforced Concrete Columns and footings.
CO4	Design structures for serviceability.
CO5	Design stair cases, canopy, retaining wall and water tanks.

Syllabus:

List of Experiments
(At least ten experiments are to be performed and detailed drawing at small sheet by every student and solved by Limit state method only).

1. Details of reinforcement in a simply supported RCC beam (singly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing.
2. Details of reinforcement in a simply supported RCC beam (doubly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing.
3. Details of reinforcement in a simply supported RCC beam (T section) with the given design data regarding the size and number of bars, stirrups their size and spacing.
4. Details of reinforcement in a one-way slab with the given design data regarding the size and number of bars, their size and spacing.
5. Details of reinforcement in a two-way slab with the given design data regarding the size and number of bars, their size and spacing.
6. Details of reinforcement in a stair case with the given design data regarding the size and number of bars, their size and spacing.
7. Details of reinforcement for a RCC rectangular column with isolated footing.
8. Details of reinforcement for a RCC square column with isolated square footing.
9. Study of detailed drawing of Isolated footings.
10. Bar bending schedules for few of the above items.
11. Study of detailing of Retaining walls.
12. Theory for Pre-stressed Concrete
13. Report of site visit. (Building under construction)

Text Books:

1. Reinforced Concrete Design, S. U. Pillai and D. Menon,2017, Tata McGraw, Third Edition.
2. Limit State Theory and Design of Reinforced Concrete (IS:456-2000), V. L. Shah and S. R. Karve,2017, Structures Publications, Pune, Eight Edition.
3. Relevant IS codes IS: 456:2000, IS 875, Part 1, 2.
4. Design Aids for Reinforced Concrete to I.S.-456-1978 (SP-16), 1980, Bureau of Indian Standards, New Delhi.
5. Limit State Design of Reinforced concrete, P. C. Varghese, 2008, PHI Learning.

Reference Books:

1. Illustrated Reinforced Concrete Design, Dr. V. L. Shah and Dr. S.R. Karve ,2018, Structures Publications Pune, Ninth Edition.
2. Design Reinforced Concrete Limit State Design, A. K. Jain, 2012, Nem Chand and Bros. Roorkee, Seventh Edition.
3. Fundamentals of Reinforced Concrete Design, M. L. Gambhir, 2008, PHI Learning.
4. Limit State Design of Reinforced Concrete, B. C. Punmia, A. K. Jain and A. K. Jain, 2016, Laxmi Publications.
5. of Reinforced Concrete, B. C. Punmia and A. K. Jain, Laxmi Publications,

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

O-PO & PSO Correlation

Course Name: Structural Engineering Design II Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	3	1	1	3	1	3	2	2	1	2
CO2	3	3	3	1	1	3		3	3	2	1	2
CO3	3	2	3	1	1	3	1	3	3	2	1	2
CO4	3	2	3	1	1	3		2	3	3	1	2
CO5	3	3	3	1	1	3		2	3	2	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Geotechnical Engineering-I Lab**	**Course Code:**	**CIE3119**
Credits :	**2**	**No of Hours**	**30**
Max Marks:	**50**		

Course Description

Geotechnical laboratory is to determine engineering properties of soil which are required for suitable design of foundations for any structure. The engineering properties include consolidation, compressibility, shear strength and bearing capacity of soil. By evaluating the properties of soil in the laboratory, students will be able to relate the concepts studied in the relevant theory course. Also students can utilize the knowledge of both theory and practical in the field application to real problems. In this laboratory both laboratory and in-situ experiments can be conducted. This laboratory course will help the students to understand the theoretical concepts learned in the course Geotechnical Engineering.

Course Outcomes:

Students will be able to:

CO Number	Course Outcome
CO1	Knowledge of site specific field investigations including collection of soil samples for testing and observation of soil behavior & Properties of the soil.
CO2	Be able to identify and classify soil based on standard geotechnical engineering practice.
CO3	Be able to perform laboratory compaction and in-place density tests for fill quality control.

Syllabus:

List of Experiments:

1. Grain size Analysis of soil by sieve analysis
2. Grain Determination of Water Content of Soil oven drying method and pycnometer bottle method.
3. Determination of specific gravity of soil by pychnomerer /or density bottle
4. size Analysis of soil by hydrometer analysis
5. Determination of Field Density by Core Cutter method.
6. Determination of Field Density by Sand Replacement method
7. Determination of Liquid Limit and Plastic Limit of Soil.
8. Determination of shrinkage limit of soil.
9. Indian Standard Light Compaction Test or Standard Proctor Test.
10. Indian Standard Heavy Compaction Test or Modified Proctor Test.
11. Falling head Permeability Test.
12. Constant head Permeability test

Recommended Books:

1. Respective Bureau of Indian Standard/ International Standard Codes of Practices.

2. Bowles, J.E. (2012). Engineering Properties of Soil and their Measurement, 4th Edition, McGraw Hill (India) Publishers.
3. Mandal, J.N. and Divshikar, D.G. (1994). Soil Testing in Civil Engineering, Oxford & IBH Publishing Company Pvt. Ltd., New Delhi, India.
4. Sivakugan, N., Arulrajah, A. and Bo, M.W. (2011). Laboratory Testing of Soils, Rocks and Aggregates,

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Geotechnical Engineering-I lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	2	1	1	3		3	1	3	2	2
CO2	3	2	2	1	1	3		3	3	3	3	3
CO3	3	3	1	1	1	3		2	3	3	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Structural Engineering Design-II**	**Course Code:**	**CIE3221**
Credits :	**4**	**No of Hours**	**55**
Max Marks:	**100**		

Course Description

This course gives Introduction to different methods of design of elements of steel structure, principally aimed to introduce the students about various elements of steel structure and their behaviour under applied load. It makes student aware about the concepts of selection of cross section to transmit design load without risk of failure. It also emphasized on the safe, efficient and economical design of some major elements of the infrastructure which are made up of steel material.

Course Outcomes

The students will be able -

CO Number	Course Outcome
CO1	To develop ability to select adequate shape and grade of structural steel.
CO2	To understand the basis of economical and safe design of steel structures.
CO3	To develop ability of choosing proper fastener for a particular joint.
CO4	To Make use of knowledge of analysis in structural planning and design of various components of buildings.

Syllabus:

UNIT- I

Methods of Design (Working stress and Limit state) - Types of Structural Steel, Advantages of steel as a structural material, Rolled Sections - Tapered Flange and Parallel Flange, Built up sections, Convention for Member Axes. Plastic Theory, Shape factor, Methods of design, Limitations of Working stress and Plastic design methods, Advantages of Limit State Design, Limit States of Strength and Serviceability, Partial Safety Factors, Loads and Load Combinations, Maximum effective slenderness ratio.

UNIT-II

Riveted/Bolted & Welded Connection - Location details of fasteners, Bearing type bolts, Friction Grip type Bolting, Welds and Welding, Advantages and Disadvantages of Welded Connections, Lap and Butt Joints, Truss Joint Connections by bolts and welds.

UNIT- III

Tension Members - Design Strength due to Yielding of cross Section, Rupture of Critical Section, Block Shear, Design of Axially Loaded Steel Angles Tension Members.

UNIT-IV

Compression Members - Design Strength, Effective length of compression members, Design of Axially loaded Steel Angles compression members, Design of Column bases under axial load, Laced Columns, Battened columns.

UNIT-V

Beams (Flexural Members) - Design Strength in Bending (Flexure), Effective length for lateral torsional buckling, Shear, Design of Laterally Supported and Laterally Unsupported Beams with unstiffened webs.

Text Books:

1. Design of Steel Structures - N. Subramanian (Oxford University Press)
2. Limit State Design of Steel Structures – S. K. Duggal (Tata McGraw Hill)
3. Design of Steel Structures - Negi, B.S. (Tata McGraw Hill India)

Reference Books:

1. Indian Standard – General Construction in Steel –Code of Practice (3rd Revision) (IS:800 – 2007)
2. Design of Steel Structures – K. S. Sai Ram (Pearson Education)
3. Structural Steel Design : LRFD Method – J. C. McCormac, J. K. Nelson (Pearson Education)
4. Limit State design in Structural Steel – M. R. Shiyekar (PHI Learning)
5. Limit State Design of Steel Structures (IS:800-2007) – V. L. Shah, V. Gore (Structures Publications)

Assessment:
Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Structural Engineering Design-II												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	3	1	1	3		3	3	2	1	2
CO2	3	2	3	1	1	3	1	3	3	2	1	2
CO3	2	3	3	1	1	3		2	3	2	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Geo-technical Engineering - II**	**Course Code:**	**CIE3222**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

The objective of this course is to to develop an understanding of concepts regarding the stability and settlement analysis of Geotechnical problems. In this course, students will understand the basics of soils through hands on experience in the Geotechnical laboratory. Some of the important topics that students will learn during the course: soil structure and grain size; identification and classification of soils for engineering purposes; physical and engineering properties of soils; fundamental behavior of soils subjected to various forces; groundwater and seepage through soils; compaction; consolidation; shear strength; and bearing capacity of soils.

Course Outcomes

The students will be able –

CO Number	Course Outcome
CO1	Analytical methods of slope stability analysis.
CO2	Study and evaluation of lateral earth pressure in soil. Stability analysis of rigid retaining structures.
CO3	Determination of bearing capacity of soil.
CO4	Geotechnical design and settlement evaluation of shallow foundations.
CO5	Design of deep foundation, selection of type of deep foundation ,design criterion for pile foundation.

Syllabus:

UNIT- I

Stability of slopes - Stability analysis of infinite slopes, Stability analysis of finite slopes, Swedish circle method, Friction circle method, Bishop's method, Taylor's stability number and use of charts, stability analysis of earth dam slopes for different conditions.

UNIT-II

Earth pressures - Earth pressure theories of lateral earth pressure, Active and passive earth pressures in cohesion less and cohesive soils, Rankine's and Coulomb's earth pressure theories Types of retaining structures, Stability considerations of gravity and cantilever retaining walls.

UNIT- III

Bearing Capacity - Terzaghi's bearing capacity theory, computation of bearing capacity in soils, Bearing capacity of Square, Rectangular, Circular and

Continuous footings, Meyerhof's theory, Skempton's method, Effect of ground water table on bearing capacity.

Foundations - Types of foundations, Depth of foundation, Design of shallow foundations from laboratory and field test data, Settlement analysis of footings.

UNIT-IV

Pile Foundation - Classification of piles, Load carrying capacity of piles, Types and methods of construction, estimation of pile capacity from static and dynamic formulae, Group action of piles, capacity and settlement of group of piles, Pile load tests. Negative skin friction.

UNIT-V

Well foundation - Types and elements of well foundation method of construction , tilts and shifts. Remedial measures.
Machine foundation - Introduction of machine foundation, types of machines and their foundations, Design criteria, Field methods of determining design Parameters, block vibration test, response of block foundations under vertical vibrations, I.S. code recommendations. **Foundation on Expansive soil** - Identification of expansive soil, contaminated soil, problems associated with contaminated and expansive soil, design consideration of foundation on expansive soil,

Text Books:

1. Ranjan, G. and Rao, A.S.R. (2016). Basic and Applied Soil Mechanics, 3rd Edition, New Age International Publishers, India.
2. Arora, K.R. (2020) . Soil Mechanics And Foundation Engineering - Geotechnical Engineering. Standard publisher dist.
3. Murthy, V.N.S. (2006). Geotechnical Engineering, Marcel Dekker Inc, New York, USA.

Reference Books:

4. Lambe, T.W. and Whitman, R.V. (1991). Soil Mechanics, John Wiley & Sons.
5. Budhu, M. (2010). Soil Mechanics and Foundations, John Wiley & Sons.
6. Gulhati S.K. and Datta, M. (2005). Geotechnical Engineering,Tata McGraw-Hill Publishing Company Limited, New Delhi,
7. Das, B.M. (2011). Principle of Foundation Engineering, 7th Edition, Cengage Learning, USA.

Assessment:
Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Geotechnical Engineering – II												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	3	1	1	3		3	3	3	3	3
CO2	3	2	2	1	1	3	1	3	3	2	2	3
CO3	3	3	3	1	1	3		3	3	3	1	3
CO4	3	2	2	1	1	3	1	3	3	3	1	3
CO5	3	3	3	1	1	3		3	3	3	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Environmental Engineering-I**	**Course Code:**	**CIE3223**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description

Environmental Engineering has its vast application and importance since the inception of civilization. This subject consists of fundamental concepts in the field of water supply along with an overview on other environmental parameters like air, noise Pollution.

Course Outcomes:

The students should be able –

CO Number	Course Outcome
CO1	An insight into the structure of drinking water supply systems, including water transport, treatment and distribution.
CO2	An understanding of water quality criteria and standards, and their relation to public health.
CO3	The ability to design and evaluate water supply project.

Syllabus:

UNIT- I

Introduction- Water Supply - Water demands and domestic use, variation in demands; population forecasting, basic needs and factors affecting consumption, design period. Sources of water and their characteristics, factors governing the selection of a source of water supply. Intakes works, numerical problems on water demand, forecasting, variation in demand and design period.

UNIT-II

Water Quality - Common impurities, physical, chemical and biological characteristics of water: Acidity, Basicity, Hardness, residual chlorine, biochemical oxygen demand, chemical oxygen demand, breakpoint chlorination, Drinking water permissible limits (Indian standard).

UNIT- III

Water Treatment-

Sedimentation- Objectives of water treatment, Theory of sedimentation, sedimentation tanks and its types, design parameters related with sedimentation tanks, sedimentation with coagulation.

Filtration- Theory of filtration, slow sand filter and rapid sand filters, pressure filters, construction and operation.

Disinfection- Methods of disinfection, Chlorination and water softening.

UNIT-IV

Hydraulic design- Hydraulic design of Conveyance main, various types of conveyance main, losses in conveyance main. Hydraulic design of elevated service reservoir.

Distribution System- Layout of distribution system, methods of distribution, distribution reservoirs, function and its types, storage capacity of distribution reservoirs. Hydraulic design of water distribution system.

UNIT-V

Air & Noise Pollution-

Air Pollution- Sources, classification, characteristics, effects. Air pollution control systems: Classification and types, Standards and limits, Introduction to particulate emission control Equipment-Gravitational settling chamber, Cyclone separator, Fabric filter, Electrostatic precipitator, Wet scrubbers.

Noise Pollution- Sources, effects, permissible limits and control of noise pollution.

Text Books:

1. Environmental Engineering, Vol. I , Garg .S.K. Khanna Publications, New Delhi.
2. Water supply and sanitary engineering. Birdie G. S. and Birdie J. S. Dhanpat Rai Publications.

Reference Books:

1. Environmental Engineering- Peavy, Howard S., Rowe, Donald R and Tchobanoglous, G. McGraw Hill Education (India) Pvt. Ltd., New Delhi.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Environmental Engineering												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcome	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	2	3	2	3	3	3	2	3	3	3
CO3	3	3	3	3	3	3	2	3	3	2	2	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Design of Bridge Structures**	**Course Code:**	**CIE3224(1)**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

This course in Bridge engineering generally introduces the fundamental concepts, principles and application of superstructure and substructure analysis and design for the undergraduate students of civil engineering. This course "Bridge Engineering" goes deeper into the various aspects of Bridge engineering along with bringing out the theories and knowledge of Bridge engineering.

Course Outcomes:

The students should be able –

CO Number	Course Outcome
CO1	At the end of this course students will be able to design different types of RCC bridges, Steel bridges and pre-stressed concrete bridges with the bearings and substructures.

Syllabus:

UNIT- I

Introduction - History of Bridges, Components of a Bridge and its definitions, Classification of Road Bridges, related structures, span length importance of bridge, selection of bridge site, preliminary data to be collected, design discharge and its determination, linear waterway, economical span, vertical clearance above HFL, scour depth, choice of bridge type.

UNIT-II

Reinforced Concrete Slab Bridges - Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges – Illustrative design example of solid slab bridge and tee beam bridge for IRC loading.

UNIT- III

Steel Bridges - Design of through type steel highway bridges for IRC loading. Illustrative design example of stringers, cross girders and main girders design.

UNIT-IV

Prestressed Concrete Bridges - Design of girder section, maximum and minimum pressurising forces, Eccentricity, Live load and dead load shear forces, Cable Zone in girder, check for stresses at various sections, check for diagonal tension, Diaphragms, End block, short term and long term deflections.

UNIT-V

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

Bearing and Joints: Various types of expansion bearing and fixed bearings, elastomeric bearings, joints and their types.

Text Books:

1. Victor D J "Essentials of Bridge Engineering" Oxford and IBH Publishers, New Delhi, 2003.
2. Vazirani & Ratwani "Design of Concrete Bridges, Khanna Publishers, New Delhi, 1986.
3. Bindra S P "Principles and Practice of Bridge Engineering" Dhanpat Rai & sons, New Delhi, 1999.
4. Punmia B.C., Jain A.K.," Design of Steel Structure", Laxmi Pub.(P) Ltd.,2009.

Reference Books:

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S," Bridge Engineering" Tata McGraw Hill, New Delhi,2003.
3. Punmia B.C., Jain A.K.,"RCC Designs", Laxmi Pub.(P) Ltd.,2003
4. Jagadeesh.T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd. 2004.
5. Johnson Victor, D. "Essentials of Bridge Engineering", Oxford and IBH Publishing Co. New Delhi, 2001.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Design of Bridge Structures												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	3	2	2	3	1	3	3	2	1	3

Note: 1: Low 2: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109
Department of Civil Engineering

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Traffic Engineering**	**Course Code:**	**CIE3224(2)**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description
Introduction to traffic engineering includes analysis, operation, and control associated with traffic studies, basics of traffic signal design and phase timing, analysis and design of pre-timed and actuated signalized intersections, signal coordination for arterials, etc.

Course Outcomes:
The students should be able –

CO Number	Course Outcome
CO1	Problem and remedial measures in mixed traffic in a developing country.
CO2	Traffic characteristics in detail.
CO3	It will help in reducing accidents.
CO4	Geometric design of road and road lighting.
CO5	Controlling the different pollution occurring on road.

Syllabus:

UNIT- I

Traffic Characteristics - Introduction-The project life cycle-Major Types of Construction-Selection of Professional Services, Construction contractors-Financing of constructed facilities-Legal and regulatory Requirements-The changing Environment of the construction Industry-The Role Project Managers.

UNIT-II

Traffic Studies - Spot Speed Studies and Volume Studies. Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. Origin and destination Studies (O& D): Various methods, collection, and interpretation of data, planning, and sampling. Traffic.

Capacity Studies - Volume, density, basic practical and possible capacities, level of service. Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

UNIT- III

Traffic Operations and Control - Traffic regulations and various means of control. One-way streets-advantages and limitations. Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible, and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval, and problems on the single isolated traffic signal.

UNIT-IV

Accident Studies & Mass Transportation - Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. Expressways and freeways, problems on mass transportation and remedial measures, a brief study of mass transportation available in the country.

UNIT-V

Traffic Management - Transportation System Management (TSM) - Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes,

Text Books:

1. Textbook of Highway and Traffic Engineering, S. C. Saxena, 2020, Publishers and Distributions Pvt. Ltd.
2. Traffic Engineering and Transport Planning, L.R. Kadiyali,1987, Khanna Publishers, Delhi, Third Edition.

Reference Books:

1. Traffic Engineering Handbook, B. Wolshon and A Pande, 2016, Institute of Transportation Engineers, John Willey and Sons, Seventh Edition.
2. Traffic and Transportation Planning, Samuel Morgan, 2016, Willford Press,
3. Transport Planning and Traffic Engineering, Flaherty, CAO'(Ed.), 2006, Elsevier Butterworth Heinemann, Sixth Edition.
4. Traffic Flow Fundamentals, A.D. May, 1990, Prentice-Hall, Englewood Cliffs, New Jersey.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Traffic Engineering												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	3	3	3	3	2	3	3	2	3	3
CO2	3	2	2	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

Note: 1: Low 2: Moderate 3: High

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Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Solid Waste Management**	**Course Code:**	**CIE3224(3)**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

This course covers engineering and scientific concepts and principles applied to the management of municipal solid waste (MSW) to protect human health and the environment and the conservation of limited resources through resource recovery and recycling of waste material. Topics include regulatory aspects and hierarchy of integrated solid waste management; characterization and properties of MSW. Municipal solid waste collection, transfer, and transportation, separation, processing, combustion, composting, and recycling of waste material; and the landfill method of solid waste disposal.

Course Outcomes:

The students should be able -

CO Number	Course Outcome
CO1	Identify key sources, typical quantities generated, composition, and properties of solid and hazardous wastes.
CO2	Identify waste disposal or transformation technics (landfills and incinerators).
CO3	Recognize the relevant regulations that apply for facilities used for disposal, and destruction of waste.
CO4	Conduct invasive and non-invasive site investigation and understand permitting process for constructing landfills.
CO5	Identify and design Solid and Hazardous Waste Landfills (RCRA Subtitle D and C) including closure, post-closure, and rehab issues.
CO6	Estimate typical waste disposal costs; and
CO7	Identify recycling and reuse options (composting, source separation, and re-use of shredded tires, recycled glass, fly ash, etc.).

Syllabus:

UNIT- I

SOLID WASTE - Definition of solid wastes, types of solid wastes, sources of solid wastes, characteristics of solid wastes, physical, chemical and biological characterization, methods of sampling, factors affecting the generation of solid waste, effects of improper disposal of solid waste - public health effects, impact on environmental health, future challenges and opportunities.

UNIT-II

SOLID WASTE MANAGEMENT - Principle of solid waste management, hierarchy of waste management options, integrated solid waste management, physical and chemical composition of municipal solid waste, different methods for generation rates, quantity assessment of solid wastes. Storage- movable bins, fixed bins.

Collection- home to home collection, community bin system. Theory and design of hauled container system, stationary container system.

UNIT- III

TRANSFER AND PROCESSING TECHNIQUES - Transfer stations-types and selection of location, operation and maintenance, labeling and handling of different solid wastes-hazardous waste, biomedical wastes, radioactive waste, E-wastes. Transport means- handcart, tri-cycle, animal cart, tripper truck, dumper placer, bulk refuse carrier, railroad transport. Engineering system for on-site handling and processing of solid waste- separators, size reduction equipment's, screening equipment's, densification, baling, cubing, pelleting equipment's.

UNIT-IV

COMPOSTING - Biological and chemical techniques for energy and other resource recovery: composting, types of composting, process description, design and operational consideration of anaerobic composting, vermicomposting, termiradation, fermentation, incineration and pyrolsis system- theory and types, its by-products.

UNIT-V

LANDFILLING - Dumping of solid waste, site selection criteria, landfill layout, landfill sections, occurrence of gases and leachate in landfills- composition and characteristics and its control, control of contamination of ground water. Solid waste management rules, status of solid waste management in India, cost economics of solid waste management.

Text Books:

1. Tchobanoglous, G., Theisen, H., & Vigil, S.A; Integrated Solid Waste Management: McGraw Hill, New York
2. Bhide, A.D., B.B. Sundaresan, Solid Waste Management in developing countries

Reference Books:

1. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.
2. Datta, M; Waste Disposal in Engineered Landfills, Narosa Publishers, Delhi.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Traffic Engineering												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	1	1	1	3	1	3	1	3	3	3
CO2	3	3	3	1	1	3	3	3	3	2	3	3
CO3	3	3	2	1	1	3	3	3	1	2	3	3
CO4	2	3	2	1	1	3	1	3	3	2	3	3
CO5	2	3	2	1	1	3	1	3	3	2	3	3
CO6	1	2	1	2	3	2	1	3	1	2	3	3
CO7	3	3	3	1	2	3	3	3	1	2	3	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Computer Methods in Structural Analysis**	**Course Code:**	**CIE3224(4)**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

This course helps students to Understand the fundamental concepts and theories of Matrix Methods which is prominently used to analysis of skeletal structures such as beams, plane and space trusses, and plane and space frames. it also make students to understand the fundamental concepts and theories of Finite Element Methods for analysis of continuum structures such as plane stress, plane strain and competence in applying these theories to solve problems manually as well as using computer programs.

Course Outcomes

The students should be able -

CO Number	Course Outcome
CO1	Understand the fundamental concepts and theories of Matrix Methods for analysis of skeletal structures.
CO2	Understand the fundamental concepts and theories of Finite Element Methods for analysis of continuum structures such as plane stress, plane strain.
CO3	Competence in developing computer program for skeletal structures.

Syllabus:

UNIT- I

Introduction - Introduction and Review of Structural Mechanics, Stiffness Method : Element wise Approach (Element Stiffness Matrices, Transformation Matrices and Transformation Process). Stiffness Method – Element-wise Approach (Assembly Process, Incorporation of Boundary Conditions, Solution Technique, Determination of Member Forces).

UNIT-II

FEM - Historical Background - Basic Concept of FEM - Engineering problems and governing differential equations – Finite element modelling – Discretisation - Node, Element - different types of element – Approximate Solutions.

UNIT- III

Finite Element Analysis of One Dimensional Problem - One dimensional problems - Coordinate systems – global, local and natural coordinate systems, shape functions – Bar, beam and truss element - Generation of Stiffness Matrix and Load Vector.

UNIT-IV

Finite Element Analysis of Two Dimensional Problems - Two Dimensional problems – Plane Stress, Plane Strain Problems – Triangular and Quadrilateral Elements – Isoperimetric Formulation - Natural Coordinates, Shape function, stiffness matrix.

UNIT-V

Introduction to Software - Introduction to structural analysis Software (STAD Pro). Analysis of beams, plane and space trusses, plane and space frames. (Reaction, displacements)

Text Books:

1. Concepts and Application of Finite Element Applications, 4th Edition, R.D. Cook, D.S. Malkus, M.E. Plesha and R.J. Witt, John Wiley
2. J.N. Reddy, An Introduction to the Finite Element Method, McGraw Hill, International Edition, 1993.
3. Matrix Methods of Structural Analysis by S. S. Bhavikatti Paperback.

Reference Books:

1. S.S.Rao, “Finite Element Method in Engineering”, Pergamon Press, 1989.
2. Chandrupatla & Belagundu, “Finite Elements in Engineering”, Prentice Hall of India Private Ltd., 1997.
3. Matrix Analysis of Framed Structures by William Weaver, Jr. James M. Gere Paperback Second Edition.
4. C.S.krishnamoorthy, “Finite Element Analysis”,”Theory and Programming:, Tata McGrawHill, 1995
5. Matrix Methods of Structural Analysis by Dr. P. N.Godbole, R.S.Sonparote, S.U. Dhote. Eastern Economy Edition.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Computer Methods in Structural Analysis												
	Program Outcome (PO)								**Program Specific Outcome (PSO)**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**	**3**	**3**		**1**	**3**		**1**	**3**	**2**	**1**	**3**
CO2	**3**	**3**	**3**		**1**	**3**		**1**	**3**	**2**	**1**	**3**
CO3	**3**	**3**	**3**	**1**	**1**	**3**		**1**	**3**	**3**	**3**	**3**

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Maintenance, Repair and Rehabilitation of Civil Engineering Structures (MRCS)Analysis**	**Course Code:**	**CIE3224(5)**
Credits :	**4**	**No of Hours**	**55**
Max Marks:	**100**		

Course Description

This course gives the knowledge of various methods of repairing and testing of various structures. Introduction to different methods of design of elements of RCC. And steel structures. This course gives also idea about Damage assessment and Evaluation, Damage testing methods. It also emphasized on the safe, efficient and economical Maintenance, Repair and Rehabilitation of Civil Engineering Structures.

Course Outcomes

The students should be able -

CO Number	Course Outcome
CO1	After the completion of this course the participants would gain the knowledge of various methods of repairing and testing of various structures.

Syllabus:

UNIT- I

Performance of structures
Need for rehabilitation
Aging of structures
Distress in concrete steel structures

UNIT-II

Damage assessment and Evaluation models
Damage testing methods – NDT, Core samples – Methods of repairs - Repair and maintenance of buildings

UNIT- III

IS standards - Bridge repairs - Seismic strengthening

UNIT-IV

Rehabilitation methods - grouting – detailing
Imbalance of structural stability

UNIT-V

Case Study1: Residential Building
Case Study 2: Industrial Building.

Text Books:

1. Repair and Rehabilitation of Concrete Structures by Poonam I. Modi. And Chirag N. Patel
2. Maintenance, Repair & Rehabilitation & Minor Works of Buildings by Varghese

Reference Books:

1.RN Raikar, "Diagnosis and treatment of Structures in Distress", R and D Centre, Structural Designers and Consultants, New Bombay, India,1994.
2. VK Raina, "Concrete Bridge Practice Construction, Maintenance and Rehabilitation", 2nd Edition, Shroff Publishers and Distributors, August, 2010.
3. WH Ransom, "Building Failures, Diagnosis and Avoidance", 2nd Edition, E and F.N. Spon Publishers, December 1987.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Maintenance, Repair and Rehabilitation of Civil Engineering Structures (MRCS)												
	Program Outcome (PO)								**Program Specific Outcome (PSO)**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**	**3**	**3**	**1**	**1**	**3**	**1**	**3**	**2**	**2**	**1**	**3**

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Remote Sensing and GIS in Civil Engineering Analysis**	**Course Code:**	**CIE3224(6)**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

This course illustrates the fundamental concepts of GIS and remote sensing technologies in the context of environmental engineering. Topics include the physical basis for remote sensing, remote sensing systems, digital image processing, data structures, database design, and spatial data analysis.

Course Outcomes

The students should be able –

CO Number	Course Outcome
CO1	To know the importance and areas of application of GIS.
CO2	Use GIS to identify, explore, understand, and solve spatial problems c.
CO3	Demonstrate GIS modeling skills d. Demonstrate critical thinking skills in solving geospatial problems.
CO4	Design and implement a GIS project.

Syllabus:

UNIT- I

Basic Concept of GIS - Introduction, Information systems, spatial and non-spatial information, Geographical concepts and terminology, Advantages of GIS, Basic components of GIS, Organization of data in GIS, Hardware & Software.

UNIT-II

GIS Data - Input data, Field data, Statistical data, Maps, Aerial photographs, Satellite data, Points, lines and areas features, Vector and Raster data, Advantages and Disadvantages, Data entry through keyboard, digitizers and scanners, Digital data, GIS data formats and standards. Data Management, Data Base Management System (DBMS), various data Models, Run – length encoding, Quadtrees, Data Analysis – Data layers, analysis of spatial and non-spatial data, Data overlay and modelling, smart features of DBMS.

UNIT III

Applications of GIS - Applications of GIS in Map Revision, Land use, Agriculture, Forestry, Archaeology, Municipal, Geology, Water Resources, Soil Erosion, Land suitability analysis, Change detection.

UNIT IV

Fundamentals of Remote Sensing - Concept of Remote Sensing, Principal of Remote Sensing, Components of Remote Sensing, Seven Elements in Remote Sensing, Characteristics of Electromagnetic Radiation.

UNIT V

Platforms Ground - Based Platforms, Aerial Platforms, Satellite Platforms, Types of Remote Sensing, Passive Remote Sensing, Active Remote Sensing, Thermal Infrared Remote Sensing, Elements of Visual Interpretation, Digital Image Processing, Remote Sensing in India.

Text Books:

1. Satheesh,G. Sathikumar,R. and Madhu,N.(2007). Advanced Surveying, EARSON Education, South Asia.

Reference Books:

1. Campbell, J.B.(1986).Introduction to Remote Sensing.The Guilford Press, London.
2. Horwood,E.(1992).Remote Sensing and Geographic Information Systems.The Guilford Press, London,

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Remote Sensing and GIS in Civil Engineering												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	1	1	2	1	3		3	1	1	2	3
CO2	3	3	3	3	1	3		3	2	2	1	3
CO3	3	3	2	1	1	3		3	1	2	3	3
CO4	3	3	3	3	1	3		3	2	2	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Urban Infrastructure**	**Course Code:**	**CIE3224(7)**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

This course is designed to provide a comprehensive understanding of physical and organisational structures needed for the operation of an urban area, as well as the services and facilities necessary for society and the economy to function. Also to orient students to the basic planning concept that governs the infrastructure need in urban area, new township and SEZ Development.

Course Outcomes:

The students should be able -

CO Number	Course Outcome
CO1	Students are expected to understand planning of urban infra structures.
CO2	Students are expected to understand concept of town planning and urban infrastructure.
CO3	Students are expected to understand concept of SEZs.
CO4	Students are expected to understand services in Urban Infrastructure.

Syllabus:

UNIT- I

Urban Infrastructure - Understanding of different types of urban infrastructures in planning, layout of service lines and interface.

UNIT-II

Urban Infrastructure - Understanding of different types of urban infrastructures in planning, layout of service lines and interface.

UNIT- III

Urban Environment - Social infrastructure; disaster management; Land Pooling and Land banking.

UNIT-IV

Township Principles and Town planning - Growth of towns, Stages in town development, current trends in township project, planning of township, requirement of new town, master plan, survey, neighbourhood planning, public utility in services existing town**.**

UNIT-V

SEZ - About SEZ, Legislative policies, setting up of SEZs, Routine operation of SEZ, Tax incentives, Infrastructure requirements for SEZ.

Text Books:

1. Chaturvedi, T, (2007), Guide to special Economic Zones, Commercial Law Publisher
2. Gupta K (2008), Law and Procedure, Township, Atlantis Publisher
3. Osborn, F.J. Whittick A. (1969), The New town, The answer to megalopolis, Leonard Hill

Reference Books:

1. Indian Infrastructure report 2009, Land as a resource.
2. Municipal and Rural Sanitation / EHBEN, V M
3. Solid Liquid flow Slurry pipeline Transportation / WASPE, E J

Assessment:
Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Urban Infrastructure												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	3	1	2	3	2	3	3	2	3	3
CO2	3	2	3	1	2	3	2	3	3	3	1	3
CO3	2	2	2	1	2	3	1	3	2	2	2	3
CO4	3	1	1	2	1	3	1	3	3	2	2	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Town Planning**	**Course Code:**	**CIE3224(8)**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description

This course gives Introduction to Goals and Objectives of planning; components of planning; benefits of planning, Levels of planning: Regional plan , Development Plan, Town Planning Scheme, Neighborhood plan ,Types of Development plans, Master Plan, City Development Plan, Structure Plan. Special townships, Land Acquisition Rehabilitation and Resettlement Act

Course Outcomes

The students should be able –

CO Number	Course Outcome
CO1	To develop a planning; components of planning; benefits of planning, Levels of planning: Regional plan, Development Plan, Town Planning Scheme, Neighborhood plan, Types of Development plans, Master Plan, City Development Plan, and Structure Plan. Special townships, Land Acquisition Rehabilitation and Resettlement Act.
CO2	To understand the basis of economical and safe Town planning.
CO3	To develop ability of choosing proper Development plans.
CO4	To make use of knowledge of analysis in structural planning and design of various components of buildings.

Syllabus:

UNIT- I

Architectural Elements - Principles and elements of Architectural Composition, Qualities of Architecture: user friendly, contextual, ecofriendly, utility of spaces, future growth etc. Role of "Urban Planner and Architect" in planning and designing in relation with spatial organization, utility, demand of the area and supply

UNIT II

Landscaping - importance, objectives, principles, elements, material (soft and hard),

Urban renewal for quality of life and livability. Importance of sustainable architecture with case study

UNIT III

Goals and Objectives of planning - components of planning; benefits of planning, Levels of planning: Regional plan, Development Plan, Town Planning Scheme, Neighborhood plan; Types of Development plans: Master Plan, City Development Plan, and Structure Plan

UNIT IV

Various types of civic surveys for DP - demographic, housing, land use, Water Supply & sanitation, etc., planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc). Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems.

UNIT V

Legislative mechanism for preparation of DP - MRTP Act 1966, UDPFI guidelines (for land use, infrastructure etc),SEZ, CRZ, Smart City Guidelines, Special townships, Land Acquisition Rehabilitation and Resettlement Act 2013, Application of GIS, GPS, remote sensing in planning.

Text Books:

1. Town Planning By G K Hiraskar --Town Planning By S Rangwala
2. Building Drawing and Built Environment- 5 Th Edition – Shah , Kale , Patki --- Planning Legislation By Koperdekar And Diwan.
3. G. K. Bandopadhyaya , "Text Book of Town Planning".
4. Climate Responsive Architecture – Arvind Krishnan.
5. Introduction To Landscape Architecture By Michael Laurie

Reference Books:

1. MRTP Act 1966
2. Manual Of Tropical Housing And Building By Koenigsbeger
3. Sustainable Building Design Manual
4. UDPFI Guidelines
5. "The Urban Pattern: City planning and design" by Gallion and Eisner.
6. Design of cities by Edmond bacon
7. LARR Act 2013
8. MoUD By GoI
9. NRSA

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Town Planning												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	3	3	3	3	2	3	3	2	3	3
CO2	2	1	3	3	2	3	3	3	2	2	2	3
CO3	2	1	2	1	3	3	3	2	1	1	2	2
CO4	2	3	3	1	2	3			1	2	2	2

Note: 1: Low 2: Moderate 3: High

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Department of Civil Engineering

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Systems Approach in Civil Engineering Analysis**	**Course Code:**	**CIE3224(9)**
Credits :	**4**	**No of Hours**	**55**
Max Marks:	**100**		

Course Description

This course deals with the extremely important topics under the broad umbrella of optimization. This is synonymous with efficiency which is the underlying prime rationale for all scientific and technological advances and progress.

Course Outcomes

The students should be able -

CO1	The characteristics of different types of decision-making environments and the appropriate decision-making approaches and tools to be used in each type.
CO2	Transportation Models and Assignment Models.
CO3	New simple models, like CPM, MSPT to improve decision–making and develop critical thinking and objective analysis of decision problems.

Syllabus:

UNIT- I

Introduction-

a) Introduction to system approach, Operations Research and Optimization Techniques and their application in Civil Engineering.

b) Introduction to Linear and Non-Linear Programming methods, Graphical Solutions to Linear Programming.

c) Various models, Objective function and constraints, convex and concave functions, regions, and sets.

UNIT II

Linear programming-

a) Formulation of Linear optimization models for Civil engineering applications.
b) The simplex method, special cases in simplex method, Method of Big M, Two-phase method, duality, and sensitivity analysis.
c) The Transportation Model and its variants, Assignment Model, and its variants.

UNIT III

Non-Linear programming -

a) Single variable unconstrained optimization –Local & Global optima, uni-modal function.

b) Queuing Theory.

UNIT IV

Sequencing model, Simulation- Monte Carlo Simulation, Games theory.

UNIT V

Dynamic programming - Multi-stage decision processes, Principle of optimality, recursive equation, Applications, various models of D.P.

Text Books:

1. Engineering Optimization: Theory and Practice, S. S. Rao, 2013, New age International Publisher, Third Edition.
2. Quantitative Techniques in Management, N.D. Vohra, 2017, McGraw Hill, Fifth Edition

Reference Books:

3. Operations Research, Hamdy A. Taha, 2019, Pearson, Tenth Edition.
4. Topics in Management Science, Robert E. Markland, 1989, Wiley Publication, Third Edition.
5. System Approach to Civil Engineering Planning & Design, Thomas K. Jewell, 1986, Harper Row Publishers.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Systems Approach in Civil Engineering												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2		2		2	2	3			1	1
CO2	3	3	3			1		2	2	2		2
CO3	2	2	3		3	1		1	2	2	1	1

Note: 1: Low 2: Moderate 3: High

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Department of Civil Engineering

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Structural Engineering Design-II Lab**	**Course Code:**	**CIE3225**
Credits:	**2**	**No of Hours:**	**30**
Max Marks:	**100**		

Course Description

Structural Engineering Design–II Lab emphasized on the safe, efficient and economical design of some major elements of the infrastructure which are made up of steel and RCC material.

This course gives Introduction to different methods of design of elements of steel and RCC structure, principally aimed to introduce the students about various elements of steel and RCC structure and their behavior under applied load. It makes student aware about the concepts of selection of cross section to transmit design load without risk of failure.

Course Outcomes

The students should be able –

CO Number	Course Outcome
CO1	To develop ability to select adequate shape and grade of structural steel.
CO2	To understand the basis of economical and safe design of steel structures.
CO3	To develop ability of choosing proper fastener for a particular joint.
CO4	To make use of knowledge of analysis in structural planning and design of various components of buildings.

Syllabus:

By using latest version of a Standard Structural Engineering Design Package such as STAAD Pro.

RCC DESIGN:

1. Introduction
2. Geometrical Modelling of RCC
3. Modelling of loads and load combinations on RCC Frame
4. Analysis and Interpretation of Results of Analysis of RCC Frame
5. Design of RCC Frame
6. Interpretation of Results of Design of RCC Frame

STEEL DESIGN:

1. Geometrical Modelling of Steel Frame
2. Modelling of loads and load combinations on Steel Frame
3. Analysis and Interpretation of Results of Analysis of Steel Frame
4. Design of Steel Frame
5. Interpretation of Results of Design of Steel Frame

CASE STUDY:

1. Case Study of design of a RCC Multistorey Building

2. Case Study of design of a Steel Industrial Building

List of Equipment's / Machine Required:

1. Latest Release of Software Package STAAD Pro (Research Engineers International, Kolkata)
2. Latest Release of Software Package STAAD.etc (Research Engineers International, Kolkata)

Recommended Books:

1. Reference Manual for Respective Software
2. Verification Manual of Respective Software

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Systems Approach in Civil Engineering												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	2	2			2			2	1		3
CO2	3	3	3			2			2	2		2
CO3	3	3	2			2			3	2		3
CO4	3	3	3			3			3	3		3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Geotechnical Engineering Lab - II**	**Course Code:**	**CIE3226**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description

Geotechnical laboratory is to determine engineering properties of soil which are required for suitable design of foundations for any structure. The engineering properties include consolidation, compressibility, shear strength and bearing capacity of soil. By evaluating the properties of soil in the laboratory, students will be able to relate the concepts studied in the relevant theory course. Also students can utilize the knowledge of both theory and practical in the field application to real problems. In this laboratory both laboratory and in-situ experiments can be conducted. This laboratory course will help the students to understand the theoretical concepts learned in the course Geotechnical Engineering.

Course Outcomes

The students should be able –

CO Number	Course Outcome
CO1	Be able to plan and implement a site investigation program including subsurface exploration to evaluate soil/structure behavior and to obtain the necessary design parameters.

Syllabus:

List of Experiments:

1. Direct shear Test on the
   (i) Dry cohesionless /cohesion soil specimen remoulded/unremoulded.
   (ii) Direct shear Test-undained test, direct shear test –consolidated undrained .
2. Determination of Unconfined compression Strength of cohesive soils (Remoulded/ Unremoulded).
3. Triaxial compression Test (Triaxial compression Test) (i) UU, (ii) CU, (iii), CC.
4. Laboratory Vane Shear Test (remoulded /unremoulded).
5. Study of standard penetration.
6. Determination of coefficient of consolidation by consolidation test.
7. Determination of bearing capacity of soil by plate load.
8. Field identification test.
9. Soil sampling.
10. Determination of swelling pressure of purely cohesive soil (remoulded /unremoulded specimen).
11. Determination of density index (relative density) of cohesion less soils.

Recommended Books:

1. Respective Bureau of Indian Standard/ International Standard Codes of Practices.
1. Bowles, J.E. (2012). Engineering Properties of Soil and their Measurement, 4th Edition, McGraw Hill (India) Publishers.

2. Mandal, J.N. and Divshikar, D.G. (1994). Soil Testing in Civil Engineering, Oxford & IBH Publishing Company Pvt. Ltd., New Delhi, India.
3. Sivakugan, N., Arulrajah, A. and Bo, M.W. (2011). Laboratory Testing of Soils, Rocks and Aggregates,

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Geotech Engineering -II												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO 1	3	3	2			3		3	2	3	1	3

Note: 1: Low 2: Moderate 3: High

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Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Environmental Engineering -I Lab**	**Course Code:**	**CIE3227**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**100**		

Course Description

To understand the sampling, preservation methods and significance of characterization of water.

Course Outcomes:

Students will be able to:

CO Number	Course Outcome
CO1	The students completing the course will be able to characterize water and conduct experiments by preparing reagents for the test.

Syllabus:

List of Experiments

(At least ten experiments are to be performed by every student)

1. Determination of pH and Turbidity of water sample.
2. Determination of Acidity and Alkalinity of water sample.
3. Determination of Chloride Content of water sample
4. Determination of Hardness of water sample.
5. Determination of DO Content of water sample.
6. Determination of Optimum Coagulant dose of water sample.
7. Determination of Total Solids in water sample.
8. Determination of COD in water sample
9. Determination of BOD of water sample
10. Determination of Fluoride content in water sample.
11. Determination of Nitrates in water sample.
12. Determination of air quality of nearby area.
13. Determination of noise level of the selected area.
14. Field visit of water treatment plant of a nearby area.

Recommended Books:

1. Garg, S.K. 'Environmental Engineering', Vol. I , Khanna Publications, New Delhi.

Assessment:

Assessment will be based on a combination of attendance, class work, tutorials, assignments and exams.

CO-PO & PSO Correlation

Course Name: Environmental Engineering Lab												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3	3	1			3		3	2	3		3

Note: 1: Low 2: Moderate 3: High

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Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Professional Development (Employability Skills-I)**	**Course Code:**	**PFD3206**
Credits :	**1**	**No of Hours :**	**30**
Max Marks:	**100**		

Course Description

Employability is a course for engineering students, designed to develop the knowledge and skills necessary to prepare for the career development. Knowledge of the factors involved in these roles is vital for preparing students to make informed and competent decisions regarding career and family life. This course focuses on the development of the transferable skills students need in job and life situation tasks. These skills include: basic academic skills, thinking skills, personal qualities, use of resources, interpersonal skills and using information.

Course Outcomes

The students should be able –

CO Number	Course Outcome
CO1	Explore their values and career choices through individual skill assessments
CO2	To make realistic employment choices and to identify the steps necessary to achieve a goal.
CO3	To develop and practice self-management skills for the work site
CO4	To explore and practice basic communication skills
CO5	To learn skills for discussing and resolving problems on the work site
CO6	To assess and improve personal grooming
CO7	To promote safety awareness including rules and procedures on the work site.

Syllabus:

UNIT-I.

Career Exploration –

a. Career Clusters

b. Interest Inventory-Career Cruising

c. Career Cruising – My Portfolio

UNIT-II.

Finding a Job -

a. Job Sources

b. Networking and Personal Contacts

c. Entrepreneurship

UNIT-III.

Job Search Skills -

a. Resume Writing

b. Letter of Application

c. Job applications d. Interviews e. Professional Dress

UNIT-IV.

Employer/Employee Relationships -

a. Communication skills b. Transferable work skills
c. Positive work skills
d. Conflict resolution
e. Workplace legal issues
f. Work ethic

UNIT-V.

Small Business -

a. Small business types
b. Entrepreneurship
c. Business plan

Recommended Books:

1. Soft Skills" by Hariharan S. , S. N.Sundararajan, and S.P.Shanmugapriya, Mjp Publishers
2. "Soft Skills: Know Yourself and Know the World" by Alex
3. "Making Work Work for the Highly Sensitive Person" by Beverly Jaeger, McGraw-Hill Education
4. "Enhancing Soft Skills" by Dipali Biswas, Shroff; First edition
5. " Soft Skills – Enhancing Employability: Connecting Campus with Corporate " by M. S. Rao, I K International Publishing House Pvt. Ltd
6. " Enhancing Employability @ Soft Skills " by Shalini Verma, Pearson Education; First edition
7. "Get your First Job: A companion for getting your first job – A Guide to Employability Skills and Career Planning " by A J Balasubramanian and Dr J Sadakkadulla, Amazon Asia-Pacific Holdings Private Limited
8. " Soft Skills at Work: Technology for Career Success " by Beverly Amer, Course Technology Inc
9. " BEST: Basic Employability Skills Training: Volume 1 " by Sally J. Vonada and JoAnn Brunner, CreateSpace Independent Publishing Platform
10. " Personal Transferable Skills in Accounting Education RPD " by Kim Watty and Beverley Jackling, Routledge; 1 edition
11. "How to develop a pleasing personality" by Atul John Rego, Better yourself bools, Mumbai,2006

Assessment:

The assessment of Employability Skills-I course will be done in two parts (Components). Following table shows the weightage of respective components of assessment:

S. No.	Component	Weightage (%)
1	Assignment & Test	**15**
3	End Semester Examination	**10**
	Total Marks	**25**

1. **Assignment & Test:** Two assignments and one test

2. **End Semester Examination:** The End Semester Examination will be held normally after completion of teaching. The End Semester Examination will be of three hours duration and the question paper will consist of three sections. The details are shown in the following table:

S. No.	Section	Description	Time Allowed	Weightage (%)
1	**A**	10 Multiple Choice Questions	30 Minutes	**20**
2	**B**	Short Response Questions (All Compulsory)	2 Hours 30 Minutes	**40**
3	**C**	Three Extended Response Questions from a choice of Four questions		**40**

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Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Water Resources Engineering-I**	**Course Code:**	**CIE4128**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description:

The subject of Water Resources Engineering-I involves different types of irrigation systems and water requirements of crops, about water logging, concepts of river training. And concepts of design of canal. A thorough understanding of the underlying principles is useful to civil engineers with several applications such as plan the reservoir for different demands.

Course Outcomes:

Students Will Be Able To**:**

CO Number	Course Outcome
CO1	Students are able to understand the different types of irrigation.
CO2	Students should be able to design the canal.
CO3	Students can explain the effects of water logging.
CO4	Students should be able to understand the behavior of river.
CO5	Students can plan the reservoir for different demands.

Syllabus

UNIT- I

Methods of Irrigation and Water Requirements of crops

Need for Irrigation, Advantages and Disadvantages of irrigation, development of irrigation in India. Types of Irrigation systems – Flow Irrigation, Tank Irrigation, Tube Well Irrigation. Design of Lift irrigation with Problem. Soil-Water-Crop relationship, Soil groups in India. Methods of Irrigation: Introduction, requirement of irrigation methods, surface and sub surface irrigation, sprinkler and drip irrigation. Water Requirement of Crops: Introduction, Water requirement of crop, quantity of water for irrigation, consumptive use of water or evapo-transpiration, crop season and crops of India, crop period and base period, delta, duty of water, relationship between delta duty and base period, factors affecting duty, methods of improving duty, Intensity of irrigation, irrigation requirement of crops.

UNIT- II

Canal Irrigation

Classification of canal, parts of canal irrigation system, canal alignment, layout of canal system, typical canal cross section, command areas, losses in irrigation systems, and water requirement of irrigation channels. Design of Stable Channel sin Alluvium: Introduction, Kennedy's silt theory, Garret's diagram, Lacey's Theory, Lacey's regime equations, Lacey's shock theory, Design of channels by Kennedy's and Lacey's theories, Use of Lacey's diagrams, maintenance of Irrigation channels, sediment transport, silting of canals and its control.

UNIT -III

Water Logging and its Control

Causes and ill effects of water logging, prevention and control, reclamation of water logged and saline lands, surface drainage. Design of Lined Channels: Introduction, benefits of lining, types of lining, economics of lining, procedure and design of lined canals .Distribution of canal waters: System of regulation and control, requirement of a good outlet, types of outlet.

UNIT- IV

River behavior, Control and Training

Objects, river characteristics, river patterns, classification of river training works, methods of river training embankments, bank protection, spurs, cutoffs, pitched, island, river diversion, meandering causes and parameters. Flood Control: Introduction, Flood estimation, levee sand embankments, channel improvement, flood ways evacuation and flood plain zoning, economics of flood control, National Policy of floods, flood forecasting.

UNIT-IV

Quality Assurance and Control : Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors influencing construction quality – Critical, major failure aspects and failure mode analysis, – Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction.

UNIT-V

Reservoir Planning

Introduction, Type of reservoirs, storage zones of a reservoir, mass curve and demand curve, determination of reservoir capacity, safe field. Flood Routing:

Graphical method, trial and error method, reservoir losses, reservoir sedimentation, life of reservoir, environmental effects of reservoirs.

Text Books:

1. Irrigation Engineering and Hydraulic Structures–S.K. Garg (Khanna Publications)

2. Irrigation Engineering–B.C. Punmia (Laxmi Publications)

Reference Books:

1. Irrigation, Water Resources and Water Power Engineering–Dr. P.N. Modi (Standard Book House)

2. Theory and Design of Irrigation Structures (Volume–I &II) –Varshney (Nem Chand & Bros.)

3. Irrigation Engineering–Asawa G.L.(New Age International Publications)

4. Fundamentals of Irrigation Engineering–Bharat Singh (NemChand&Bros.)

CO-PO-PSO mapping

	Course name: Water Resources Engineering-I											
Graduate attributes	**Program outcome**								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**	**2**		**3**		**2**	**2**	**2**		**1**	**2**	**1**
CO2	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**1**	**3**	**2**	**2**	**2**
CO3	**3**	**1**		**1**			**1**	**1**			**2**	**1**
CO4	**1**	**2**		**1**		**1**	**2**	**1**			**2**	**1**
CO5	**2**	**1**	**2**	**1**	**1**	**2**	**1**	**2**	**2**	**2**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Design of Earthquake Resistant Building (PE-II)**	**Course Code:**	**CIE 4130(1)**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:
This course gives Introduction to Earthquake basics and their effects on the nature and mainly to the building. Principally aimed to introduce the students about various methods of designing the earthquake resistant designs with the help of standard codes and the designs.

COURSE OUTCOMES:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	The students will gain an experience in the implementation of Earthquake Engineering on engineering concepts which are applied in field Structural Engineering.
CO2	The students will get a diverse knowledge of earthquake engineering practices applied toreal life problems
CO3	The students will learn to understand the theoretical and practical aspects of earthquake engineering along with the planning and design aspects.

Syllabus:

Unit I:

Basics of Seismology: Earth and its interior, Plate Tectonics, Convection Currents, the Earth quake, Inter Plate Earthquake (Convergent Boundaries, Divergent Boundaries and Transform Boundaries), Intra Plate Earthquake (Faults and Types of Faults), Seismic Waves, Basic Terminology, Measuring Units and Instruments.

Unit-II:

Fundamentals of Earthquake Vibrations of Structures: Equation of Motion (By Newton's Law and By D'Alembert's Principle), Degrees of Freedom, Simplified Single Degree of Freedom, Mathematical Modeling. Building characteristics – Mode shape and fundamental period, building frequency and ground period, damping, ductility, seismic weight.

Unit III :

Equation of Motion: Free Vibration for Damped and Un damped System (Single Degree of Freedom System), Equation of Motion for Forced Vibration for Damped and Un damped System (Single Degree of Freedom System), Definitions of basic

problems in dynamics, static versus dynamic loads, different types of dynamic loads

Unit-IV:

Design forces: buildings Introduction; Equivalent static method; Mode superposition technique; Dynamic in elastic time history analysis; Advantages and disadvantages of these methods; Determination of lateral forces as per IS 1893(Part 1) – Equivalent static method, Model analysis using response spectrum.

Unit-V:

Earthquake Load Analysis on Structures: Introduction to methods of Earthquake Load Analysis (Linear Static, Linear Dynamic, Non Linear Static, Non Linear Dynamic) ,Analysis of Structure by Linear Static Method (Seismic Coefficient Method).

Text Books:

1. Earthquake resistant design of structures - Pankaj Agarwal and Manish Shrikhande, Prentice-Hall of India, 2006.
2. IS: 1893 (Part-I) 2002, Criteria for Earthquake Resistant Design General Provision to Building.
3. IITK-BMTPC, Earthquake Tips "Learning Earthquake Design and Construction" - C.V.R.Murthy, Building Material and Technology Promotion Council.

Reference Books:

1. A. K. Chopra; Dynamics of Structures, Pearson, New Delhi
2. S S Rao; Mechanical Vibration; Pearson, New Delhi.
3. IS: 1893 (Part-I) 2002, Criteria for Earthquake Resistant Design General Provision to Building
4. Seismic design of reinforced concrete and masonry buildings by T. Paulay and M.J.N. Priestley, John Wiley & Sons, 1991.
5. S. K. Duggal; Earthquake Resistance Design of Structures; Oxford University Press, New Delhi

PO-CO-PSO mapping:

	Course name: Design of Earthquake Resistant Building (PE-II)											
Graduate attributes	**Program outcome**								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**2**	**1**	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**2**	**2**
CO2	**2**	**1**	**1**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**
CO3	**3**	**2**	**2**	**2**	**3**	**1**			**3**	**2**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Transportation Planning and Management (PE-II)**	**Course Code:**	**CIE4130(2)**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:

This course gives Introduction to ways of transportation planning, its stages and monitoring process.

Course Outcomes:

The students should be able:

CO Number	Course Outcome
CO1	To be able to plan and handle issues related with transport planning and management.

Syllabus:

Unit-I

Introduction Urbanization and transportation problems, transportation sector in five year plans, regional transportation plans, comprehensive transportation planning, goals and objectives, principles of transport planning, process of urban transport planning.

Unit-II

Trip Generation Analysis Trip classification, multiple regression analysis, trip rate analysis, category analysis.

Unit-III

Trip Distribution Analysis Methods of trip distribution, uniform factor method, average factor method, frator method, furness method, limitations of growth factor methods, elementary gravity model.

Unit-IV

Model Choice Analysis Determinants of mode choice, theoretical framework for discrete choice model, binomial and multinomial logit model, choice-set determination, model specification, functional form, statistical estimation, validation.

Unit-V

Economic Evaluation of Transport Plans Need, costs and benefits of transport projects, methods of economic evaluation, benefit-cost ratio method, first year rate of return, net present value methods, internal rate of return method. Major Issues: Public transport policy, intermediate public transport, non motorized transport.

Text Books:

1. Traffic Engineering and Transport Planning – Kadiyali, L.R. (Khanna Publishers, Delhi, 1996).
2. Transport Planning and Traffic Engineering – Flaherty, CAO (John Wiley & Sons, Inc., New York, 1997).

Reference Books:

1. Principles of Urban Transport Systems Planning – Hutchinson, B.G. (Scripta Book Company, Washington, D.C., 1974).

2. Modelling Transport – Ortuzar, title D. and Willumson, L.G. (John Wiley & Sons, New York, 1995).

Assessment:

Assessment can vary from course to course and can include a combination of class work, tutorials, assignments, laboratory work, quizzes, surprise test, online test, project work and exams.

PO-CO-PSO mapping:

	Course name: Transportation Planning and Management (PE-II)											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**2**	**1**	**1**		**1**	**1**	**2**	**1**	**2**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Quality Control And Assurance In Construction**	**Course Code:**	**CIE4130(3)**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:
This course offers quality control aspects in planning, systems, and management, assurance and improvement techniques.

COURSE OUTCOMES:
Civil Engineering Graduates will be able to:

CO Number	Course Outcome
CO1	On completion of this course the students will be able to know the quality control aspects in planning, systems, and management, assurance and improvement techniques.

Syllabus:

UNIT I

Quality Management: Introduction – Definitions and objectives – Factors influencing construction quality – Responsibilities and authority – Quality plan – Quality Management Guidelines – Quality circles.

UNIT II

Quality Systems: Introduction - Quality system standard – ISO 9000 family of standards – Requirements – Preparing Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

UNIT III

Quality Planning : Quality Policy, Objectives and methods in Construction industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance – Taguchi's concept of quality – Codes and Standards – Documents – Contract and construction programming – Inspection procedures - Processes and products – Total QA / QC programme and cost implication.

UNIT IV

Quality Assurance And Control : Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors influencing construction quality – Critical, major failure aspects and failure mode analysis, – Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction.

UNIT IV

Quality Assurance and Control : Objectives – Regularity agent, owner, design, contract and construction oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, Factors influencing construction

quality – Critical, major failure aspects and failure mode analysis, – Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction.

UNIT V

Quality Improvement Techniques: Selection of new materials – Influence of drawings, detailing, specification, standardization – Bid preparation – Construction activity, environmental safety, social and environmental factors – Natural causes and speed of construction – Life cycle costing – Value engineering and value analysis.

TEXT BOOK:

1. Hutchins.G, ISO 9000 : A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification, Viva Books Pvt. Ltd., 1994.
2. James, J.O' Brian, Construction Inspection Handbook – Total Quality Management, Van Nostrand, 1997

REFERENCES:

1. John L. Ashford, The Management of Quality in Construction, E & F.N.Spon, 1989.
2. Juran Frank, J.M. and Gryna, F.M. Quality Planning and Analysis, McGraw Hill, 2001
3. Kwaku.A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation, Reston Publishing Co., Inc., 1985.

Assessment:

Assessment can vary from course to course and can include a combination of class work, tutorials, assignments, laboratory work, quizzes, surprise test, online test, project work and exams.

PO-CO-PSO mapping:

	Course name: Quality Control And Assurance In Construction											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**1**	**2**	**2**	**3**	**2**		**2**	**2**	**2**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Modern Construction Materials and Methods (PE-II)**	**Course Code:**	**CIE4130(4)**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description

This course gives Introduction about various properties of modern construction materials and methods.

Course Outcomes:

Civil Engineering Graduates will be able to:

CO Number	Course Outcome
CO1	To know the importance and areas of application of modern construction materials and methods.

Syllabus:

UNIT I

Concretes: High strength and High performance concrete-Fiber Reinforced concrete. Composites: Plastics-Reinforced polymers-FRP-Celular cores.

UNIT II

Other Materials: Water proofing compounds-Non -weathering Materials-Flooring and Facade Materials.

UNIT III

Smart and Intelligent Materials: Brief outline and uses.

UNIT IV

Sub-structure Construction Techniques Box jacking -Pipe Jacking-Under Water Construction of diaphragm walls and basement caisson-sinking cofferdam-cable anchoring and grouting-driving diaphragm walls, sheet piles-laying operations for built up offshore system-shoring for deep cutting-Large reservoir, well points Dewatering and stand by Plant equipment for underground open excavation

UNIT V

Super Structure Construction Vacuum Dewatering of concrete flooring-Concrete paving technology-Techniques of construction for continuous concreting operation in Tall buildings of various shapes and Varying sections-Launching Techniques-Suspended from work-erection techniques of tall structures, Large span structures-Launching techniques for heavy decks in situ prestressing in high rise structures.

Text Books:

1. Civil Engineering Materials (2nd Edititon) – Shan Somayaji (Prentice Hall Inc., 2001)
2. Materials for Civil and Construction Engineers – Mamlouk, M.S. and Zaniewski, J.P. (Prentice Hall Inc., 1999)

Reference Books:

1. Materials for Civil and Highway Engineers (4th Edition) – Derucher, K.Korfiatis. G. and Ezeldin, S. (Prentice Hall Inc., 1999)
2. High Performance Concrete – Aitkens (McGraw Hill, 1999)

Assessment:

Assessment can vary from course to course and can include a combination of class work, tutorials, assignments, laboratory work, quizzes, surprise test, online test, project work and exams.

PO-CO-PSO mapping:

	Course Name: Modern Construction Materials and Methods (PE-II)											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**1**		**1**	**1**	**1**	**2**	**1**	**1**		**1**	**1**

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109

Department of Civil Engineering

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of The Course:	**Advanced Reinforced Concrete Design**	**Course Code:**	**CIE4130(5)**
Credits :	**3**	**No Of Hours :**	**45**
Max Marks:	**100**		

Course Description:
This course designed to provide a comprehensive understanding of advanced reinforced concrete structures and its design.

Course Outcomes:
The students should be able –

CO Number	Course Outcome
CO1	Students are expected to understand Effective span, bending moments and shear forces of span and Design criteria.
CO2	Students are expected to understand curved Beams, torsional moments and its design.
CO3	Students are expected to understand different types of water tanks and its design.
CO4	Students are expected to understand Analysis of multi-storey frames and its design.
CO5	Students are expected to design deep beams.

Syllabus:

UNIT I:
Introduction, Effective span, Span/depth ratio, Bending moments and shear forces, Design examples.

Unit-II:
Curved Beams: Analysis of bending and torsional moments in circular beams, Moment in semi-circular beams supported on three columns, Design example.

Unit III
Types of overhead water tanks, Intz type tank, Design example of intz type of water tank, Conical or funnel shaped tank. Design example of funnel shaped over head tank.

Unit-IV:
Analysis of multi-storey frames, Methods of substitute frames, design examples, Bending moments in column, Analysis of multi-storey frames subjected to horizontal forces, Design examples.

Unit-V:
Deep Beams: General features, Parameters influence design, Flexural bending stress, Shear stress in deep beams, I.S. Code provisions, Design examples.

Text Books:

1. Raju, K.N., 2016. Advanced Reinforced Concrete Design.
2. Varghese, P.C., 2010, Advanced Reinforced Concrete Design.

Reference Books:

1. Dayaratnam, P. and Sarah, P. 2017. Design of Reinforced Concrete Structure

PO-CO-PSO mapping:

	Course name: Advanced Reinforced Concrete Design											
	Program outcome								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**	**2**	**3**	**2**	**2**	**2**	**1**		**2**	**1**	**1**	**2**
CO2	**2**	**2**	**2**	**1**	**1**	**2**	**1**		**2**	**1**	**1**	**2**
CO3	**2**	**2**	**2**	**2**	**2**	**2**	**1**		**2**	**1**	**1**	**2**
CO4	**3**	**2**	**2**	**1**	**2**	**2**	**1**		**2**	**1**	**1**	**2**
CO5	**2**	**2**	**2**	**1**	**1**	**2**	**1**		**2**	**1**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Industrial Waste Management**	**Course Code:**	**CIE4130(6)**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:

The subject of Industrial Waste Management involves different types issues related to quality, quantity, treatment and disposal of industrial waste. Also, to learn plan and handle the issues related to industrial waste.

Course Outcomes:

Civil Engineering students will be able to:

CO Number	Course Outcome
CO1	To be able to plan and handle the issues related to industrial waste.

Syllabus

UNIT-1:

General

Effect of discharge of industrial wastewaters on streams, land and environment, Importance and scope, Problems involved in treatment, Variation in quality and quantity of industrial wastewaters.

Standards & Criteria: Indian standards for discharge of treated wastewaters on land, into municipal sewer and natural water courses.

Sampling of Wastewaters: Representative sample, Grab and composite samples.

UNIT-2:

Effluent Quality and Quantity

Approaches to minimization – good housekeeping, equalization and neutralization by mixing of different effluent streams; recycling of wastewater streams. Process modifications in terms of raw materials and chemicals used Treatment of industrial wastes, Removal of dissolved and suspended solids, Organic waste treatment processes, Sludge treatment and handling.

UNIT-3:

General Approaches to Planning of Industrial Wastewater Treatment and Disposal

Equalization and proportioning, Neutralization Treating different effluent streams separately, Treating different streams jointly after mixing them partly or fully Including / excluding domestic wastewater along with the industrial waste Treating industrial wastewaters along with town waste.

UNIT-4:

General Approaches for Handling and Treatment of Specific Characteristics of Industrial Wastewaters

Stream Water Quality, DO Sag Curve, etc. Approaches for treating wastes having shock loads, colours, toxic metal-ions, refractory substances, e.g., ABS and other detergents, growth inhibiting substances such as insecticides, high concentration of nutrients (N.P.K., etc.), oil and grease, suspended solids, BOD., hot wastes, wastes with acidity, alkalinity, etc.

UNIT-5:

Process Flow Diagrams, Characteristics and Treatment of Various Industrial Wastes

Industrial wastes of pulp and paper, textile, tannery, food, canning, sugar mill, distillery, dairy, pharmaceutical, electroplating, etc. Industrial pollution abatement measures, referring to case studies in fertilizer industries, textile, petroleum refineries and distilleries.

Text Books:

1. Introduction to Environmental Science – Y. Anjaneyulu (B.S. Publications)
2. Elements of Environmental Engineering – K.N. Duggal (S. Chand & Co., New Delhi)

Reference Books:

1. The Treatment of Industrial Wastes – Besselieure, E.B. and Schwartz, M. (McGraw Hill Kogakusha Ltd., NewDelhi, 1969)
2. Industrial Water Pollution – Nemerow, N.L. (Ann Arbour, New York, 1978)
3. Waste Water Engineering – MetCalaff Eddy (Tata McGraw Hill, New Delhi)
4. Environmental Engineering – G.N. Pandey& G.C. Karney (Tata McGraw Hill, New Delhi)

PO-CO-PSO mapping:

	Course name: Industrial Waste Management											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**		**1**	**2**	**1**	**2**	**3**	**2**	**2**	**1**	**2**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Foundation Engineering**	**Course Code:**	**CIE 4130 (7)**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description

This course gives Introduction to foundation engineering, and design of shallow foundation and pile foundation. The field and laboratory soil testing methods are discussed to determine the required design parameters. Lateral earth pressures theories and design of various retaining structures are covered. Design of sheet piles and bracing system is also discussed.

Course Objectives:

Civil engineering students will be able to

CO Number	Course Outcome
CO1	Students are expected to understand Soil Exploration.
CO2	Students are expected to understand Earth Pressure theories.
CO3	Students are expected to Design of Shallow Foundation.
CO4	Students are expected to Design of Deep Foundations
CO5	Students are expected to Design of Retaining Structures

Syllabus:

UNIT I: Introduction,

Planning for subsurface exploration, Methods of exploration, Geophysical exploration, Soil sampling and samplers, In-situ tests, Common soil tests, Soil investigation report.

Unit-II: Theory of Lateral Earth Pressure

Types of earth pressures, Different theories of earth pressures, Displacement-related earth pressure, Rankine and Coulomb theory, Friction circle method, Terzaghi's analysis, Development of bearing capacity theory, Development of uplift capacity theory

Unit III: Design of Shallow Foundation

Introduction, Different types of foundations, Calculation of bearing capacity, Stresses in soil, Concept of contact pressure, Calculation of settlements, Codal provision

Unit-IV: Design of Deep Foundations

Different types of foundations, Design methodology for piles, Calculation of pile capacity, Stresses in pile, Analysis of pile group, Settlement of pile group, Concept of negative skin friction, Piles subjected to lateral loads, Pile load test, Design and construction of well foundation, piers etc.

Unit-V: Design of Retaining Structures

Introduction, Different types of retaining structures, Stability analysis of rigid walls, Design of cantilever sheet piles, Design of anchored sheet piles, Bracing system for underground construction, Failure analysis for bracing system, Dewatering, Techniques of ground improvement.

Text Books:

1. Braja M. Das, Principles of Foundation Engineering PWS Publishing Company.
2. Basic and Applied Soil Mechanics, Gopal Ranjan, A S R Rao, New Age International, 2007.
3. Soil Mechanics and Foundation Engineering, K.R. Arora, Standard Publishers, New Delhi

Reference Books:

1. Soil Mechanics and Foundation Engineering, B.C. Punmia, Laxmi Publications.
2. S. K. Gulhati and M. Datta, Geotechnical Engineering, McGraw-Hill Companies.
3. V. N. S. Murthy, Principles of Soil Mechanics and Foundation Engg, UBSPD.

PO-CO-PSO mapping:

	Course name: Foundation Engineering											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**		**1**	**1**		**1**	**1**	**1**	**1**		**1**	**2**
CO2	**2**		**1**	**1**		**1**	**1**	**1**	**1**		**1**	**2**
CO3	**2**	**2**	**2**	**1**	**1**	**2**	**1**		**3**	**2**	**1**	**2**
CO4	**2**	**2**	**2**	**1**	**1**	**2**	**1**		**3**	**2**	**1**	**2**
CO5	**2**	**2**	**2**	**1**	**1**	**2**	**1**		**3**	**2**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Air Pollution & Control**	**Course Code:**	**CIE4130 (8)**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:

This course designed to provide a comprehensive understanding of the causes and effects of air pollution, and the management measures and engineering technologies available for its control.

Course Outcomes:

Students will be able to

CO Number	Course Outcome
CO1	Students are expected to understand history of air pollution various types of sources and classification of air pollutants and air pollution monitoring system.
CO2	Students are expected to understand effect of air pollution and its control.
CO3	Students are expected to understand different air quality models.
CO4	Students are expected to aware of the indoor air pollution, sources, causes and effects.
CO5	Students are expected to identify Issues of concerns in air pollution.

Syllabus:

UNIT I:

History of air pollution, Air pollution definition and types, Air pollutant, Ambient Air Pollution Monitoring, Stack Monitoring, Techniques & instrumentation, Experimental analysis, Gaseous & particulates, Standards & limits.

Unit-II:

Air pollution effects: On living and non-living beings, Principles of controls, Source control, Air pollution meterology.

Unit III

Air quality modelling, Fundamentals of air quality modelling, Deterministic approach, Gaussian Plume Dispersion Model, Deterministic models, Statistical models, Physical models, Limitation of models.

Unit-IV:

Indoor air pollution, Sources of indoor air pollution, Type and effect of indoor air pollution, Indoor air quality modelling. Types of modelling.

Unit-V:

Problems of air pollution, Global Warming, Greenhouse effect, Effects of Global Warming, Photochemical Smog, Effects on human health, Ozone Layer Depletion, Acid Rain,

Text Books:

1. Rao, M.N. and Rao, H. V. N., 1993. Air Pollution, Tata Mc-Graw Hill, New Delhi.
2. Murty, B. P., 2004. Environmental Meteorology, I.K. International Pvt. Ltd., New Delhi.
3. Nevers, N.D. 2000. Air Pollution Control Engineering, Second Edition, Pub., McGraw Hill, New York.
4. Cheremisinoff, N.P., 2002. Handbook of Air Pollution Prevention and Control, Pub., Butterworth-Heinemann, Elsevier Science, USA.

Reference Books:

1. C. D. Cooper and F.C. Alley, Air Pollution Control: A Design Approach, McGraw Hill
2. L. K. Wang, Air pollution control Engineering, Humana Press Inc., U.S.; 2Rev Ed edition, 2004

PO-CO-PSO mapping:

	Course name: Air Pollution & Control											
	Program outcome								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	1		1		2	2	3	2		2	2
CO2	2	1		1		2	2	3	2		2	2
CO3	2	2	1	1		1	1	1	2	2	1	2
CO4	2	1		1		2	2	3	2		2	2
CO5	2	1		1		2	2	3	2		2	2

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109
Department of Civil Engineering

Programme:	**B.Tech.**	**Semester :**	**VII**
Name of the Course:	**Professional Practice Lab**	**Course Code:**	**CIE4131**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description:

Professional Practice Lab emphasized on the accurate and technical based correct estimation, costing, valuation and rate analysis of some major elements of the infrastructure which are made up of steel and RCC material.

Course Outcomes:

Civil engineering students will be able to

CO Number	Course Outcome
CO1	To develop ability to prepare estimate for civil structures.
CO2	To understand the basis of estimating, costing and valuation.
CO3	To develop ability of rate analysis.

List of Experiments to be performed (Min 10 experiments):

1. Estimating cost of a proposed building on Plinth area method, Volume area method.
2. Estimated cost of a proposed building from materials and labour by CBRI method.
3. Calculation of wall area in a building by measuring floor area for ordinary building and framed structure.
4. Calculation of approximate cost of water supply, sanitation, electrical works for a building.
5. Preparation of approximate estimate for road projects.
6. Preparation of detailed estimate of a building.
7. Analysis of rates: Concrete work, Brick work, Plaster, Flooring.
8. Use of PWD schedule of rates for determining cost of a building project.
9. Determination of present value of a building valuation.
10. Development method of valuation of plots in a locality.
11. Estimation of quantity of reinforcement and preparing bar bending schedule from a working and drawing for a building.
12. Rate analysis using software: R.C.C. items, Masonry work, Plastering, Road work.
13. Valuation by software.
14. Quantity estimates by estimation software

List of Equipment's / Machine Required:

1. List of Equipment's – Not Required.

Recommended Books:

1. Estimating and Costing – Rangawala (Charotar Publications).
2. Estimating and Costing – Dutta B.N. (UBS Publishers & Distributors).

Assessment:

Assessment includes a combination of attendance, class work, tutorials, assignments, laboratory work, surprise test, online test, and exams.

PO_CO-PSO mapping:

	Course name: Professional Practice Lab											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**1**	**3**	**3**	**1**	**2**
CO2	**3**	**2**	**3**	**2**	**3**	**3**	**2**		**3**	**3**	**1**	**2**
CO3	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**1**	**3**	**3**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VIII**
Name of the Course:	**Structural Engineering Design-III**	**Course Code:**	**CIE4234**
Credits :	**4**	**No of Hours :**	**55**
Max Marks:	**100**		

Course Description:

This course gives Introduction to Limit State Design Methods Combined footings, retaining walls. Principally aimed to introduce the students about various design methods water tanks and bridge structures. It makes student aware about the concepts of prestressing.

Course Outcomes:

Civil engineering students will be able to

CO Number	Course Outcome
CO1	Capable of designing retaining walls.
CO2	Capable of designing simple water tanks.
CO3	Capable of designing of solid slab bridges.
CO4	Capable of analyzing prestressed concrete beams.

Syllabus:

UNIT I: Combined Footings

Limit State Design of Combined Rectangular and Combined Trapezoidal Footings, Introduction to design of strap footing and Raft Foundation.

Unit-2: Retaining walls

Limit State Design of Cantilever retaining wall with horizontal and sloping backfill, Counterfort Retaining Wall with horizontal backfill.

Unit-3: Water Tanks

Circular tank (resting on ground) with flexible / rigid joint between floor and wall (by approximate method), Design of Circular overhead tank with domed bottom and top (membrane analysis), Intze Tank (Membrane Analysis): Dimensions, Design of top dome, Top ring beam, cylindrical wall, middle ring beam, conical dome, bottom dome.

Unit-4: Bridges

Various types of Bridges, Loading for road bridges, Design of super structure for solid slab bridge, Introduction to design of interior panels and girders of a T-Beam Bridge.

Unit-5: Prestressed Concrete

Basic concepts, classification and types of prestressing, Prestressing systems, Losses in Prestress, Properties of materials, merits and demerits of prestressed concrete, Analysis of beam for flexure, Kern distances and efficiency of Sections.

Text Books:

1. Reinforced Concrete Structures – B.C. Punmia (Laxmi Publications)
2. Prestressed Concrete – N. Krishna Raju (New Age Publications)
3. RCC Design – Sinha & Roy (S. Chand & Co.)

Reference Books:

1. RCC Structures – N. Krishna Raju (New Age Publications)
2. Bridge Engineering – R.K. Raina
3. IS codes 456-2000

PO-CO-PSO mapping:

	Course name: Structural Engineering Design-III											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**	**2**	**2**	**2**		**2**			**3**	**2**	**1**	**2**
CO2	**3**	**2**	**2**	**2**		**2**			**3**	**2**	**1**	**2**
CO3	**3**	**2**	**2**	**2**		**2**			**3**	**2**	**1**	**2**
CO4	**3**	**2**	**2**	**2**		**2**			**3**	**2**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

OP JINDAL UNIVERSITY

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Department of Civil Engineering

Programme:	**B.Tech.**	**Semester :**	**VIII**
Name of the Course:	**Software Applications in Civil Engineering**	**Course Code:**	**CIE4235**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description

course is designed to give students a basic knowledge of C++ programming. The course will cover fundamentals of C++ operations with arrays (vectors and matrices): how to create s files, function use loop and conditional statements, and present the computed results. Students will be required to write simple programs in C++.

Course Outcomes:

Students will be able to

CO Number	Course Outcome
CO1	Variables, data Types (including strings and arrays) and Expressions.
CO2	Flow of Control.
CO3	Functional and procedural abstraction and its importance in good program design .
CO4	Pointers and memory allocation (static and dynamic).
CO5	Iteration and Recursion.

Syllabus:

UNIT I:

C++ program for Reynolds no, Froude no in pipe for laminar and turbulent flow, friction factor in pipes for laminar and turbulent flows, discharge in open rectangular and trapezoidal open channel, hardy cross method for water supply distribution.

UNIT II:

C++ program for determination of earliest expected time for an activity network analysis, determination of reduced level of various points by rise and fall method and HI method, convert whole circle bearing to reduced bearing, calculation of local attraction by observed bearing of a closed traverse.

UNIT III:

C++ program for Determination of vertical effective stress at a given depth for any soil profile, determination of bearing capacity of soil for given water table condition, determination of one dimensional preconsolidation settlement under compacted fill. Determination of horizontal and vertical hydraulic conductivities for flow through anisotropic soil.

UNIT IV:

C++ program for SF & BM at any desired section of a simply supported beam for point load and udl. Determination of maximum shear force at a section of a simply supported beam, calculation of simple stress, strain of a section. Calculation of bending stress of a desired section of a beam.

UNIT V:

C++ program for RCC: IS:456 -- moment of resistance of a rectangular beam section by limit state method, safe load carrying capacity of a column, area of steel required of a rectangular beam section. Steel: Calculate the safe compressive load of a given section by IS: 800 – 2007, calculation of number of rivets required for connecting an angle section the gusset plate.

Text Books:

1. Let us C++ – Yeshwant Kanitkar (BPB Publications).
2. Problem Solving with C++ – Savitch (Addison Wesley Publication).

Reference Books:

1. C++ Interactive Course – Lafore (BPB Publications) 2. 3.
2. 2 C++ Components and Algorithms – et. al. (BPB Publications)
3. Object Oriented Programming in Turbo C++ – Rober Lafore (Galgotia Publications)

Course Outcomes:

1. Knowledge and Understanding-
   At the end of a course the student will understand the concepts of:
   a) Variables, data Types (including strings and arrays) and Expressions
   b) Flow of Control
   c) Functional and procedural abstraction and its importance in good program design
   d) Pointers and memory allocation (static and dynamic)
   e) Iteration and Recursion
2. Skills –
   At the end of the course, a student will be able to:
   a) Analyze a simple programming problem specification
   b) Design a high-level (programming language independent) solution to the problem using functional abstraction and general imperative programming language constructs.
   c) Write, compile, execute and debug a C++ program which maps the high-level design onto concrete C++ programming constructs.

PO-CO-PSO mapping:

	Course name: Software Applications in Civil Engineering											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**2**	**2**			**1**			**2**	**1**	**1**	**2**
CO2	**2**	**2**	**2**			**1**			**2**	**1**	**1**	**2**
CO3	**2**	**2**	**2**			**1**			**2**	**1**	**1**	**2**
CO4	**2**	**2**	**2**			**1**			**2**	**1**	**1**	**2**
CO5	**2**		**1**			**1**			**1**	**2**	**1**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VIII**
Name of the Course:	**Disaster management**	**Course Code:**	**OPE4201**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description

This course gives Introduction to Natural and environmental disasters, their behaviour and possible impacts. Principally aimed to introduce the students about various Methods of mitigating damage during disasters.

Course Outcomes:

Civil engineering students will be able to

CO Number	Course Outcome
CO1	Students are expected to understand disaster and its nature.
CO2	Students are expected to understand impact and hazard assessment.
CO3	Students are expected to understand disaster preparedness and mitigation.
CO4	Students are expected to understand use of construction technology for disaster management.
CO5	Students are expected to identify short term and long term relief measures.

Syllabus:

UNIT I:

Nature of disasters-Natural and other disasters, Earthquakes, floods, draught, cyclones, fire and other environmental disasters.

Unit-II:

Behaviour of structures in disaster prone areas, Disaster zoning, Hazard assessment, Environmental Impact Assessment

Unit III :

Methods of mitigating damage during disasters, disaster preparedness.

Unit-IV:

Management systems during disasters, Construction Technology for mitigation of damage of structures.

Unit-V:

Short-term and long-term relief measures.

Text Books:

1. Design of Earthquake Resistant Buildings – Minoru Wakabayashi (McGraw Hill Publication)
2. Dynamics of Structures: Theory and Application to Earthquake Engineering (2nd edition) – Anil K Chopra (Pearson Education Publication)

Reference Books:

1. Reference Books: 1. Fundamentals of Vibrations – Anderson, R.A. (Mc Millan)
2. IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993
3. Earth quake engineering damage assessment and structural design – S.F. Borg
4. Disasters and development – Cuny F (Oxford University Press Publication)

PO-CO-PSO mapping:

	Course name: Disaster management											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**					**2**		**3**	**2**		**1**	**2**
CO2	**2**					**2**		**3**	**2**		**1**	**2**
CO3	**2**					**2**	**1**	**3**	**2**		**1**	**2**
CO4	**2**					**2**		**3**	**2**		**1**	**2**
CO5	**2**					**2**		**3**	**2**		**1**	**2**
CO6	**3**			**1**		**2**		**3**	**2**	**1**	**2**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VIII**
Name of the Course:	**Construction Management**	**Course Code:**	**OPE 4202**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:

This course equips students with proficiency in tools of civil engineering focusing on effective construction management practices, modern construction materials and techniques. The program trains enrolled candidates in the specialized field of construction of special structures towards accomplishing critical projects within a given schedule and budget.

Course Outcomes:

Students will be able to

CO Number	Course Outcome
CO1	The students identify, analyse and implement suitable planning and management techniques.
CO2	Create network, calculate project duration and optimize the time and minimize the cost.
CO3	Implement resource allocation and control techniques.
CO4	Plan and implement quality and safety management.

Syllabus:

Unit I:

The Owner's Perspective Introduction-The project life cycle-Major Types of Construction-Selection of Professional Services, Construction contractors-Financing of constructed facilities-Legal and regulatory Requirements-The changing Environment of the construction Industry-The Role Project Managers

Unit II:

Organizing for Project Management What is project management – Trends in Modern Management-Strategic planning and project programming- Effects of project risks on organization, Organization of Project Participants, Traditional designer-Constructor sequence-Professional construction management-Owner-Builder Operation-Turnkey operation-Leadership and Motivation for the Project team-Interpersonal behaviour in project organization-perceptions of Owners and Contractors

Unit III:

The Design and Construction Process Design and construction as an integrated System-Innovation and technological Feasibility-Innovation and technological feasibility-Design Methodology-Functional Design-Physical Structures-Geotechnical Engineering Investigation-Construction Site Environment-Value engineering-

Construction Planning-Industrialized Construction and Prefabrication-Computer - Aided Engineering

Unit IV:

Labour, Material and Equipment Utilization Historical Perspective – Labour Productivity-Factors Affecting Job-Site Productivity-Labour Relations in Construction-Problems in collective Bargaining-Materials Management-Materials Procurement and Delivery- Inventory control-Trade-offs of cost in Material Management-Construction Equipment Choice of Equipment and Standard production Rates-Construction Processes Queues and Resource Bottlenecks

Unit V

Cost Estimation Costs Associated with Construction Facilities-Approaches to cost Estimation-Type of construction cost estimates- Effects of scale on construction cost-Unit cost-Method of estimation-Methods for allocation of joint costs- Historical cost data-Cost indices-Applications of cost Indices to Estimating Estimate based on Engineers List of Quantities-Allocation of Construction costs over time-Computer Aided cost Estimation-Estimation of operating costs

Text Books:

1. Construction Project Management Planning, Scheduling and Control – Chitkara, K.K. (Tata McGraw Hill Publishing Co., New Delhi, 1998)
2. Project Mangement: A systems Approach to Planning, Scheduling and Controlling – Harold Kerzner (CBS Publishers & Distributors, Delhi, 1988)

Reference Books:

1. Project management for Construction: Fundamental Concepts for owners, Engineers, Architects and Builders – Chris Hendrickson and Tung Au, (Prentice Hall, Pitsburgh, 2000)
2. Construction Project Management – Frederick E.Gould (Wentworth Institute of Technology, Vary E.Joyce, Massachususetts Institute of Technology, 2000)
3. Project Management – Choudhury, S. (Tata McGraw Hill Publishing Co., New Delhi, 1988)
4. Applied project Engineering and Management – Ernest E. Ludwig (Gulf Publishing Co., Houstan, Texas, 1988).

PO-CO-PSO mapping:

	Course name: Construction Management											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**3**		**2**	**1**	**2**	**2**	**1**	**1**	**3**	**1**	**1**	**3**
CO2	**3**		**2**	**1**	**3**	**2**	**1**	**1**	**3**	**1**	**1**	**3**
CO3	**3**		**2**			**2**	**1**		**1**		**2**	**2**
CO4	**3**		**2**			**2**	**1**	**2**	**1**		**2**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VIII**
Name of the Course:	**Ecology and Sustainable Development**	**Course Code:**	**OPE4203**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:
This course provides an ecological perspective to the environmental challenges and opportunities related to urban development adopting an inter–disciplinary approach. Ecology and Environment is offered to the B.tech.

Course Outcomes:
Students will be able to

CO Number	Course Outcome
CO1	Gain a wider understanding of urban ecological and environmental issues ranging from biodiversity to climate resilience and appreciate potential approaches for cities to deal with ecological and environmental challenges and threats of climate change.
CO2	Enhance abilities and skills relating to evaluation of environmental and social impacts of urban development. Ability to measure quality of concrete making material.

Syllabus:

Unit I:
Nature of ecology and sustainable development Definition, scope of ecology an sustainable development, geomorphology, oceanography, climatology and biogeography.

Unit II:
Energy and environment Introduction of energy environment, use of solar cells for heating and operated drills, methane gas digesters, environmentally friendly method of energy conservation, difference between conventional and non-conventional energy sources, future trends of energy systems.

Unit III :
Theory of isostasy Concept of isostasy for sustainable development, discovery of the concept, concept of Hayford and Bowie, Joly, and Holmes, Global isostatic adjustment.

Unit-IV:
Physical geography and man human impact on the natural environment Modification of land forms, direct alternation of land forms, wind deflation, coastal erosion and deposition, modification of the atmosphere, ultration process in eco and energy systems.

Unit-V:
Obstacles in sustainable development Pollution growth, species extinction, restriction of bat lands, desertification, soil erosion, soil pollution, characterisation of contaminated soil, global warming and ozone depletion etc.

Text Books:

1. Energy and environment – Fowler (McGraw Hill, New Delhi)
2. Restoration Ecology and sustainable development – Krystyna M. Urbanska et.al. (Cambridge University Press, U.K.)

Reference Books:

1. Reuniting Economy and Ecology in Sustainable Development – Russ Beaton et.al.
2. Theory and implementation of economic models for sustainable development – Jeroen C.J.M. Van Den Bergh
3. Economy and Ecology: Towards sustainable development – F. Archibugi et.al.
4. Evaluating Sustainable Development: Giving People a voice in their destiny – Okechukwu Ukaga et.al.

PO-CO-PSO mapping:

	Course name: Ecology and Sustainable Development											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**			**2**	**1**	**2**	**3**	**3**			**2**	**2**
CO2	**2**			**2**		**2**	**3**	**3**			**2**	**2**

Note: 1: Low 2.: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**VIII**
Name of the Course:	**Professional Devlopment**	**Course Code:**	**PD 4208**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

COURSE DESCRIPTION:

Today in the present world, society and organization can be developed that follow a process among the people of organization as an instrument in order to get new styles in proceeding, production and services and effective decision making and the comparison of organization with dynamic environment and competitive market which this process is beds for the developed employment skill. Entrepreneur and Knowledge Management Course aims to provide students with scientific and practical knowledge about entrepreneurship and knowledge management as well as the skills to turn such knowledge into practice. The learning outcomes are therefore designed to help the student acquire perspectives, skills and experiences necessary to take on an entrepreneurial role in future positions and activities. Knowledge Management may provide the experiences knowledge and experts. This function will create new abilities; increase the performance and the new innovation.

COURSE OUTCOMES:

Civil engineering graduates will be able to;

CO Number	Course Outcome
CO1	To provide an integrative and holistic understanding of the nature of entrepreneurship.
CO2	To make students understand the criticality of entrepreneurship survival, growth and sustainability.
CO3	To make students learn the factors that contribute to entrepreneurship success and failure.
CO4	To make students learn the role of creativity, knowledge and learning processes in entrepreneurship.
CO5	To make students learn the knowledge management.

COURSE CONTENT:

UNIT-I

Entrepreneurship – Definition, Role and expectations – Entrepreneurial styles and types – Characteristics of the Entrepreneur – Functions of an Entrepreneur – Promotion of Entrepreneurship – Role of Socio-Cultural, Economic and Political Environment – Growth of Entrepreneurship in Pre and Post independence era – Constraints for the Growth of Entrepreneurial Culture.

UNIT-II

Entrepreneurial Motivation Theories - Entrepreneurial Competencies – Developing Competencies – Role of Entrepreneur. Development Programs – Assistance Programme for Small Scale Units – Institutional Framework – Role of SSI Sector in

the Economy – SSI Units – Failure, Causes and Preventive Measures – Turnaround Strategies.

UNIT-III
Identification of Business Opportunity – Preparation of Feasibility Report – Financial and Technical Evaluation – Project Formulation – Common Errors in Project Formulation – Specimen Project Report – Ownership Structures – Proprietorship, Partnership, Company, Co-operative, Franchise.

UNIT-IV
Corporate Entrepreneurship (Intrapreneurship) – Concepts – Need – Strategies - Corporate Practices – Select Cases – Dynamics of Competition – Plans for Survival and Growth.

UNIT-V
Women Entrepreneurship – Need – Growth of women Entrepreneurship – Problems faced by Women Entrepreneurs – Development of women Entrepreneurship – Entrepreneurship in Informal Sector – Rural Entrepreneurship – Entrepreneurship in Sectors like Agriculture, Tourism, health case, Transport and allied services.

RECOMMENDED TEXT &

1. Peter F.Drucker : INNOVATION AND ENTREPRENEURSHIP (Heinemann). REFERENCES
2. Donald L. Sexton & Raymond W.Smilor: THE ART AND SCIENCE OF ENTREPRENEURSHIP (Ballinger Pub. Co,).
3. Clifford M.Baumback & Joseph R.Mancuso: ENTREPRENEURSHIP AND VENTURE MANAGEMENT (Prentice Hall). 4. Gifford Pinchot: INTRAPRENEURING (Harper & Row)

REFERENCE BOOKS

1. Ram K.Vepa: HOW TO SUCCEED IN SMALL SCALE INDUSTRY (Vikas).
2. Richard M.Hodgets: EFFECTIVE SMALL BUSINESS MANAGEMENT (Academic Press).
3. Dan Steinhoff & John F.Burgess : SMALL BUSINESS MANAGEMENT – FUNDATMENTALS (McGraw Hill).
4. Small Industries Service Institute (SISI), Madras Publication : GUIDELINES TO ENTREPRENEURS FOR STARTING A SMALL SCALE INDUSTRY.

CO-PO-PSO Mapping:

	Course name: Professional Development											
	Program outcome								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1				3		2	1				1	
CO2				3		2	1				1	
CO3				3		2	1				1	
CO4				3		2	1				1	
CO5				3		2	1				1	

Note: 1: Low 2.: Moderate 3: High