OP Jindal University
Raigarh-Chhattisgarh

UNIVERSITY OF STEEL TECHNOLOGY AND MANAGEMENT

Scheme and Syllabus of
Bachelor in Technology
School of Engineering
Session- 2019-2023

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

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+P+T)
				L	T	P	PRE**		ESE*	Total Marks	
							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**

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**

SEMESTER V

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2 (L+P+T)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CE501	CIVIL	Theory of Structures –II	3	0	0	30	20	50	100	3
2	SOE-B-CE502	CIVIL	Structural Engineering Design-I	3	0	0	30	20	50	100	3
3	SOE-B-CE503	CIVIL	Geotechnical Engineering-I	3	0	0	30	20	50	100	3
4	SOE-B-CE504	CIVIL	Transportation Engineering-II	3	0	0	30	20	50	100	3
5	SOE-B-CE505	CIVIL	Concrete Technology	3	0	0	30	20	50	100	3
6	SOE-B-CE506	CIVIL	Concrete Technology Lab	0	0	4	0	30	20	50	2
7	SOE-B-CE507	CIVIL	Structural Engineering Design-I Lab	0	0	4	0	30	20	50	2
8	SOE-B-CE508	CIVIL	Geotechnical Engineering-I Lab	0	0	4	0	30	20	50	2
9	SOE-B-CE509	CIVIL	Seminar On Industrial Training	0	0	1	0	25	25	50	1
10	SOE-B-CE510	CIVIL	***Design Thinking (online)	1	0	2	15	15	20	50	2
TOTAL				**16**	**0**	**15**	**165**	**230**	**355**	**750**	**24**

* End Semester Examination

** Progress Review Examination

***Certificate Coarse on MOOCs/NPTEL: Students required to enroll for the course Design Thinking (Minimum 4 weeks) approved by department of civil engineering and submit the certificate of completion. The students who failed to score the desired marks as per minimum passing criteria of MOOC shall be required to appear for end sem examination of the course conducted by OPJU. For backlog students in this course examination will be conducted by OPJU.

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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	SOE-B-CE601	CIVIL	Structural Engineering Design-II	3	0	0	30	20	50	100	3
2	SOE-B-CE602	CIVIL	Geotechnical Engineering-II	3	0	0	30	20	50	100	3
3	SOE-B-CE603	CIVIL	Environmental Engineering I	3	0	0	30	20	50	100	3
4	SOE-B-CE604	CIVIL	Construction Planning and Management	3	0	0	30	20	50	100	3
5	SOE-B-CE605(1-9)	CIVIL	Professional Elective -I (**CIE Annexure - I**)	3	0	0	30	20	50	100	3
6	SOE-B-CE606	CIVIL	Structural Engineering Design-II Lab	0	0	4	0	30	20	50	2
7	SOE-B-CE607	CIVIL	Geotechnical Engineering-II Lab	0	0	4	0	30	20	50	2
8	SOE-B-CE608	CIVIL	Environmental Engineering Lab	0	0	4	0	30	20	50	2
9	SOE-B-CE609	CIVIL	Professional Development	0	0	1	0	25	25	50	1
10	SOE-B-CE610	CIVIL	Microsoft Project (MS Project)	1	0	2	15	15	20	50	2
TOTAL				**16**	**0**	**15**	**165**	**230**	**355**	**750**	**24**

Professional Elective-I (CIE Annexure - I)

Sr. No	Courses	Name of the Courses
1	SOE-B-CE605(1)	Design of Bridge Structures
2	SOE-B-CE605(2)	Traffic Engineering
3	SOE-B-CE605(3)	Solid Waste Management
4	SOE-B-CE605(4)	Computer Methods in Structural Analysis
5	SOE-B-CE604(5)	Maintenance, Repair and Rehabilitation of Civil Engineering Structures (MRCS)
6	SOE-B-CE605(6)	Remote Sensing and GIS in Civil Engineering
7	SOE-B-CE605(7)	Urban Infrastructure
8	SOE-B-CE605(8)	Town Planning
9	SOE-B-CE605(9)	Systems Approach in Civil Engineering

* End Semester Examination

** Progress Review Examination

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	6	MME1101	Engineering Drawing	4
	7	PFD1101	Professional Development	3
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	9	CHM1102	Chemistry Lab	1
2nd	10	MAT1202	Math	5
	11	PHY1203	Physics- II	4
	14	CHM1203	Environmental Studies	4
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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**

SEMESTER IV

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				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
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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**

Programme:	**B.Tech**	**Semester :**	**I**
Name of the Course:	**Mathematics-I**	**Course Code:**	**SOE-B-FY101**
Credits :	**5**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description:

Learning Objective 1. Find the Rank and Inverse of matrix by using Elementary Transformations. 2. Solve systems of linear equations (homogeneous & non-homogeneous), Eigen values and Eigen vectors of matrix. 3. Find the nth derivative by using Leibmitz's, Taylor's and Maclaurin's Theorem. 4. Differentiation of functions having more than one variable. 4. Integration of functions having nth power, double and triple integral and applications. 5. Gradient, divergence and curl, line integral, Surface integral and Volume integral. 6. Relation between line integral, Surface integral and Volume integral.

Course Outcomes:

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

CO1	Find Rank and Inverse of matrix by using Elementary Transformations and Solve systems of linear equations
CO2	Understand applications in Engineering Problems
CO3	Understand Successive Differentiation, Leibmitz's Theorem for nth derivative of two functions.
CO4	Understand Taylor's and Maclaurin's Theorem and tracing of curves.
CO5	Understand Limits, continuity and differentiability of function of several variables.
CO6	Understand Partial derivatives, Maxima and minima of function of two or more variables.
CO7	Understand Reduction formulae, Double and triple integrals, Change of order of integrations. Beta and Gamma functions; Applications to area and volume.
CO8	Understand Beta and Gamma functions, Applications to area and volume.
CO9	Understand Gradient, divergence and curl and Properties of gradient, divergence and curl.
CO10	Understand Line integral, Surface integral, Volume integral, Green's theorem in a plane; Gauss's Divergence theorem; Stoke's theorem.

Syllabus

Unit 1: Linear Algebra

Matrix algebra; Elementary transformations; Inverse of a matrix; Rank of matrix; Systems of linear equations (homogeneous & non-homogeneous); Eigen values and Eigen vectors; Cayley-Hamilton theorem; Applications of matrices in Engineering.

Unit 2: Differential Calculus
Successive differentiation; Leibnitz's theorem; Taylor's and Maclaurin's series; Radius of curvature; Curve tracing.

Unit 3: Multivariable Calculus
Limits, continuity and differentiability of function of several variables; Partial derivatives; Maxima and minima of function of two or more variables; Method of Lagrange's multipliers; Differentiation under integral sign

Unit 4: Integral Calculus
Reduction formulae; Double and triple integrals; Change of order of integrations; Beta and Gamma functions; Applications to area and volume

Unit 5: Vector Calculus
Scalar and vector point functions; Gradient, divergence and curl; Properties of gradient, divergence and curl; Line integral; Surface integral; Volume integral; Green's theorem in a plane; Gauss's Divergence theorem; Stoke's theorem

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. 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.

Reference Books:
1. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
3. D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.
6. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.

CO-PO Correlation

	Course Name: MATHEMATICS- I [SOE-B-FY101]											
	Program Outcomes (POs)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2		1	2		2	1	2	1	1	2
CO2	2					1		2	3	2	2	2
CO3	1		1		1		1		2	2	1	3
CO4	1				2				1	2	3	4
CO5	1	2	2	2			2	1	2	1	1	2
CO6	1				2	2			3	2	2	2
CO7	1	1	1					1	2	2	1	3
CO8	1		1			1	2		1	2	3	4
CO9	2			1	1			1	2	1	1	2
CO10	1		1		1		1		3	2	2	2

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

Name of the Course:	Engineering Chemistry	Course Code:	SOE-B-FY102
Credits :	3	No of Hours :	45
Max Marks :	100		

Course Description:

This course aims at giving students theoretical understanding about the basic concepts of Chemistry and to acquire the skills required for an engineer. Reaction rates and factors that influence the reactions and the importance & utility related to it is introduced. The 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

Syllabus

Unit I: Reaction Kinetics

Factors affecting rate of reaction (reactant concentrations, temperature, physical states and surface areas, solvent and catalyst); Rate of reaction, mathematical expression, units, instantaneous & average rate; Rate Law-Differential & Integrated Rate law, order and molecularity, determination of rate law- Differential, Integral, Half-life, Initial rate & graphical method, rate constants (up to second order with one reactant only); Half-lives and radioactive decay kinetics (carbon dating); Collision model of reaction kinetics, activation energy, Arrhenius equation; Catalysis.

Unit II: Corrosion Chemistry

Corrosion fundamentals (causes, consequences & driving force); Theories of Corrosion: Dry/ Chemical Corrosion & Wet/ Electrochemical corrosion; Forms of corrosion- Galvanic, Concentration Cell / Differential aeration, wire-fence, waterline, pitting, crevice, stress corrosion, corrosion fatigue, microbial & soil corrosion; Factors affecting corrosion: nature of the metal & corroding environment: Corrosion Control- Proper design, materials selection, protective coatings, use of inhibitors, modifying/ alteration of environment, cathodic protection (sacrificial anodic & impressed current cathodic).

Unit III: Water Chemistry

Introduction, sources of water, impurities present in water & their effect, requirement of boiler feed water; Alkalinity – types & determination (including numerical problems); Hardness - definition, types, determination; Water softening process- Lime and Soda, Zeolite & Ion Exchange Process (including numerical problems)**;** Boiler problems (causes & removal) **-** sludge and scale, caustic embrittlement, boiler corrosion, priming and foaming; Conditioning of boiler feed water (carbonate, phosphate, colloidal & calgon conditioning).

Unit IV: Fuels Chemistry

Introduction (definition & classification, characteristics, combustion); Calorific value (HCV & LCV) & its determination - by Dulong's formula & Bomb Calorimeter (principle & working); Coal, ranking & analysis - proximate & ultimate analysis and their importance in ranking; Coke, importance as fuel, manufacturing & carbonization- high temp & low temp carbonization.

Unit V: Polymer Chemistry

Fundamentals (nomenclature, degree of polymerization, monomer units & classification), Polymerization- Addition, Condensation & Co-polymerization; glass transition temperature, tacticity & Ziegler-Natta catalyst; Preparation, properties, and technical application of major polymers (polyethylene, PVC, Teflon, Nylon 6,6, Bakelite); Introduction to Resin, Types of Resins, Thermoplastic & thermosetting Resin, Industrial applications of resin; Elastomers, natural rubber & vulcanization process.

Textbooks:

1. Engineering Chemistry by P.C. Jain & Monica Jain, 2008
2. A textbook of Engineering Chemistry by Dara, S.S. & Umare, S.S., S Chand, 2013
3. Engineering Chemistry by Palanna O.G., Mc Graw Hill Edu., 2017

Reference Books

1. Chemistry in Engineering and Technology (Vol-2) by J. C. Kuriacose, J. Rajaram (Tata McGraw Hill).
2. Engineering Chemistry by M.M. Uppal, Revised by S.C. Bhatia (Khanna Publishers).
3. Corrosion for Science and Engineering, Trethewey and Chamberlain, 2nd Edition, Pearson Education 1998
4. Corrosion Engineering, Fontana, 3rd Edition, McGraw Hill, 1986
5. Corrosion Engineering, Roberge, McGraw Hill, 2008
6. Principles of Chemistry, Laidler, K.J., Harcourt, Brace & World, New York, 1966
7. Physical Chemistry, Moore, W.J., Prentice-Hall, 1962
8. Inorganic Chemistry, Moeller, T., John Wiley, 1982

CO - PO Correlation

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

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

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Physics-I**	**Course Code:**	**SOE-B-FY103**
Credits :	**3**	**No of Hours :**	**45**
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 electronics, theory and applications of laser, concepts of Newton's law of motion, parameter of Mechanics, interference of light, good conditions for interference 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 Solid-State Physics.
CO2	Know the fundamental principles of semiconductors
CO3	Understand the interference from wave optics concepts and know its applications.
CO4	Acquire knowledge and understanding of fundamental principles of modern physics relevant to problems of Electrical and Electronics Engineering

Syllabus:
Unit I.
Solid State Theory: Formation of energy bands in metals, Classification of solids on the basis of energy band diagram, Conductivity of Semiconductors, mobility in conductor & semiconductor.

Unit II.
Electronics: Electrons and holes in an intrinsic semiconductors, Donor and acceptor impurities, Fermi level, Carrier densities in semiconductor, Hall effect, Diffusion, Recombination, Junction Diode, PN junction characteristic, Effect of Temperature, Depletion Layer, Breakdown Mechanism: Zener and Avalanche Breakdown, Half wave and full wave rectifiers, filters, Zener diode as a regulator, Transistors (PNP & NPN) Operation, CE, CB, CC configuration.

Unit III.
Lasers: Principles and working of laser, population inversion, Laser characteristics, components of laser, Einstein's coefficients, He-Ne laser, Ruby laser, Laser applications.

Unit IV.
General Mechanics: Central and non-central forces, Inverse square force, Potential energy function F = -grad V, equipotential surfaces and meaning of gradient. Conservative and non-conservative forces, Conservation laws of energy & momentum, Harmonic oscillator, damped harmonic motion forced oscillations.

Unit V.
Interference of light: Superposition of Waves, Conditions for Interference, Methods of formation of coherent sources, Theory of Interference, Fresnel's Biprism, Newton's ring, Diffraction grating, Rayleigh's criterion of resolution, Engineering applications of Interference phenomenon.

Texts/ References:

1. Beiser, Perspectives in Modern Physics, McGraw Hill, 1969.
2. Lengyel, Introduction to Laser Physics, Wiley Interscience 1971.
3. E. Siegman, An Introduction to Laser and Masers, McGraw Hill 1971.
4. S. H. Patil, Elements of Modern Physics, Tata McGraw Hill, 1989.
5. A.K. Ghatak and S. Loknathan, Quantum Mechanics, Theory and Applications, McMillan India, 1984.
6. Michael Sayer & Abhai Mansingh, "Measurement, Instrumentation and experiment design in physics and engineering", Prentice Hall of India Pvt. Ltd., New Delhi – 110 001, 2003.
7. P. Malvino, "Electronic Principles", Tata McGraw-Hill, 1979.
8. H. V. Malmstadt, "Electronics for Scientists", New York : W. A. Benjamin, 1962.
9. J. W. Goodman, An Introduction of Fourier Optics, McGraw Hill,N.Y., 1968.

CO-PO & PSO Correlation

Course Name: Physics-I (SOE-B-FY103)												
	Program Outcomes						PSO					
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	2	2	2	2	2	2	2			
CO2	3	2	2	1	2	3	2	2		1		
CO3	2	3	3	2	2	2	2	2	1		2	
CO4	3	1	1	2	1	2	2	3		1		2

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

Programme:	B. Tech	Semester:	I

Name of the Course:	**Basic Computing**	**Course Code:**	**SOE-B-FY104**
Credits:	**4**	**No of Hours:**	**55**
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.

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 Outcomes								PSO			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2			1	3				1		1	
CO2	1		2	2						2		3
CO3	3		1	1	2		2		2		2	
CO4	2			1						3		1
CO5		1			1		2	3		1	2	

Note: 1: Low, Note – 1: Low , 2: Moderate, 3: High

Programme:	**B. Tech.**	**Semester :**	**I**
Name of the Course:	**Engineering Graphics**	**Course Code:**	**SOE-B-FY105**
Credits:	**3**	**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. A. 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:

1. W. J. Luzadder, Fundamental of Engineering Drawing, Prentice Hall of India.
2. Basudeb Bhattacharyya, Machine Drawing Include Auto CAD Supplements, Oxford University Press, India.
3. French and Vierck, Graphic Science, Mc- Graw Hill international
4. K. Venugopal, Engineering Drawing and Graphics, New Age Publication.
5. R. K. Dhawan, Engineering Drawing, S. Chand and Company Ltd., New Delhi, India.
6. N. B. Shaha and B. C. Rana, Engineering Drawing, Person Education.

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

CO-PO&PSO Correlation

	Course Name: Engineering Graphics											
Course Outcome	Program Outcome								PSO			
	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2	3	3				1	3		3
CO2	3	3	2	3	2						1	1
CO3	3	3	2	3	2						1	1
CO4	3	3	2	3	2						1	1
CO5	3	2	2	3	3						1	1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**I**
Name of the Course:	**Basic Electrical and Electronics Engineering**	**Course Code:**	**SOE-B-FY106**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Description:

The subject curriculum focuses on fundamentals of electrical and electronic circuits. It covers the DC and AC electrical circuit analysis, magnetic circuit analysis and description of basic electronics components and their applications.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the basic concepts of Core Electrical Engineering subjects.
CO2	Analyse different network theorems.
CO3	Draw phasor diagram for various electrical circuits.
CO4	Understand the fundamental of semiconductor devices.
CO5	Know the different application of transistors.

Course Contents:

UNIT-1: DC Electrical Circuit Analysis:

Voltage and current sources, dependent and independent sources, Source Conversion, Star-delta and delta-star conversions, Ohm's Law, Kirchhoff's Laws & their limitations, Nodal analysis, loop analysis and Mesh current methods, Superposition principle, Thevenin's and Norton's theorems, Maximum power transfer theorem.

UNIT-2: AC Circuits:

Single- phase AC Circuits: Single phase emf generation, average and effective values of sinusoids, R.M.S. value, form factor and peak factor of AC quantity, Concept of phasor diagram, Concept of Power factor, impedance and admittance, Active, reactive and apparent power, analysis of R-L, R-C, R-L-C series, parallel and series-parallel circuit and Resonance condition.

UNIT-3: Magnetic Circuits:

Basic definitions, magnetization characteristics of Ferro magnetic materials, self-inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, AC excitation in magnetic circuits, magnetic field produced by

current carrying conductor, Force on a current carrying conductor. Induced voltage, fundamental laws of electromagnetic Induction, direction of induced E.M.F.

UNIT-4: Semiconductor Diodes:

Introduction to semiconductor, Formation of P-N Junction, P-N Junction Diodes; Semiconductor Diodes, V-I Characteristics, Effect of Temperature on V-I Characteristics, Ideal Diode, Diode equation, Diode Resistance, Transition and Diffusion Capacitance. Light Emitting Diode, Zener Diode, Photodiode. Applications of Diodes.

UNIT-5: Transistors:

Transistor: Introduction, Construction, Types: npn and pnp, Current components. Transistor as amplifier, Transistor Characteristics.
Digital logic fundamentals, Boolean Algebra, truth table, Logic Gates.

Text Books:

1. E. Hughes, Electrical Technology, ELBS, 1997.
2. B L Theraja, Electrical technology, Basic Electrical Engineering, Volume 1, S Chand.
3. Integrated Electronics: Analog & Digital Circuit Systems – Jacob Millman & Halkias, TMH.
4. Electronic Devices and Circuit Theory – Boylestad & Nashelsky

Reference Books:

1. Charles & Sadiku, Fundamentals of Electric circuits, TMH, Third Edition.
2. V. D. Toro, Basic Electrical Engineering, PHI, 2000.

CO-PO & PSO Correlation:

Course Name : BEEE (SOE-B-FY106)												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	2			2			3			1
CO2	3	3	2							2		
CO3	3	3	3						1		2	
CO4	3	3	3						1			2
CO5	3	3	3			2			2	3	1	

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

Programme:	**B. Tech.**	**Semester :**	**I**
Name of the Course:	**Basic Electrical and Electronics Engineering**	**Course Code:**	**SOE-B-FY107**
Credits :	**1**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description:

The response of Electrical Circuit can be verified practically by applying different theorems and fundamental techniques. The students will become sure that the theoretical tricks which they have learned from books are true. The students will become competent in the field of circuit analysis

Course Outcomes:

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

CO Number	Course Outcome
CO1	Get the basic knowledge about the Electric circuits.
CO2	Understand the basic construction of transistors.
CO3	Get the knowledge about various measuring instruments.
CO4	Know about the components of electronic circuits.

Syllabus:

List of Experiments:

1. Study of Electrical Safety precautions.
2. Study of CRO, DSO, Function Generator, Multimeter, Power supply.
3. To verify KCL and KVL.
4. To verify Thevenin's and Norton's Theorem.
5. To verify Superposition Theorem.
6. Determine resonant frequency of series R-L-C circuit.
7. To measure Current, Power, Voltage and Power Factor of series R-L-C Circuit.
8. To measure the armature and field resistance using Ohm's law.
9. Determine the VI Characteristics of PN junction Diode
10. Design and study the characteristics of Common Emitter configuration of NPN transistor
11. Design and Study the characteristics of Common Collector Configuration of NPN transistor
12. Study Different logic gates and verify their truth table.

Reference Books & Manuals:

1. Basic Practical in Electrical Engineering: P. S. Dhogal (Author), Standard Publishers Distributors (2004).

Equipment's/Machine/Software required: Different types of meters, resistors, DC supply, variac, transformers, rheostat. Some experiments can be done by MATLAB.

CO-PO & PSO Correlation:

Course Name : BEEE (SOE-B-FY107)												
	Program Outcomes								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**2**	**2**			**2**			**2**			
CO2	**3**	**3**	**2**							**1**		**2**
CO3	**3**	**3**	**3**						**3**			
CO4	**3**	**3**	**3**								**1**	

Note: 1: Low 2: Moderate 3: High

Programme :	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Engineering Chemistry Lab**	**Course Code :**	**SOE-B-FY108**
Credits :	**1**	**No of Hours :**	**30**
Max Marks :	**50**		

Course Description:

This Engineering Chemistry Laboratory is common to first year branches of UG Engineering. The course enables students to

- Apply and use knowledge, methods and techniques for analysis
- Develop an ability to analyze, evaluate and synthesize scientific information
- Develop experimental and investigative scientific skills

Course Outcomes (CO)

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

List of Experiments

1. Determination of type and extent of Alkalinity in the given sample of water using hydrochloric acid solution (acid-base titration)
2. Determination of chloride ion content in a given water sample by Mohr's method ($AgNO_3$, Cl- titration)
3. Determination of the Dissolved Oxygen in a given water sample by Wrinkler's method using Std. Sodium thiosuphate solution (iodometric titration)
4. Determination of temporary & permanent hardness in water sample by EDTA method (complexometric titration)
5. Determination of order and rate law expression of acid decomposition of thiosulfate ion solution (kinetics study)
6. Determination of the concentration of unknown solution of an electrolyte by conductivity measurement (using data loggers with conductivity probe and drop counters)
7. Determination of equivalence point and concentration of acid by pH measurement (using data loggers with pH probe and drop counters)
8. Demonstration of different types of Corrosion of metals
9. Kinetics ICT Exercise: Determination of order and rate constant of reaction using a spreadsheet and graphical techniques
10. Acid & Base ICT Exercise: Determination of equivalence point and concentration of acid (or base) using spreadsheet and graphical techniques.

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.

Reference 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.

CO- PO & PSO Correlation

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

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

Programme:	**B.Tech**	**Semester :**	**I**
Name of the Course:	**Spoken English Communication**	**Course Code:**	**SOE-B-FY109**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description

This course examines the process of spoken communication in English language with an emphasis to develop fluency in it. Through individual and group activities, students work on improving pronunciation, practice conversation strategies and delivering oral presentation.

Course Outcome

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Reduce anxiety by recognizing and using communication strategies.
CO2	Apply principles of effective and ethical speaking during conversation at the various situations.
CO3	Formulate the speech according to the purpose, audience and time constraints
CO4	To recognize and use effectively non-verbal clues in communication
CO5	Give effective presentation.

Syllabus

Unit 1: Basics of Communication

Introduction to Communication, Types of Communication, Barriers to Communication, Listening Skill.

Unit 2: Grammar in Use

Sentence Structures, Determiners and Preposition, Modals in Conversational Usage, , Voice, Punctuation.

Unit 3: Oral Communication

Speaking: An Overview, Combating Stage Fright, Describing Objects/Situations/People, Delivering Just-a-minute Sessions, Dialog delivery, one to one conversation

Unit 4: Body Language

Body Language - the role of body postures, movements, gestures, facial expressions, dress and make up in effective communication, Conduct while facing interviews.

Unit 5: Professional Presentation

Presentation, Power point Presentation, Group Discussion, Role Plays, Delivering Different Types of Speeches.

Texts Books:

1. A Communicative Grammar of English by Geoffrey N. Leech and Jan Svartvik, Longman
2. Technical Communication for Engineers by Shalini Verma, Vikas Publishing House.
3. A Practical Course in Spoken English by Gangal J.K, Prentice Hall India Learning Private Limited.

Reference Books:

1. English for Technical Communication (With CD) by Aysha Viswamohan, McGraw Hill Education.
2. Comprehensive English Grammar by Madan Sood, Goodwill Publishing House.
3. Spoken English by Alison Reid, Goodwill Publishing House.
4. All about Words: An Adult Approach to Vocabulary Building by Nurnberg, M and M. Rosenblum, W.R. Goyal Publishers & Distributors.
5. High School English Grammar and Composition by WREN & MARTIN , S CHAND PUBLICATION

CO-PO Correlation

Course Name: Spoken English Communication (SOE-B-FY109)												
	Program Outcomes								**PSO**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1				**2**	**1**	**1**	**1**		**1**			
CO2				**3**	**1**	**2**						
CO3				**3**	**2**		**2**				**1**	
CO4				**3**	**1**		**1**					
CO5				**3**	**1**	**1**	**1**			**1**		

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

Programme:	**B.Tech**	**Semester :**	**II**
Name of the Course:	**Mathematics-II**	**Course Code:**	**SOE-B-FY201**
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: Ordinary Differential Equation of First order

Review of ordinary differential equation of first order; non linear differential equation of first order and their applications to engineering problems (viz. Simple electrical circuits, Heat conduction problem, Rate of decay of radio-active material, Chemical reactions and solutions, etc.).

Unit 2: Differential Equation of Higher order

Linear differential equations of higher order with constant coefficients; Method of variation of parameters; Cauchy's & Legendre's linear equations; simultaneous linear equations with constant coefficients; Applications to engineering problems.

Unit 3: Partial Differential Equation

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.

Unit 4: Fourier series

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

Unit 5: Application of Partial Differential Equation

Method of separation of variables; Solution of heat equation; Wave equation; Laplace equation & Poisson's equation

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. Higher Engineering Mathematics by B. V. Rammana-Tata Mc Graw Hill.
4. Advance Engineering Mathematics by R. R. Greenberg- Pearson Publication.
5. Ordinary and Partial Differential Equations by MD Rai Singhania-S. Chand & Sons.

REFERENCE BOOKS

1. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
3. D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata Mc Graw-Hill, New Delhi, 2008.
5. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

CO-PO Correlation

Course Name :MATHEMATICS- II [SOE-B-FY201]												
	Program Outcomes (POs)								Program Outcomes (POs)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	1		2	1		1	1	1			
CO2	1					1		1				
CO3	1		1		1		1				1	
CO4	2				2				2		2	
CO5	2	2	2	2			1	1		1		
CO6	1				2	1			1			2
CO7	2	1						1	1			
CO8	1		1			1	2					
CO9	2			1	1			1			1	
CO10	1		1		1		1		2		2	

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

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Physics-II**	**Course Code:**	**SOE-B-FY202**
Credits :	**2**	**No of Hours :**	**30**
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 atomic and nuclear physics and explore their technological applications in diverse fields.
CO2	Acquire knowledge of basic principles of Relativity and able to differentiate between classical and quantum mechanics.
CO3	Knowledge of propagation of electromagnetic energy through transmission lines and the design of propagation medium based on the requirements.
CO4	Gain basic knowledge of quantum mechanics and origin of Universe.

Syllabus:

Unit I.

Atomic & Nuclear Physics: X-rays, Properties of X-rays, Bragg's law, Bragg's X-ray spectrometer, Characteristic X-ray spectrum, Moseley's law, Daune-Haun't criteria. Nuclei: properties, Mass defect, Binding 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).

Unit II.

The 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 III.

Electromagnetism: Motion of Charged Particles in crossed electric & magnetic fields, Velocity Selector & Magnetic focusing, Gauss law, continuity equation, in consistency in Ampere's Law, Maxwell's equations (differential and integral forms), propagation of plane electromagnetic waves in conducting and nonconducting medium. Gradient, divergence, and curl of scalar and vector fields, Formulation and solving the engineering problems on electromagnetism.

Unit IV.

Quantum mechanics: Introduction to quantum physics, black body radiation, photon concept, de Broglie hypothesis, wave-particle duality, verification of matter waves, wave function and its properties, Phase & group velocity, Uncertainty principle, Schrodinger's equation and its application to particle in 1-D box.

Unit V.

Origin of Universe: Various interpretations about the origin, Big Bang Theory, Large Hadron Collider (LHC) experiment, Hawkins theory about the universe.

Texts/ References:

- Beiser, Perspectives in Modern Physics, McGraw Hill, 1969.
- M.A. Preston and R.K. Bhaduri, Structure of the nucleus, Addison- Wesley, 1975.
- M.K. Pal, Theory of Nuclear Structure, Affiliated East West Press, 1982.
- S. H. Patil, Elements of Modern Physics, Tata McGraw Hill, 1989.
- A.K. Ghatak and S. Loknathan, Quantum Mechanics, Theory and Applications, McMillan India, 1984.
- Michael Sayer & Abhai Mansingh, "Measurement, Instrumentation and experiment design in physics and engineering", Prentice Hall of India Pvt. Ltd., New Delhi – 110 001, 2003.
- P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

CO-PO & PSO Correlation

Course Name: Physics-II (SOE-B-FY202)												
	Program Outcomes								PSO			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	3	2	2	3	2	1	2	1	1		3
CO2	3	2	2	2	2	2	1	2			2	1
CO3	3	2	2	2	2	1	1	2	2		1	
CO4	3	2	2	2	2	1	1	2		2		2

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

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Basics of Civil Engineering**	**Course Code :**	**SOE-B-FY204**
Credits :	**3**	**No of Hours :**	**45**
Max Marks :	**100**		

Course Description:
Civil Engineering as a profession; General introduction to history of civil engineering; types and classification of buildings; setting out of buildings; building materials- various types of bricks, various types of cements, natural and fly ash aggregates, cement mortar and concrete, TMT and structural steel; Overview of foundation engineering; Introduction to traffic and transportation engineering; Case studies of some advance technologies in civil engineering.

Course Outcomes:
After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Explain the importance of civil engineering in the infrastructural development of the society.
CO2	Illustrate the types, uses and properties of various civil engineering materials, foundations, traffic and plans of civil engineering structures.
CO3	Understand the latest technologies in the construction of different civil engineering structures.

Syllabus:

Unit- I
Civil Engineering Materials
Masonry Materials: Types and characteristics of burnt clay and fly ash bricks, AAC blocks, paver blocks; various bonds in masonry.
Cement: Raw materials, Initial and final setting times, types and manufacturing process of cements.
Aggregate: Coarse and fine aggregates and their characteristics.
Steel: Difference among cast-iron, wrought iron, steel, mild steel, tor-steel and 550D grade of steel.
Mortar and Concrete: Proportions of cement mortar and concrete and their characteristics, self-healing concrete.
Activity: Industrial visit to any one of following (student will submit visit report)

1. Brick manufacturing plant
2. Cement manufacturing plant
3. Steel rolling mill.

Unit-II
Building Plans: Components of residential, industrial, commercial and public buildings. Concepts of smart buildings and smart city.

Activity: Study of architectural principles of any one in following (student will submit a report)

1. Central jail building
2. Church
3. Auditorium
4. Industrial building
5. Power station
6. Software technology park
7. Naya Raipur development authority, smart city

Unit- III

Basic concepts of transportation and traffic engineering, signage and signals. Kinetic roadway and walk ways, automation in tunnelling and bridge construction.

Activity: Case study any one of following (student will submit a report)

1. Warli Bandra sea link
2. Britain France chunnel
3. Pumbam bridge

Unit-IV

Civil Engineering Foundations

Various types of foundations for high rise building, bridges, dams, roads.

Activity: Case study of any one of following (student will submit a report)

1. Burj Khalifa,
2. Petronas towers
3. Statue of unity
4. Swaminarayan temple of the Bochasanwasi in Dubai
5. Flipkart headquarters at Bangalore

Unit-V

Advance Technologies in Civil Engineering

Modular construction, cloud collaboration, supply chain management in civil engineering. Introduction to software in civil engineering, photovoltaic glassing, augmented and virtual reality in civil engineering. Overview of total station and application of drones in civil engineering.

Activity: Any one case study in (student will submit a report)

1. Cloud collaboration in civil engineering,
2. Supply chain management in civil engineering,
3. Software application in civil engineering
4. Application of drones in civil engineering

Text Books:

1. Chen,W.F. and Liew, J.Y.R., The Civil Engineering Handbook, 2nd Ed., CRC Press, Taylors and Francis, (2002).
2. Kandya A.A., Elements of Civil Engineering, Charotar Publishing House, (2015).

Reference Books:

1. Gopi, S., Basic Civil Engineering, 1st Ed., Pearson Publishers, (2009).
2. Ahuja, T.D. and Birdi, G.S., Civil Engineering (Building Construction), 8th Ed., Rajsons Publications Pvt. Ltd., (2018).

3. Relevant BIS codes and CPWD Manuals.

Assessment:
Assessment will be on the basis of Attendance, Class Work, Tutorials, Assignments, Quizzes, Activities and Exams.

CO-PO&PSO Correlation

Course Name: Basic Civil Engineering												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	3		2			1		1	2		1	1
CO2	3					1			2	2		
CO3	3	3	2			1		1	2			2

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

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Engineering Mechanics**	**Course Code:**	**SOE-B-FY-205**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description:
This course helps in understanding the various types and system of forces. Resolution and addition of forces. It helps the way to apply the condition of equilibrium in various forces system. It also helps in understanding the friction, centroid, and center of gravity etc. At last, it helps in understanding the concept of kinetics of rigid body and energy principle.

COURSE OUTCOMES:
After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand various force system and apply various concepts to solve problems related with force.
CO2	Understand the different structures like Frame, Trusses, and structures.
CO3	Understand the role of friction and its industrial applications.
CO4	Understand and apply the concept of kinetics and energy principles.

Syllabus:

UNIT-1:
Definitions of mechanics, statics, dynamics, characteristics of a force, principle of transmissibility, Composition and resolution of forces, moment of forces.

System of Coplanar forces: Introduction to coplanar & non-coplanar force system. Forces and their components. Moment of the force about a point, couple.
Resultant of coplanar force system: Resultant of concurrent forces, parallel forces, non-concurrent non-parallel system of forces. Varignon's theorem.

UNIT-II
Equilibrium of coplanar force system: Meaning of equilibrium, free body diagrams, equilibrium of concurrent, parallel and non-concurrent non-parallel (general) system of forces. Types of supports, determination of reactions at supports for various types of determinate beams.
Analysis of pin jointed frame / truss: Perfect truss, Imperfect truss, Analysis of truss by method of joints and method of sections.

UNIT-III: Friction

Definition of friction, force of friction, Limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction and coefficient of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction. Equilibrium of bodies on level plane, external force applied on horizontal and inclined up and down. Equilibrium of bodies on inclined plane external forces is applied parallel to the plane, horizontal and inclined to inclined plane.

UNIT-IV:

Centroid: Definition, centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure.

Centre of Gravity: CG of simple solids such as cylinder, sphere, hemisphere. Cone, cube, and rectangular block. Centre of gravity of composite solids.

Moment of inertia: of plane areas, parallel axis theorem. Introduction to polar moment of inertia, product of inertia and mass moment of inertia. Problems on moment of inertia of composite areas.

UNIT: V

Kinetics of particles: Newton's laws of motion, D' Alembert's principle, equation of dynamic equilibrium linear motion, curvilinear motion. Kinetics of rigid bodies, D' Alembert's principle for bodies under rotational motion about a fixed axis.

Energy principles: Work done by a force, potential and kinetic energy, power, work energy equation, principle of conservation of energy.

Text Books:

1. B.C. Punmia-Theory of structures, Laxmi Publication.
2. Engineering Mechanics (Statics and Dynamics) by A.K. Tayal, Umesh Pub.,
3. Engineering Mechanics by K.L. Kumar, Tata McGraw Hill.

Reference Books

1. Engineering Mechanics (Statics and Dynamics): R.C. Hibbeler, Pearson
2. Engineering Mechanics: Meriam and Kreige, John Wiley and sons
3. Thermodynamics: Cengel and Boles, TMH
4. Essential of Engg. Mechanics: S. Rajasekharan and G. Shankara Subramaniyam, Vikas Publications
5. Engineering Mechanics by Beer & Johnson, Tata McGraw Hill
6. Engineering Mechanics by F.L. Harper & Raw Publication.
7. Engineering Mechanics by Shames, Prentice Hall, India.

CO-PO & PSO Correlation

	Course Name: Engineering Mechanics											
	Program Outcomes								PSO			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2		1					1	3		2	
CO2	2		1					1		1		1
CO3	2		1					1	2		3	
CO4	2		1					1		2		3

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

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Workshop Practice**	**Course Code:**	**SOE-B-FY-206**
Credits :	**1**	**No of Hours :**	**30**
Max Marks:	**50**		

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.

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	Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
CO4	Work effectively with engineering and science teams as well as with multidisciplinary designs.
CO5	Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

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.	4

	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, 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	Test and quiz	

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.
5.

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.

CO-PO/PSO Mapping

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

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

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Environmental Studies**	**Course Code :**	**SOE-B-FY207**
Credits :	**2**	**No of Hours :**	**30**
Max Marks :	**50**		

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)

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.
CO 5	Adopt sustainability as a practice in life, society, and industry.

Syllabus

Unit I: Ecology and Bio-Diversity

Ecology, Environment & Ecosystem, Biotic & Abiotic Components; Structure & functions of Ecosystem, Productivity, Decomposition, Energy Flow, Nutrient cycling, Food Chain & Food Web, Ecological Pyramids; Ecological succession; Bio-diversity: Concept, Importance, and Threats & Conservation

Unit II: Environment and Natural Resources

Earth's Environment: Atmosphere, Lithosphere, Hydrosphere & Biosphere, functions and related problems; Environmental degradation and its causes; Natural resources, Renewable and Non-renewable Resources & associated problems; Study of major Resources on Earth (overview): Forest, Water, Mineral, Food, Energy and Land.

Unit III: Air Pollution

Classification of air pollutants, sources and effects of CO, SOx, NOx, Hydrocarbons, PM, Acid Rain, Ozone, Photochemical Smog & Peroxy Actyl Nitrate (PAN). Earth's energy balance, Green House Effect, Global warming; Stratospheric Ozone & its Depletion; Lapse rate & Temperature Inversion; Ambient Air Quality standard; Air pollution Control Techniques for Gaseous and Particulate air pollutants & equipment used.

Unit IV: Water Pollution & Soil Pollution

Point & non-point source; Water pollutants & types, sources and effects; Water Quality measurement, Dissolved Oxygen, BOD & COD; Wastewater Management, Primary, Secondary & Tertiary stages: Objective, Process overview and Equipment used.

Soil formation, composition & profile; Sources of Soil pollution & effect; Solid Waste Management: Objective, Process & Disposal Techniques.

Unit V: Sustainability & Social issues and Environment

Concept of Sustainable Development (SD), models, indicators and principles of Sustainability. Water conservation- Rain water harvesting, Watershed management. Population Growth, variation among nations, Population explosion, Family Welfare Programme; Environment and human health

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", 1st Edition, 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.).

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	2		2
CO2							1	1		1	1	3
CO3	1		1			1		1	3		2	
CO4				1				1		3		2
CO5			1			1		1	2		1	1

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

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Physics-II Lab**	**Course Code:**	**SOE-B-FY203**
Credits :	**1**	**No of Hours :**	**30**
Max Marks:	**100**		

Course Description:
This course deals with practical knowledge of basic physics including mechanics, optics and electronics.

Course Outcomes:
After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Gain practical knowledge of mechanics
CO2	Aquire hands-on experience of optics experiments using laser.
CO3	Gain knowledge of measuring moment of inertia of fly wheel, acceleration due to gravity, frequency of AC signal, and viscosity of different liquids.

Syllabus:
At least ten experiments are to be performed by each student from the following list.

1. Determination of wavelength of given light by Newton's ring method.
2. Determination of grating element of diffraction grating using He-Ne laser source.
3. Determination of NA (Numerical Aperture) of an optical fiber.
4. Determination of e/m by Thomson method.
5. Determination of AC frequency using Sonometer.
6. Determination of energy gap of semiconductor diode.
7. To study solar cell characteristics.
8. To study the characteristics of PN junction diode.
9. To determine the divergence of laser beam.
10. To study the Hall effect.
11. To study the transistor characteristics in CE mode.
12. Determination of wavelength of He-Ne laser using diffraction grating.

CO-PO & PSO Correlation

Course Name: Physics-II Lab												
	Program Outcomes								PSO			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**3**	**2**	**2**	**3**	**2**	**1**	**2**	**1**		**2**	
CO2	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**3**		**3**	**1**	**2**
CO3	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**		**3**	**1**
CO4	**3**	**2**	**2**	**1**	**2**	**1**	**1**	**2**		**2**		**3**

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

Programme:	**B. Tech**	**Semester:**	**II**
Name of the Course:	**Introduction to Artificial Intelligence**	**Course Code:**	**SOE-B-FY208**
Credits :	**3**	**No of Hours:**	**45**
Max Marks:	**100**		

Course Description:
In this course, students will study the most fundamental knowledge for understanding AI. The course will introduce some basic search algorithms for problem solving, Computing methods like Hard computing & soft computing, various soft computing approaches for learning through neural network. Hands-on with Python programming will enable students to develop AI applications.

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

CO Number	Course Outcome
CO1	Understand the basics of Artificial Intelligence.
CO2	Understand overview of problem solving through search methods.
CO3	Understand the difference between Hard and Soft computing approaches.
CO4	Understand basic Neural network structure and activation functions.
CO5	Understand how to implement the AI concepts using Python programming.

Syllabus:

Unit-I Overview and search techniques
Introduction to AI, AI Definition, Philosophy of AI, Related Fields: Robotics, Machine Learning, Data Science, Deep Learning, Applications: Self Driving Cars, Content Recommendation System, Video/Image processing.AI problem Solving and Games, A* Search.

Unit- 2 Machine Learning and Knowledge representation Odds and Probability:
Why probability matters, Various examples like card playing, Dice, Uncertainty in real life like train ticket confirmation. How to deal with uncertainty, Odds and Expected outcomes, Bayes Rule, Prior and Posterior odds: Basic Principles. Application areas of Bayes classification. Knowledge representation in AI, Types of Knowledge in AI

Unit-III: Advanced Topics in Machine Learning DATA PREPARATION:
Validation, Dimensionality, Missing, Values, Dimensionality, Encoding, Basics of confusion matrix Classification in Machine Learning, MNIST Data set identification, Supervised, Unsupervised and Reinforced Learning.

Unit–IV Introduction to Artificial Neural Network Neural Network Basics
Elements of Neural Network, Why Develop Artificial Neural Networks: Modelling Key features, How Neural networks are Built: Weights and Input, Activation and

Output: Identity Function, Step function, Sigmoid Function. Perceptron, Neural Network, Neural Network classifier. Advanced Neural network techniques: Convolutional Neural Network, Generative adversarial networks (GANs), Deep Learning: It's application on data processing.

Unit–V Application and Case Studies in AI Case study:
Auto Driving Cars, Smart Home and IoT Applications, Robotics, Mine Detections, Medical Diagnosis, Applications in multiple domains. Smart City, Implications of AI, Predicting the Future and Social Implications

Textbooks

1. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Prentice Hall of India.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and applications by S. Rajashekran and G.A. Vijayalakshmi, Prentice Hall of India.
3. Python Programming Fundamentals by Nischay Kumar Hegde, Educreation Publishing.
4. A Textbook of Discrete Mathematics by Swapan Kumar Sarkar, S. Chand Publishing.
5. Discrete Mathematics and its Applications by Kenneth H. Rosen, McGraw-Hill Publication.

Reference Books

3. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.
4. Principles of Artificial Intelligence by Nils J. Nilsson, Narosa Publishing house.
5. Introduction to Artificial Neural Network by Jacek M. Zurada, West Publishing Company.

CO-PO Correlation

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

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

Programme:	**B.Tech**	**Semester :**	**II**
Name of the Course:	**Written English Communication**	**Course Code:**	**SOE-B-FY209**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Course Description

The purpose of the course is to acquire accuracy and clarity in written communication. It helps to develop written text of varying lengths and styles that communicate effectively accurately and appropriately across various situations.

Course Outcome

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Communicate by writing clearly and precisely without errors
CO2	Draft various business correspondence in correct styles and format
CO3	Prepare various forms of the report
CO4	Know the principles of effective written communication
CO5	Develop advance corporate writing skills

UNIT 1: Basics of Writing

An introduction to writing: Definition, Characteristics of effective writing, Principles of writings(7C's), Modes of Writing: Narrative, Descriptive, Argumentative, Expository.

UNIT 2: Grammar in Use

Sentence structure, Subject-Verb concord, Tenses, Voice, Narration, Identifying common errors in writings, Précis writings, Paragraph writings.

UNIT 3: Letter Writing

Types of letters, Elements of letters, Styles of letter writing, Basics of official correspondence, Preparation of Resume and Job application, Quotation, Order, Complaint letter.

UNIT 4: Report Writing

Characteristics of good report, Elements of report, Preparation and writings of report, Use of illustrations in reports, Preparation of Bibliography and References.

UNIT 5: Corporate Writing

Notice, Agenda and Minutes Writing techniques, Tenders, Advertising, Sales Letter

Texts Books:

1. **A Communicative Grammar of English by Geoffrey N. Leech and Jan Svartvik, Longman**
2. Effective Technical Communication- M.Ashraf Rizvi Tata McGraw Hill Company limited New Delhi.
3. Developing Communication Skills- Krishna Mohan and Meera Banerjee, Mc Millan India Ltd, New Delhi

Reference Books:

1. Introduction to Communication studies- John Fisk, RotledgeLondon
2. Writing Technical Papers- D.H.Menzel, H.M.Jonest. Mc GrawHill . New Delhi.
3. A Remedial English Grammar for Foreign Students- F.T.Wood Mc Millan India Ltd.
4. Living English Structure- W. Stannard Allen, Orient Longman London Fourth edition.
5. Technical Communication for Engineers by Shalini Verma, Vikas Publishing House.

CO-PO Correlation

Course Name: Written English Communication (SOE-B-FY209)												
	Program Outcomes								PSO			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1			2	1	1	1		1			1
CO2				3	2	1	1				1	2
CO3	1		1	2	2	1				1		
CO4				2	1				1		1	
CO5				3	2	2	2			1		

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

Programme:	**B. Tech.**	**Semester:**	**III**
Name of the Course:	**Surveying I**	**Course Code:**	**SOE-B-CE301**
Credits :	**4**	**No of Hours :**	**50**
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 leveling, use of theodolite.

Course Outcomes:

Students will be able to:

CO Number	Course Outcome
CO 1	Determine the relative positions and elevations of ground points by applying different techniques.
CO 2	Set out various curves with the field problems.
CO 3	Gain and apply the knowledge of Tacheometry, various systems, instruments etc.

Syllabus

UNIT- I

Methods of Traversing: 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, principle and methods of plane table surveying.

UNIT-II

Leveling and Contouring: Principle and classification of leveling, bench marks, level computations, longitudinal and cross- sectional leveling, plotting the profile, characteristics of contours, methods of contouring, interpolation, contour gradient, contour maps.

UNIT- III

Theodolite Surveying: Principle of theodolite, linear and angular observations, traverses computations.

UNIT- IV

Tacheometery: Definitions, principles of stadia systems, instrument constants, substance and tangential systems of tacheometry, derivations of equation in three different cases. Construction and use of reduction tacheometers, errors in stadia surveying.

UNIT-V

Curve Setting: Types of curves, elements of a curve, setting out a simple horizontal curve, setting out a compound horizontal 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.

Text 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.

Reference Books:

1. Surveying (Vol. II & III), K.R. Arora, (1993), Standard Book House, Delhi.
2. Surveying (Vol. I & II), S.K. Duggal,(2004), Tata McGraw Hill.
3. Surveying (Vol. I & II), T.P. Kanetkar,(1988), Pune Vidyarthi Griha Prakashan, Pune.
4. Surveying (Vol. I & II), C. Venkataramaih,(2011), Universitires Press Hyderabad.
6. Plane and Geodetic Surveying for Engineers Volume 2 Higher Surveying, D.S.CLARK, (1 January 2004), Paperback publications, 6th Edition (revised by J. E. Jackson).

Assessment:

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

CO-PO & PSO Correlation

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

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the	**Strength of**	**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	0	2	1	1	3	0	0	3	1	1	3
CO2	2	1	2	2	1	2	0	0	2	2	1	2
CO3	3	1	2	1	1	2	0	0	2	2	1	3
CO4	2	2	2	1	1	2	0	0	1	3	1	2
CO5	2	1	2	2	1	2	0	0	1	2	1	3

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

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the	**Introduction to Python**	**Course Code:**	**SOE-B-CE303**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course description:
This course introduces the Object-Oriented Programming to the undergraduate students of Civil Engineering. The course includes simple programs in Python for Civil Engineering Problems in structural Engineering, Fluid Mechanics, Soil Engineering and Transportation Engineering.

Outcomes:
The students will be able to

CO Number	Course Outcome
CO 1	Use simple functions in python
CO 2	Use libraries in python
CO 3	Write simple code in python for civil engineering problems

Syllabus

Unit I – Introduction to Python:
History, Features, Programming Concepts, Identifiers, Keywords, Statements and Expressions, Variables, Operators, Data Types, Indentation, Comments, Reading Input, Output, Type Conversions. Essential Python libraries like numpy, pandas, matplotlib, SciPy, scikit-learn, statsmodels, The python interpreter, IPython Basics, Python Language Basics.

Unit II – Built in Data Structures

Functions, Array-Oriented Programming with Arrays, Expressing Conditional Logic as Array Operations, File Input and Output with Arrays, **:**If-else, Loops – For, While; break continue, String manipulations –Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, Formatting Strings, immutability, string functions and methods.

Unit III – Python Building Blocks:
Defining , invoking functions, passing parameters, Lists – list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, Tuples - tuple assignment, tuple as return value, Sets - Concept of Sets , creating, initializing and accessing the elements, operations, Dictionaries - Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, operations and methods, Modules - Importing module, Math module, Random module, Packages.

Unit IV – Python for Analytics:
NumPy – Introduction, creating objects, operations on objects, Functions, files and the operating system, NumPy basics, arrays and vectorized computations,The NumPyandarray: A Multidimensional Array Object, Arithmetic with NumPy Arrays, Boolean Indexing, Transposing Arrays and Swapping Axes, Universal Functions: Fast Element-Wise Array.

Introduction to Pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics, Functions Pandas – Introduction, series, DataFrame, Panel, operations and statistical functions,
SciPy – Introduction, Basic functionality, Cluster, Constants, Statistical functions, plotting with Matplotlib.

Unit V – Introduction to Machine Learning:
Mean, Median, Mode, Standard Deviation, Data Distribution and Normal Data Distributions, Regression – Linear, Polynomial, Multiple regression, Scale, Train/Test – Evaluate Model, operations on Data Sets.

Text books:

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming, Eric Matthes, (20 November 2015), No Starch Press, 2nd Edition.
2. Head First Python: A Brain-Friendly Guide, Paul Barry, (December 6, 2016), Paperback, 2nd Edition.

Reference books:

1. Python Programming: An Introduction to Computer Science, John Zelle, (August 8, 2016), Paperback, 3rd Edition.
2. Learn Python the Hard Way, Zed A. Shaw, Paperback, 3rd Edition.

Assessment:
Combination of class work, tutorials, assignments, quizzes, surprise test, online test, and exams.

CO-PO & PSO Correlation

Course Name: Introduction to Python												
	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	2	2			1	1	
CO2	1			2	1	2		3	1	1		2
CO3		2	3	2	1	2	1		3		1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Engineering Mathematics-III**	**Course Code:**	**SOE-B-MA301**
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

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Fluid Mechanics**	**Course Code:**	**SOE-B- CE304**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course Description

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

Course Outcomes:

Students will be able to understand:

CO Number	Course Outcome
CO 1	Different types of fluid, their physical properties and applications.
CO 2	Various flow types, their occurrence in practice and analysis of them.
CO 3	Application of the principles of hydraulics for getting various energy conversions and their use.
CO 4	About hydraulic machines like turbines and pumps, their classifications and applications.
CO 5	Dimensional analysis, similitude, models etc.

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, Energy equation, Bernoulli's equation, applications of Bernoulli's equation, analysis of finite control volumes and its application to siphon, venturi meter, 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, introduction to jet pump and submergible pump.

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 including Hydraulic Machine,P.N.Modi,S.M. Seth,(2013), Standard Book House, New Delhi, 20th edition.
2. A Textbook of Fluid Mechanics and Hydraulic Machines: (in S.I. Units), R.K.Bansal, (2005), Laxmi Publications, New Delhi, Print.

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering,D.S.Kumar, (2013),S K. Kataria& Sons, 8th edition.
2. Text Book of Fluid Mechanics and Hydraulic Machinery,R.K.Rajput, (2005), S. Chand & Company, Ltd., New Delhi,
3. Fluid Mechanics, F.M.White,(2011), McGraw-Hill Companies, Seventh Edition.
4. Fundamentals of Fluid Mechanics,B.R.Munson, D.F. Young, T. H, Okiishi. (2006), Hoboken, NJ: J. Wiley & Sons, Print.
5. Mechanics of fluids, B.S. Massey, (1989), Chapman & Hall, 6th edition.

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		2	3	1	1	3
CO2	2	1	1	1		2			2	2	1	2
CO3		1				2	1		2	2	1	3
CO4	2		2		1	1			1	3	1	2
CO5		2		3				2	1	2	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Disaster Management**	**Course Code:**	**SOE-B-CE305**
Credits :	**1**	**No of Hours :**	**30**
Max Marks:	**100**		

Course Description

This course gives introduction to natural and environmental disasters, their behavior and possible impacts. Principally aimed to introduce the students to various methods of mitigating damage during disasters.

Course Outcomes:

Students will be able to understand

CO 1	Disaster and its nature.
CO 2	Impact and hazard assessment.
CO 3	Disaster preparedness and mitigation.
CO 4	Use of construction technology for disaster management.
CO 5	Short term and long term relief measures.

Syllabus

UNIT I

Nature of disasters, natural and other disasters, earthquakes, floods, draught, cyclones, fire, epidemics and pandemics and other environmental disasters.

Unit II

Behaviour of structures in disaster prone areas, disaster zoning, hazard assessment, Environmental Impact Assessment (EIA).

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. Earthquake Engineering damage assessment and structural design, S.F. Borg (August 1, 1988), World Scientific Publishing Co, 2nd revised edition.
2. Disasters and development, Cuny F, (October 13, 1983), Oxford University Press Publication.

Reference Books:

1. IS 1893 (Part I): 2002, IS 13920: 1993, IS 4326: 1993, IS 13828:1993.
2. Dynamics of Structures: Theory and Application to Earthquake Engineering, Anil K Chopra, (September 11, 2000), Pearson Education Publication, 2nd edition.

Assessment:

Combination of class work, tutorials, assignments, laboratory work, quizzes, surprise test, online test, project work and exams.

CO-PO & PSO Correlation

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

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester:**	**III**
Name of the	**Surveying Lab**	**Course Code:**	**SOE-B-CE306**
Credits:	**1**	**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 Outcomes:
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		1		1		3
CO2		3	2	3	3		1		2		1	
CO3	3	2	2		3	3		1	2	2	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**Fluid Mechanics Lab**	**Course Code:**	**SOE-B-CE307**
Credits :	**1**	**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, venturi meter, 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 venturi meter.
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:

1. Bourden's tube pressure gauge, manometers.
2. Bernoulli's theorem apparatus.
3. Various notches, orifices, mouthpieces.

4. Model of ship.
5. 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		1	2	2			1		1	
CO2	3		2			1	1		1	2	2	1
CO3	2	2	3	2	1	2		1		1		2
CO4		2	2	2	2				1	1	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the	**Civil Engineering**	**Course Code:**	**SOE-B-308**
Credits :	**1**	**No of Hours :**	**20**
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	2	1		1	1	2				3
CO2	3			1	3	3		2	3	1	2	
CO3		3	2		1		1				1	2
CO4	3		3	2		3			3	1		

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**III**
Name of the Course:	**NPTEL COURSE**	**Course Code:**	**SOE-B-CE302**
Credits :	**2**	**No of Hours :**	**30**
Max Marks:	**50**		

Description: Certificate Coarse on MOOCs/NPTEL: Students required to enroll for the course (Minimum 8 weeks) approved by department of civil engineering and submit the certificate of completion. The students who failed to score the desired marks as per minimum passing criteria of MOOC shall be required to appear for end sem examination of the course conducted by OPJU. For backlog students in this course examination will be conducted by OPJU.

Course Outcomes:
student will be able to

CO Number	Course Outcome
CO 1	Know about various online platforms which are useful for enhancement of knowledge in the domain.

CO-PO & PSO Correlation

Course Name : NPTEL COURSE												
	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**	**1**		**2**			**1**		**1**	**2**

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Theory of Structures -I**	**Course Code:**	**SOE-B-CE401**
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		2	2		1	2		1	1	2	1	2
CO2	2		2	1	1	2	1		1	1	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	B. Tech.	Semester :	IV

Name of the Course:	Engineering Hydrology	Course Code:	SOE-B-CE402
Credits :	4	No of Hours :	50
Max Marks:	100		

Course Description:
The course serves as an introduction to the field of engineering hydrology. It covers fundamentals such as the hydrological cycle, catchment, losses, hydrographs and hyetographs. Determination rainfall intensity and hyetographs, peak flow estimation, hydrograph estimation, groundwater hydrology and modeling, and drought risk analysis / yield hydrology.

Course Outcomes
Students will be able to understand

CO Number	Course Outcome
CO 1	Essential components and function of the hydrologic cycle including precipitation, evaporation/evapotranspiration, overland flow and surface storage, groundwater flow and storage, and channel flow, storm water runoff and water quality.
CO 2	Computation of hydrologic mass balance in a closed basin.
CO 3	Unit hydrographs analysis.
CO 4	Ground water resource, contamination of ground water and unified presentation of ground water hydrology.

Syllabus:

UNIT I
Introduction: Definition and scope, hydrology in relation to water resources development,
Hydrologic cycle, the necessity for hydrologic data, the global water budget, practical applications, water balance equation.
Hydrometeorology: Introduction, constituents of atmosphere, the weather and the atmosphere, the general circulation, air masses and fronts, climate and weather seasons in India.

UNIT II
Precipitation: Forms of precipitation, measurement of precipitation, recording and non-recording type of rain gauges, typical and record rainfall data, errors in measurement of rainfall. Location of rain gauge stations, analysis and interpretation of rainfall data, average depth of rainfall over area, most modern method of measurement of rainfall, Probable Maximum Precipitation (PMP).

UNIT III
Infiltration and Run off: Introduction, factors affecting infiltration, measurement of infiltration, infiltrometers, infiltration equations, infiltration indices, effect of infiltration on runoff and recharge of ground water, runoff, components of runoff, estimation of runoff, calculations by infiltration method, rainfall-runoff relationship, rational method of estimating runoff, basin yield.
UNIT IV

Hydrograph Analysis: Introduction, characteristics of the hydrograph, effect of rainfall distribution on the shape of hydrograph, hydrograph separation, unit hydrograph, derivation of the unit hydrograph, storms-hydrograph, applications of unit hydrograph, direct runoff hydrograph, S-hydrograph hyetograph and isohyets.

UNIT V

Evaporation and Evapotranspiration: Introduction, evaporation process, factors affecting evaporation, estimation of evaporation, measurement of evaporation, reducing evaporation from water surfaces, transpiration, Evapotranspiration

Ground Water: Introduction, occurrence of ground water, aquifer parameters, ground water movement, Darcy's Law, permeability, steady and unsteady flow to wells in confined and unconfined aquifers.

Text Books:

1. Engineering Hydrology, Subramanya K, (2017), Tata McGraw Hill, 3rd Edition.
2. A Text Book of Hydrology, Reddy PJR, (2011), Laxmi Publications, 3rd Edition.

Reference Books:

1. Hydrology Principles, Analysis, Design, Raghunath HM, (2105), New Age International Pvt Ltd, 3rd Edition.
2. Applied Hydrology, Chow V, Maidment D, Mays L, (2017), McGraw Hill, 1st Edition.
3. Applied Hydrology, Linsley RK, Kohler MA, Paulhus JLH, (1949), McGraw Hill, 1st Edition.
4. Hydrology for Engineers and Planners, Hjelmfelt AT, (1975), Iowa State University Press, 1st Edition.
5. Ground Water Hydrology, Todd DK, Mays MW, (2005), Wiley publication, 3rd Edition.

Assessment:

Combination of class work, tutorials, assignments, quizzes, surprise test, online test, and exams.

CO-PO & PSO Correlation

Course Name: Engineering Hydrology												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1		1	2		2					1	
CO2			2		2	2	1		1	3		2
CO3	3			1	1			1			2	
CO4	2		2	1	2	1			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:	SOE-B-CE403
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 an idea of materials being used in the modern road construction techniques and practices. It also covers the transportation planning, traffic studies and airport planning.

Course Outcomes:

Students will be able to understand

CO Number	Course Outcome
CO 1	Highway planning and design.
CO 2	Different aspects of traffic engineering.
CO 3	Application of highway construction material.
CO 4	Design of pavements.
CO 5	The planning process of airport.

SYLLABUS

UNIT I

Principles of Highway Planning: Elements of transportation engineering, different modes of transportation, road development and planning in India, requirements of highway alignment, engineering surveys for highway location, maps and drawing.

Geometric Design: Cross section elements of horizontal and vertical alignment. Highway drainage, surface and subsoil drainage, geometry of hill roads, curve layout.

UNIT II

Traffic Engineering: Introduction to traffic flow theory, PIEV theory, speed-density, speed-flow and flow-density relation, data collection techniques for traffic parameters and delay studies, parking facilities and their uses. Traffic control devices, prevention of road accidents, rotary intersection, highway lighting,

Highway Materials: Behavior of highway materials, properties of sub grade and pavement component materials. Tests on sub grade soil, aggregate and bituminous materials, I.R.C. recommendations, MoRTH recommendations.

UNIT III

Pavement Design: Study of flexible and rigid pavements, basic concepts of pavement analysis and design. Stresses in rigid pavements. I.R.C. recommendations, ideal pavement or perpetual pavement design method.

UNIT IV

Pavement Construction Techniques and Quality Control: Types of Pavements water bound macadam, bituminous and cement concrete pavements. Joints in cement concrete pavements, pavement failures. Innovative materials in pavements.

UNIT V

Airport Planning: Definition of terms related to airport engineering, factors affecting site, selection, obstructions, various surveys for site selection, zoning laws. Classification of obstructions runways orientation, basic runway length and its corrections. Geometric design of runway, runway configuration, taxiways layout, exit taxiways.

Airport Engineering: Brief history of air transport: Aircraft characteristics. Imaginary surfaces, Approach zone and turning zone. Airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons, Wind- rose diagram, Structural design of runway pavements. Trend growth of Domestic Air Traffic in India, Air Cargo, Terminal area, building area, parking area, apron, hanger typical airport layouts. Design of flexible and rigid runways as per FAA procedure, Specifications for the different layers of runway and taxiway pavements, Pavement management systems for runway pavements. ATC Towers.

Text 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, Partha Chakroborty and Animesh Das, (2011), Prentice Hall India Learning Private Limited, Sixth Edition.

References Books:

1. Highway Engineering, Rangawala S.C, (2017), Charotar Publishers, Eleventh Edition.
2. Standard Specifications and Code of Practice for Road Bridges, Section I – General Features of Design, IRC6, (2017), Eight Revision.
3. Specifications for Road and Bridge Works, Transport and Highways (MORTH, formerly MOST), Published by Indian Roads Congress, Fifth Edition.
4. Manual for Survey, Investigation and Preparation of Road Projects Published (Rights of Publication and of Translation Reserved), IRC Publication2001.
5. Traffic and Highway Engineering, Nicholas J. Garber and Lester A. Hoel, (2002), Bill Stenquist, Third Edition.

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		1				2				1		
CO3	1		1		1	1					1	1
CO4	2	1		1	2	2		1	3		1	2
CO5	2	2	2		2	2				1		2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Numerical Methods and Computing**	**Course Code:**	**SOE-B-MA401**
Credits :	**3**	**No of Hours :**	**45**
Max Marks:	**100**		

Course Outcomes:

Students will be able to

CO Number	Course Outcome
CO 1	Solve the problems using finite element method.
CO 2	Evaluate the engineering problems using different optimization techniques.
CO 3	Obtain the numerical solution of ordinary differential equations.
CO 4	Fit the linear and non linear curves to the tabulated data.

Syllabus

Unit I

Finite Element Method: Introduction, history and applications, finite element formulation using minimum potential energy principle, assembly of global stiffness matrices, element strain and stress, spring element, bar and beam elements.

Unit II

Introduction to Evolutionary Algorithms: Introduction to Optimization: Engineering application of optimization, statement of an optimization problem, optimal problem formulation, classification of optimization problem, single variable optimization algorithm, bounding phase method, dual simplex method.

Unit III

Introduction to neural networks: Optimization algorithms for solving constrained optimization problems, direct methods, penalty function methods, engineering applications of constrained and unconstrained algorithms, simulated annealing, neural-network based optimization.

Unit IV

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 V

Algebraic Eigen Value Problem:

Introduction, Classification of numerical computation methods, Theorems, Power Methods, Inverse Iteration Method, Generalized Eigen Value Problem, Jacobi Method.

Text Books:

1. Engineering Optimization: Theory and Practice, S. S. Rao, (2009), John Wiley & Sons, Fourth Edition.
2. Optimization for Engineering Design: Algorithms and Examples, K. Deb, (2012), Prentice Hall India Learning Private Limited, Second Edition
3. Numerical Methods in Engineering & Science with Programs in C, C++ & MATLAB, B. S. Grewal, (2013), Khanna Publishers, Eleventh Edition.
4. Numerical Methods for Scientific and Engineering Computation, M. K. Jain, S. R. K. Iyengar, R. K. Jain, (2007), New Age International (P) Limited, Fifth Edition.

Reference Books:

1. Introduction to Evolutionary Algorithms, X. Yu, M. Gen, (2012), Springer.
2. Higher Engineering Mathematics, B. Ramana, (2017), McGraw Hill Education, First Edition.
3. Numerical Methods for Scientists and Engineers, K. S. Rao, (2007), Prentice Hall India Learning Private Limited, Third Edition.

Assessment:

Assessment includes attendance, performance, record work and exams.

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	1	2
CO2	2	1	2		1				1		1	
CO3		1				2	1			1		2
CO4	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:	**Surveying-II**	**Course Code:**	**SOE-B-CE404**
Credits :	**4**	**No of Hours :**	**50**
Max Marks:	**100**		

Course description:

This course emphasizes on the aspects of triangulation. Further it gives a fair idea of computational errors and observations in survey work. It also covers the total station surveying, photographic, aerial and hydrographic surveying

Course Outcomes:

Students will be able to:

CO Number	Course Outcome
CO 1	Deal with the various aspects of Triangulation.
CO 2	Evaluate computational errors and observations.
CO 3	Work in actual surveying field with total station.
CO 4	Apply the knowledge of Tacheometry, various systems, instruments etc.
CO 5	Understand the concepts of photographic and aerial surveying.
CO 6	Understand the concepts of hydrographic surveying.

Syllabus

UNIT I

Triangulation: Principle and classification of triangulation system, triangulation chains, strength of figures, station marks and signals, satellite station, intersected and resected points.

Field Work: Reconnaissance, intervisibillty of stations, angular measurements, base line measurements and its extension, adjustment of field observations and computation of co-ordinates.

UNIT II

Total Station: Components of total station, basics of total station, setting of instrument, linear measurements, horizontal and vertical angle measurements, traversing, differential leveling, contouring and earthwork measurement, extraction of data to computer, interpretation of data, use of survey data for drawing preparation.

UNIT III

Total Station: Mini projects using total station (Outstation survey camp)

1. Profile surveying of road project (2 days).
2. Contour topographical mapping (2 days).

UNIT IV

Photographic and Aerial Surveying: Photo theodolite, principle of the method of terrestrial photogrammetry, stereo photogrammetry, aerial surveying, scale and distortion of the vertical and tilted photograph, comparison between air photograph and map, study of GPS, GIS and Remote Sensing.

UNIT V

Hydrographic Surveying: Introduction, shore line survey, soundings methods, gauges, equipment required for hydrographic surveying, sounding party, methods of locating soundings, reduction of soundings and plotting of soundings, problems related to hydrographic surveying.

Text Books:

1. Surveying I and II, B.C. Punmia, A. K. Jain, Arun Jain, (2016), Laxmi Publications, Seventeenth Edition.
2. Surveying (Vol. II & III), R. Agor, (1995), Khanna publications, Delhi, First Edition.

References Books:

1. Engineering Surveying Technology, T.J.M Kennie, and G Petrie. (1990), Blackie & Sons Pvt. Ltd., London.
2. Solving Problems in Surveying, A. Bannister and R. Baker, (1994), Longman Scientific Technical, U.K.
3. Surveying (Vol. II & III), K.R. Arora, (1993), Standard Book House, Delhi.
4. Surveying (Vol. I & II), T.P. Kanetkar, (1988), Pune Vidyarthi Griha Prakashan, Pune.
5. Surveying (Vol. I & II), C. Venkataramaih, (2011), Universitires Press, Hyderabad.

Assessment:

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

CO-PO & PSO Correlation

Course Name: Surveying-II												
	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				1	2	1	2
CO2	2	1			1	2			1	1	1	2
CO3		3	2	2		2			3	2	2	2
CO4	2				2	2			1	1	1	2
CO5		1	1			2			1		1	2
CO6	2	1			1	2			1		1	1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**Theory of Structures Lab**	**Course Code:**	**SOE-CE-405**
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:	**Material Testing Lab and Studio**	**Course Code:**	**SOE-B-CE406**
Credits :	**1**	**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 outcomes:

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.
CO 5	Identify, formulate, and solve engineering problems of structural elements subjected to flexure.

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 :**	**IV**
Name of the Course:	**Transportation Engineering Lab**	**Course Code:**	**SOE-B-CE407**
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, Partha Chakroborty 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	2
CO3	2			1	1	1				1	1	1

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		1	2	1	1	1	2
CO2		1	2		1	2			1		1	
CO3	2	1		1			2			1		2
CO4	2		1		1	2			1	1	1	2
CO5		1		2				2		1		
CO6	2	1	1		1	2	1		1	1	1	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the Course:	**PROFESSIONAL DEVELOPMENT**	**Course Code:**	**SOE-B-CE408**
Credits :	**2**	**No of Hours :**	**30**
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

COURSE OUTCOMES

Upon successful completion of the course,

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

1. Stephen E. Lucas, *The Art of Public Speaking*, Third Edition, Singapore: McGraw-Hill, 1989.
2. Sonya Hamlin, *How to Talk so People Listen*, New York: Throson, 1993
3. Jeff Davidson, *The Complete Guide to Public Speaking*, Manjul Books PVT. Bhopal, 2006.
4. 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		1	1	2					1		2	
CO3	1				1	2			1	1		2
CO4	2		2	3		2			1		2	
CO5		2			1				1			2
CO6	2			3	1	2			1	1	2	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**IV**
Name of the	**NPTEL COURSE**	**Course**	**SOE-B-CE409**
Credits :	**1**	**No of Hours**	**15**
Max Marks:	**50**		

Description: Certificate Coarse on MOOCs/NPTEL: Students required to enroll for the course (Minimum 4 weeks) approved by department of civil engineering and submit the certificate of completion. The students who failed to score the desired marks as per minimum passing criteria of MOOC shall be required to appear for end sem examination of the course conducted by OPJU. For backlog students in this course examination will be conducted by OPJU.

Course Outcomes:

student will be able to

CO Number	**Course Outcome**
CO 1	Know about various online platforms which are useful for enhancement of knowledge in the domain

CO-PO & PSO Correlation

Course Name : NPTEL COURSE												
	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**	**1**		**2**			**1**		**1**	**2**

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Theory of Structures -II**	**Course Code:**	**SOE-B-CE501**
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:

Course Outcomes:	Course Outcomes:
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			1	1		1		2		1	
CO2		2	1							1		
CO3	3			2	1	3	1	2	3	2		2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Structural Engineering Design I**	**Course Code:**	**SOE-B-CE502**
Credits :	**3**	**No of Hours :**	**45**
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:

Course Outcomes:	Course Outcomes:
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		1	3	1			2		2	1	1	2
CO2	3				1	3		1				
CO3			3				2		1		1	
CO4	3	2		1	1			1		2		3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the	**Geotechnical Engineering -**	**Course Code:**	**SOE-B-CE503**
Credits :	**3**	**No of Hours :**	**45**
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:

Course Outcomes:	Course Outcomes:
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
CO1		2	1		1	3		2	3	2	1	3
CO2	3		1	1			2			1		
CO3		2		1	1	3		1	2		1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Transportation Engineering – II**	**Course Code:**	**SOE-B-CE504**
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:

Course Outcomes:	Course Outcomes:
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		1		3	1	1	3	3	2	1		
CO2	3		1	2	2		1				3	3
CO3		2	2	2	2	1	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:**	**SOE-B-CE505**
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:

Course Outcomes:	**Course Outcomes:**
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	1		2	1		3	1	1	2	2	3	2
CO2		1			1			2	3		1	
CO3	2		2	1		3	1			2		2
CO4	3	1			2		1	2	2		3	
CO5	1		3	3		3			2	2		
CO6		2			1		1	2		1	3	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Structural Engineering Design I Lab**	**Course Code:**	**SOE-B-CE506**
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:

Course Outcomes:	Course Outcomes:
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. 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.

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	2	1	1	2		1	1	1		2	1	3
CO2		1		3	2	1	2	1	1		1	
CO3	2		3		2		3			3		3
CO4			3	2		2			3		1	
CO5	3	2		2	2	3		1		2		2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**V**
Name of the Course:	**Geotechnical Engineering Lab - I**	**Course Code:**	**SOE-B-CE507**
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:

Course Outcomes:	Course Outcomes:
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			2	1	2			3	1		2	2
CO2	3	2		1			1	3		3		
CO3			1	1	1			2	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:**	**SOE-B-CE601**
Credits :	**3**	**No of Hours**	**45**
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 behavior 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 -

Course Outcomes:	**Course Outcomes:**
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)			
CO1	1	2	3	4	5	6	7	8	1	2	3	4
CO2	1		1	1		2	3	1	2	1	3	
CO3		1			1		2		1	1		2
CO4	2	3	3	1	1	3		2		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:**	**SOE-B-CE602**
Credits :	**4**	**No of Hours :**	**60**
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 –

Course Outcomes:	**Course Outcomes:**
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	2	3	2		1		2		3			1
CO2	1		3	1		3		1		2	1	
CO3		3		2	1		2	1	1			3
CO4	1		2		1						2	
CO5		2		3		1	2		2	1		1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Environmental Engineering-I**	**Course Code:**	**SOE-B-CE603**
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 Ourcomes:

The students should be able –

Course Outcomes:	**Course Outcomes:**
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	1	3		1	3	3		1	3
CO2	3		2		2	1		1	2	3		1
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:	**Construction Planning and**	**Course Code:**	**Code: SOE-B-CE604**
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:

The students should be able –

Course Outcomes:	**Course Outcomes:**
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.

Unit III:

The Design and Construction Process Design and construction as an integrated System- 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- Equipment Choice of Equipment and Standard Production Rates-Construction

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)

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.

CO-PO & PSO Correlation

Course Name: Construction Planning and Management												
	Program Outcome (PO)								Program Specific Outcome (PSO)			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1	2	3	1	2	2	1	3		2		3
CO1	1				1		2		2		1	
CO1		2	2	3	3	1	1		1		1	2
CO1	2			2		3	3	1		2	3	1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Design of Bridge Structures**	**Course Code:**	**SOE-B-CE605(1)**
Credits :	**3**	**No of Hours :**	**45**
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 –

Course Outcomes:	**Course Outcomes:**
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

Programme:	B. Tech.	Semester :	VI

Name of the Course:	Traffic Engineering	Course Code:	SOE-B-CE605(2)
Credits :	3	No of Hours :	45
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 –

Course Outcomes:	Course Outcomes:
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		1		1	2		2	1		1
CO2	3	2	2		2			1			2	
CO3				3			2		2			1
CO4	3	3	1		1	2		1		1	2	
CO5			3	3	2		3		1			1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Solid Waste Management**	**Course Code:**	**SOE-B-CE605(3)**
Credits :	**3**	**No of Hours**	**45**
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 -

Course Outcomes:	Course Outcomes:
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:**	**SOE-B-CE605(4)**
Credits :	**3**	**No of Hours :**	**45**
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 -

Course Outcomes:	**Course Outcomes:**
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	0	1	3	0	1	3	2	1	3
CO2	3	3	3	0	1	3	0	1	3	2	1	3
CO3	3	3	3	1	1	3	0	1	3	3	3	3

Programme:	B. Tech.	Semester :	VI

Note: 1: Low 2: Moderate 3: High

Name of the Course:	**Maintenance, Repair and Rehabilitation of Civil Engineering Structures (MRCS)Analysis**	**Course Code:**	**SOE-B-CE605(5)**
Credits :	**3**	**No of Hours**	**45**
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 -

Course Outcomes:	**Course Outcomes:**
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

OP JINDAL UNIVERSITY

OP Jindal Knowledge Park, Punjipatra, Raigarh-496109

Department of Civil Engineering

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Remote Sensing and GIS in Civil Engineering Analysis**	**Course Code:**	**SOE-B-CE605(6)**
Credits :	**3**	**No of Hours :**	**45**
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 –

Course Outcomes:	**Course Outcomes:**
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		2	1		2		1	1	2	3
CO2			3			3		3			1	
CO3				1	1		2		1	2		3
CO4	3	3	3		1	3		3		2	1	

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Urban Infrastructure**	**Course Code:**	**SOE-B-CE605(7)**
Credits :	**3**	**No of Hours :**	**45**
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 -

Course Outcomes:	**Course Outcomes:**
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	1			2			1		1	2		3
CO2		2	3	1	3	2		3	2		3	1
CO3	2	1	1		2	1	3			2	2	
CO4		2		2				3	2			1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Town Planning**	**Course Code:**	**SOE-B-CE605(8)**
Credits :	**3**	**No of Hours :**	**45**
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 –

Course Outcomes:	**Course Outcomes:**
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			1				
CO2	2			3		3		1	2	2	2	3
CO3		1	2				3	2	1	1		
CO4	2			1	2	3			1		2	2

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Systems Approach in Civil Engineering Analysis**	**Course Code:**	**SOE-B-CE605(9)**
Credits :	**3**	**No of Hours**	**45**
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 -

Course Outcomes:	**Course Outcomes:**
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	1		2		2	2	3			1	1
CO2	3		3			1		2	2	2		2
CO3	2	2	3	1	3	1		1	2	2	1	1

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Structural Engineering Design-II Lab**	**Course Code:**	**SOE-B-CE606**
Credits:	**2**	**No of Hours:**	**45**
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 –

Course Outcomes:	**Course Outcomes:**
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	1		3
CO2		3			1			1			1	
CO3	3			1		2	2		3	2		3
CO4		3	3			3						3

Note: 1: Low 2: Moderate 3: High

Name of the Course:	**Geotechnical Engineering Lab - II**	**Course Code:**	**SOE-B-CE607**
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 –

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
CO1	3		2			3		1	2	3	1	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Environmental Engineering -I Lab**	**Course Code:**	**SOE-B-CE608**
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:

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**	**1**	**1**			**3**		**3**	**2**	**3**		**3**

Note: 1: Low 2: Moderate 3: High

Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Professional Development (Employability Skills-I)**	**Course Code:**	**SOE-B-CE609**
Credits :	**1**	**No of Hours :**	**18**
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 –

Course Outcomes:	**Course Outcomes:**
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**

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	**1**	**1**		**3**	**1**		**3**	**3**	**1**	**1**	**1**	**1**
CO2		**1**	**2**		**1**	**3**			**1**	**2**	**3**	
CO3		**1**	**2**	**2**			**3**	**3**	**1**	**1**		
CO4	**3**	**3**	**3**			**3**			**3**		**1**	**1**
CO5				**1**	**1**		**1**	**3**		**1**		
CO6	**1**		**1**	**3**		**3**		**2**			**1**	
CO6				**3**	**1**		**3**	**3**			**3**	**1**

Note: 1: Low 2: Moderate 3: High

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Programme:	**B. Tech.**	**Semester :**	**VI**
Name of the Course:	**Microsoft Project (MS Project)**	**Course Code:**	**SOE-B-CE610**
Credits :	**1**	**No of Hours :**	**18**
Max Marks:	**50**		

Course Description

Microsoft Project 2019 is a project management application that gives managers the ability to track tasks, resources, reports and timelines for small and enterprise projects. Just one mistake during project management can destroy project budgets and deadlines. MS Project helps student avoid common pitfalls by giving a complete overview of every component of a project, and this course explains each one of these components to get started.

This course starts with basic project setup. A new Project file starts as a template, and the project manager must then fill out worksheets to define resources and tasks. This course takes you step-by-step through each part of configuring a new task and creating resources to work on those tasks. We then show you how to assign each resource to a task to ensure that it gets completed.

Course Outcomes

The students should be able –

Course Outcomes:	**Course Outcomes:**
CO1	Describe what MS Project is and what are its capabilities.
CO2	Demonstrate defining and creating projects
CO3	Demonstrate entering and scheduling tasks
CO4	Describe calendar and how to organize tasks
CO5	Define resources and resource management
CO6	Demonstrate consolidating projects and resources
CO7	Describe what MS Project is and what are its capabilities.

Syllabus

Unit 1:

Basics of Project Management: About Project, Project Attributes, Triple Constraints, Project Management, 5 Stages of Project, Project Life Cycle, Scheduling, Linking, Baseline setup, Logical Relationship of task, Activities listing. Milestone, Work Break Down structure, Float, Forward Pass, Backward Pass, Gantt chart, Network Diagram, Critical Path Method, PERT, Project Monitoring, Project Tracking, S-Curve Analysis.

Unit 2:

Introduction to MS Project: Background, Getting Started in MS Project 2019. Defining and Creating Projects, Entering and Scheduling Tasks, Project 2019 Views, Defining Calendar.

Unit 3:

Defining Activities and Task: Organizing Tasks, Working with Task Duration, Constraints, and Deadlines, Introducing Dependencies, Logical Relationship setup, Assigning Durations, Actual Start, Schedule Task.

Unit 4:

Resources and Tracking: Types of Resources, Working with Resources, Resource Management, Tracking Work in Project 2019, Communication and Progress Updates, Using Baselines,

Unit 5:

Reports: Customizing and Formatting Your Project, Running Reports, Consolidating Projects and Resources, Printing Project Information

Course Materials

All course material will be provided in the lessons and net links. There are no required materials to purchase before taking the class.

Assessment:

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

CO-PO & PSO Correlation

Course Name: Microsoft Project (MS Project)												
	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	3	2		3	2		3
CO2		1	1			1					1	
CO3	3	1	1	2				2	3	1	1	3
CO4		3	3			3	2		3			
CO5	2				2				-	1		2
CO6	2					3	1		3			3
CO7	1	1		3		1		2		3	3	1

Note: 1: Low 2: Moderate 3: High