OP JINDAL UNIVERSITY

Raigarh-Chhattisgarh

(Program Code: 01UG010)

Scheme and Syllabus

of

B. Tech

Department of

Civil Engineering

School of Engineering

2022-2026

Program Outcomes for Engineering Graduate

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

SEMESTER I

S. N.	Subject Code	SUBJECT	Periods per week			Credit (L+ (T+P)/2)	Scheme of Examination and Marks				BoS
			L	T	P		PRE		ESE	Total Marks	
							Mid Sem	TA			
1	SOE-B-FY101	Mathematics- I	4	1	0	5	30	20	50	100	Maths
2	SOE-B-FY102	Engineering Chemistry	3	0	0	3	30	20	50	100	Chemistry
3	SOE-B-FY103	Physics- I	3	0	0	3	30	20	50	100	Physics
4	SOE-B-FY104	Basic Computing	3	2	0	4	30	20	50	100	CSE
5	SOE-B-FY105	Engineering Graphics	2	2	0	3	30	20	50	100	Mech
6	SOE-B-FY106	Basic Electrical & Electronics Engineering	3	0	0	3	30	20	50	100	EE
7	SOE-B-FY107	Basic Electrical & Electronics Engineering Lab	0	0	2	1	-	30	20	50	EE
8	SOE-B-FY108	Engineering Chemistry Lab	0	0	2	1	-	30	20	50	Chemistry
9	SOE-B-FY109	Spoken English Communication	0	0	2	1	-	30	20	50	Humanities
		TOTAL	18	05	06	24	180	210	360	750	

Note: The tutorials of courses Basic Computing & Engineering Graphics shall be conducted in their respective laboratories.

SEMESTER II

S. N.	Subject Code	SUBJECT	Periods per week			Credit (L+ (T+P)/2)	Scheme of Examination and Marks				BoS
			L	T	P		PRE		ESE	Total Marks	
							Mid Sem	TA			
1	SOE-B-FY201	Mathematics- II	4	1	0	5	30	20	50	100	Maths
2	SOE-B-FY202	Physics- II	3	0	0	2	15	10	25	50	Physics
3	SOE-B-FY204	Basics of Civil Engineering	3	0	0	3	30	20	50	100	Civil
4	SOE-B-FY205	Engineering Mechanics	3	0	2	4	30	20	50	100	Mech
5	SOE-B-FY207	Environmental Studies	1	0	2	2	15	10	25	50	Chemistry
6	SOE-B-FY208	Introduction to Artificial Intelligence	2	0	2	3	30	20	50	100	CSE
7	SOE-B-FY203	Physics-II Lab	0	0	2	1	-	30	20	50	Physics
8	SOE-B-FY206	Workshop Practice	0	0	2	1	-	30	20	50	Mech
9	SOE-B-FY209	Written English Communication	0	0	2	1	-	30	20	50	Humanities
		TOTAL	16	01	12	22	150	190	310	650	

SEMESTER III

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2
				L	T	P	PRE**		ESE*	Total Marks	(L+P+T)
							Mid Sem	TA			
1	SOE-B-CE301	CIVIL	Surveying-I	4	0	0	30	20	50	100	4
2	SOE-B-CE302	CIVIL	Strength of Materials	4	0	0	30	20	50	100	4
3	SOE-B-CE303	CIVIL	Introduction to Python	3	0	0	30	20	50	100	3
4	SOE-B-MA301	MATH	Engineering Mathematics-III	4	0	0	30	20	50	100	4
5	SOE-B-CE304	CIVIL	Fluid Mechanics	4	0	0	30	20	50	100	4
6	SOE-B-CE305	CIVIL	Disaster Management (Online)	1	0	0	15	10	25	50	1
7	SOE-B-CE306	CIVIL	Surveying Lab	0	0	2	0	30	20	50	1
8	SOE-B-CE307	CIVIL	Fluid Mechanics Lab	0	0	2	0	30	20	50	1
9	SOE-B-CE308	CIVIL	Civil Engineering Drawing Lab (Autocad based)	0	0	2	0	30	20	50	1
10	SOE-B-CE309	CIVIL	***Certificate Coarse on (MOOCs/NPTEL)	2	0	0	0	30	20	50	2
			TOTAL	22	0	6	165	230	355	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	PRE**		ESE*	Total Marks	(L+T+P)
							Mid Sem	TA			
1	SOE-B-CE401	CIVIL	Theory of Structures- I	4	0	0	30	20	50	100	4
2	SOE-B-CE402	CIVIL	Engineering Hydrology	4	0	0	30	20	50	100	4
3	SOE-B-CE403	CIVIL	Transportation Engineering-I	4	0	0	30	20	50	100	4
4	SOE-B-MA401	MATH	Numerical Methods and Computing	3	1	0	30	20	50	100	3
5	SOE-B-CE404	CIVIL	Surveying-II	4	0	0	30	20	50	100	4
6	SOE-B-CE405	CIVIL	Theory of Structures Lab (STAAD Pro based)	0	0	2	0	30	20	50	1
7	SOE-B-CE406	CIVIL	Material Testing Lab and studio	0	0	2	0	30	20	50	1
8	SOE-B-CE407	CIVIL	Transportation Engineering Lab	0	0	2	0	30	20	50	1
9	SOE-B-CE408	HUMANITIES	Professional Development	0	0	2	0	30	20	50	2
10	SOE-B-CE409	CIVIL	Certificate Coarse on (MOOCs/NPTEL)***	1	0	0	0	30	20	50	1
			TOTAL	20	1	8	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:	5 Hrs/ week
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- I
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- II
Differential Calculus
Successive differentiation; Leibnitz's theorem; Taylor's and Maclaurin's series; Radius of curvature; Curve tracing.

UNIT- III
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- IV
Integral Calculus
Reduction formulae; Double and triple integrals; Change of order of integrations; Beta and Gamma functions; Applications to area and volume

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

Programme :	B.Tech.	Semester :	I
Name of the Course:	Engineering Chemistry	Course Code:	SOE-B-FY102
Credits :	3	No of Hours :	3 Hrs/week
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 :	3 Hrs/week
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. Perspectives in Modern Physics, Beiser, McGraw Hill, 1969.
2. Introduction to Laser Physics, Lengyel, Wiley Interscience 1971.
3. An Introduction to Laser and Masers, E. Siegman, McGraw Hill 1971.
4. Elements of Modern Physics, S. H. Patil, Tata McGraw Hill, 1989.
5. Quantum Mechanics, Theory and Applications, A.K. Ghatak and S. Loknathan, McMillan India, 1984.
6. Measurement, Instrumentation and experiment design in physics and engineering Michael Sayer & Abhai Mansingh, Prentice Hall of India Pvt. Ltd., New Delhi – 110 001, 2003.
7. Electronic Principles, P. Malvino, Tata McGraw-Hill, 1979.
8. Electronics for Scientists, H. V. Malmstadt, New York : W. A. Benjamin, 1962.
9. An Introduction of Fourier Optics, J. W. Goodman, McGraw Hill,N.Y., 1968.

CO-PO & PSO Correlation

Course Name: Physics-I (SOE-B-FY103)												
Course Outcomes	**Program Outcomes**								**PSO**			
	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:	4 Hrs/week
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. Fundamental of Computers, Raja Raman V., (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 :	3 Hrs/week
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- I
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- II
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- III
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- IV
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- V
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. Panchal, Engineering Drawing, N. D. Bhatt and V.M. Plane and Solid Geometry, Charotor Publication House, Anand, Gujarat, India.
2. Engineering Drawing with an Introduction to Auto CAD, Dhaanjay A. Jolhe, Tata Megraw-hill Publishing Co. Ltd, New Delhi, India.
3. Engineering Drawing, Basant Agrawal and C.M. Agrawal, Tata Megraw-hill Publishing Co. Ltd, New Delhi, India.
4. Engineering Drawing, K. L. Narayana and P.L. Kannaiah, Second Edition, Scitech Publications (India) Pvt. Ltd. Chennai.
5. Engineering Graphics for Degree, K. C. John, PHI Learning Pvt. Ltd. New Delhi, 2009
6. Engineering Graphics, A. R. Bapat, Allied Publications, New Delhi, India.
7. Engineering Drawing, D. N. Johle, S. Chand and Company Ltd., New Delhi, India.

Reference Books:

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

8. Engineering Drawing and Graphics by using Auto CAD, T. Jeyaproovan, Vikas Publication house, Pvt. Ltd. New Delhi, India.
9. Engineering Graphics, Association of technical Authors, M. L. Dhabhade, Pune India.
10. Engineering Drawing, B. V. R. Gupta, M. Raja Roy, I. K. International Pvt. Ltd, India.
11. Engineering Drawing, R. K. Dhawan, S. Chand and Company Ltd., New Delhi, India.

CO-PO&PSO Correlation

Course Outcome	Course Name: Engineering Graphics											
	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 :	3 Hrs/week
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.

Syllabus

UNIT- I
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- II
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- III
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- IV
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- V
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. Electrical Technology, E. Hughes, ELBS, 1997.
2. Electrical technology, Basic Electrical Engineering, B L Theraja, 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. Basic Electrical Engineering, V. D. Toro, PHI, 2000.

CO-PO & PSO Correlation:

Course Name : BEEE (SOE-B-FY106)											
Course Outcomes	**Program Outcomes**								**PSOs**			
	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 Lab	Course Code:	SOE-B-FY107
Credits :	1	No of Hours :	2 Hrs/week
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	Understand the basic circuit concepts and verification of network theorems.
CO2	Understand the application of different tools and electrical meters
CO3	The knowledge about the component of electronic and electrical circuit.

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)											
Course Outcomes	Program Outcomes								PSOs			
	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 :	2 Hrs/week
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. Qualitative Inorganic Analysis, Svehla, G. Vogel's Pearson Education, 2012.
3. Quantitative Chemical Analysis, Mendham, J. Vogel's Pearson, 2009.
4. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G.,
5. Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
6. Text Book of Chemical Science by F.W. Billmeyer, John Wiley & sons, 1994.
7. Textbook of Quantitative Chemical Analysis (Latest ed.), Vogel's Revised by G.H. Jeffery, J. Bassett, J. Mendham & R.C. Denney.
8. 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 :	2 Hrs/week
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- I
Basics of Communication

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

UNIT- II
Grammar in Use

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

UNIT- III
Oral Communication

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

UNIT- IV
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- V
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 Outcomes	Program Outcomes								PSO			
	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		

Course Name: Spoken English Communication (SOE-B-FY109)

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	5 Hrs/Week
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	Und 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-I
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- II
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- III
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- IV
Fourier series
Euler's Formula; Functions having points of discontinuity; Change of interval; Even and odd functions; Half range series; Harmonic analysis.

UNIT- V
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. Advance Engineering Mathematics, Peter V. O'Neil, Thomson (Cengage) Learning, 2007.
2. Calculus,Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, 11th Edition, Pearson.
3. Linear Algebra: A Modern Introduction,D. Poole, 2nd Edition, Brooks/Cole, 2005.
4. Engineering Mathematics for first year, Veerarajan T., Tata Mc Graw-Hill, New Delhi, 2008.
5. Engineering Mathematics for first year, P. Sivaramakrishna Das and C. Vijayakumari, 1st Edition, Pearson India Education Services Pvt. Ltd

CO-PO Correlation

Course Name: MATHEMATICS- II [SOE-B-FY201]											
Course Outcomes	**Program Outcomes (POs)**								**Program Outcomes (POs)**			
	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 :	2 Hrs/week
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:
1. Perspectives in Modern Physics, Beiser, McGraw Hill, 1969.
2. Structure of the nucleus, M.A. Preston and R.K. Bhaduri, Addison- Wesley, 1975.
3. Theory of Nuclear Structure, M.K. Pal, Affiliated East West Press, 1982.
4. Elements of Modern Physics, S. H. Patil, Tata McGraw Hill, 1989.
5. Quantum Mechanics, Theory and Applications, A.K. Ghatak and S. Loknathan, McMillan India, 1984.
6. Measurement, Instrumentation and experiment design in physics and engineering ,Michael Sayer & Abhai Mansingh, Prentice Hall of India Pvt. Ltd., New Delhi – 110 001, 2003.
7. Engineering Mathematics, P. Sivaramakrishna Das and C. Vijayakumari, 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:	3 Hrs/week
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. The Civil Engineering Handbook, Chen,W.F. and Liew, J.Y.R., 2nd Ed., CRC Press, Taylors and Francis, (2002).
2. Elements of Civil Engineering, Kandya A.A., Charotar Publishing House, (2015).

Reference Books:
1. Basic Civil Engineering, Gopi, S., 1st Ed., Pearson Publishers, (2009).
2. Civil Engineering (Building Construction), Ahuja, T.D. and Birdi, G.S., 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												
Course Outcomes	Program Outcomes								PSOs			
	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 :	4 Hrs/week
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- II
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. Theory of structures, ,B.C. Punmia, 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 Outcomes	Course Name: Engineering Mechanics											
	Program Outcomes								PSO			
	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 :	2 Hrs/week
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:

Content
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.

WELDINGSHOP

1. Introduction
2. Types of welding, ARC welding, Gas welding, Gas Cutting.
3. Welding of dissimilar materials, Selection of welding rod material Size of welding rod and work piece.
4. Different types of flame.
5. Elementary symbolic representation,
6. Safety precautions in welding safety equipments 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

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.

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.

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. Workshop Technology Vol. I & III, Chapman, W.A.J. and Arnold E., Viva Low price student Edition, 1998.
5. Elements of Workshop Technology ,Chaudhary, Hajra, Media Promoters & Publishers, 1997.
6. Workshop Technology Vol I 7 II, Raghuwanshi, B.S., Dhanpat Rai and Sons 1998.

CO-PO/PSO Mapping

Course Outcome	Course Name: Workshop Practice											
	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 :	2 Hrs/week
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. Essentials of Environmental Studies, Kurian Joseph & R. Nagendran,1st Edition, Pearson Education, 2004.
2. Environmental Chemistry, A. K. Dey, New Age International Publishers.
3. Environment & Ecology, Smriti Srivastava, S.K. Kataria & Sons, New Delhi.

References Books:
1. Environmental Science and Engineering, Keerthinarayana & Daniel Yesudian, 1st Edition, Hi-Tech publications, 2004.
2. A Text Book for Environmental Studies, Erach Bharucha, Text Book of University Grants Commission, 2004.
3. Environmental Engineering, Peavy, H.S., D.R. Rowe & T. George, New York: Mc Graw Hill, 1987.
4. Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy, 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 :	2 Hrs/week
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	Acquire 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

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:	3 Hrs/week
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- II
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
1. Artificial Neural Networks, Robert J. Schalkoff, McGraw-Hill International Editions, 1997.
2. Principles of Artificial Intelligence by Nils J. Nilsson, Narosa Publishing house.
3. 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 :	2 Hrs/week
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- I
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- II
Grammar in Use

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

UNIT- III
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- IV
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- V
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)											
Course Outcomes	Program Outcomes								PSO			
	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 :	4 Hrs/week
Max Marks:	100		

Course Description:
This subject emphasizes on the study of chain and compass surveying, linear and angular measurements, adjustment of closing error. Different methods of surveying and levelling, use of theodolite.

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 compasses, 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.
5. Plane and Geodetic Surveying for Engineers Volume 2
6. 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 Course:	**Strength of Materials**		**Course Code:**	**CIE2102**
Credits :	4		**No of Hours :**	**4 Hrs/week**
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			1	1	3				1	1	3
CO2	2	1	2	2	1		1		2	2		2
CO3		1	2			2		1	2		1	3
CO4	2	2		1	1				1	3	1	
CO5	2		2	2		2	1		1	2		3

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

Programme:	B. Tech.	Semester :	III
Name of the Course:	Introduction to Python	Course Code:	SOE-B-CE303
Credits :	3	No of Hours:	3 Hrs/week
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 NumPy and array: 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, Data Frame, 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 :	4 Hrs/week
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- I
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- II
Expansion in Taylor's and Laurent's series, Singularities and their classifications, Residues, Cauchy-Residue's theorem and Contour Integration

UNIT- III
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- IV
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- V
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 :	4 Hrs/week
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 :	2 Hrs/week
Max Marks:	50		

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 Number	Course Outcome
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 Course:	Surveying Lab	Course Code:	SOE-B-CE306
Credits:	1	No of Hours:	2 Hrs/week
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 (7th Edition).
2. Surveying and Leveling, R. Subramanian, (2012) Oxford University Press, 2nd Edition.
3. Surveying (Vol. II & III), R. Agor, (1995), Khanna publications, Delhi, 1st 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 :	2Hrs/week
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 Course:	Civil Engineering Drawing Lab	Course Code:	SOE-B-308
Credits :	1	No of Hours :	2 Hrs/week
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), 11th Edition.
2. Civil Engineering Drawing and Design, D.N. Ghose, CBS Publisher, (2015), 2nd 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), 10th Edition.
2. Building Construction, Punmia B.C, Jain, Ashok Kumar and Jain, Arun Kumar, Laxmi Publications, (2008), 10th Edition.
3. National Building Code, BIS, New Delhi.
4. Building Drawing, Shah M.H, and Kale C.M, Tata McGraw Hill New Delhi, (2001), 4th Edition.
5. Planning and Designing Building, Y.S.Sane, Poona, Allied Book Stall, (1975), 3rd 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 :	2 Hrs/week
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 :	4 Hrs/week
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 :	4 Hrs/week
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 modelling, 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											
Course Outcomes	**Program Outcome (PO)**								**Program Specific Outcome (PSO)**			
	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 :**	**4 Hrs/week**
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 Sem
Name of the Course:	Numerical Methods and Computing	Course Code:	SOE-B-MA401
Credits :	3	No of Hours :	3 Hrs/week
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 :	4 Hrs/week
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												
Course Outcomes	**Program Outcome (PO)**								**Program Specific Outcome (PSO)**			
	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 :	2 Hrs/week
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 multi-storeyed 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 Sem
Name of the Course:	Material Testing Lab and Studio	Course Code:	SOE-B-CE406
Credits :	1	No of Hours	2 Hrs/week
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 :	2 Hrs/week
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 :	4 Hrs/week
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

UNIT- I

(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- II

(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- III

(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- 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
(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 :	2 Hrs/Week
Max Marks:	50		

Course Description

'Effective Speaking Skills' course is designed to teach students to apply theories and principles of effective interpersonal and public speaking. This course provides instruction and experience in preparation and delivery of speeches within a public setting and group discussion. Emphasis is on research, preparation, delivery, and evaluation of informative, persuasive, and special occasion public speaking. Upon completion, students should be able to prepare and deliver well-organized speeches and participate in group discussion with appropriate audio visual 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

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

REFERENCE BOOKS
1. The Art of Public Speaking, Stephen E. Lucas, Third Edition, Singapore: McGraw-Hill, 1989.
2. How to Talk so People Listen, Sonya Hamlin, New York: Throson, 1993
3. The Complete Guide to Public Speaking, Jeff Davidson, Manjul Books PVT. Bhopal, 2006.
4. Effective Speaking, Second Indian Reprint, Turk, Cristopher, 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		1		2	
CO3	1				1	2			1	1		2
CO4	2		2	3		2		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 Course:	NPTEL COURSE	Course Code:	SOE-B-CE409
Credits :	1	No of Hours :	2 Hrs/Week
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