OP JINDAL UNIVERSITY

Raigarh-Chhattisgarh

(Program Code: 01UG010)

UNIVERSITY OF STEEL TECHNOLOGY AND MANAGEMENT

Scheme and Syllabus

of

B. Tech

Department of

Civil Engineering

School of Engineering

2023-2027

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	SOS-B-Math-23-101	Engineering Mathematics-I	3	0	0	3	30	20	50	**100**	Maths
2	SOS-B-Phy-23-102	Applied Physics	2	0	0	2	15	10	25	**50**	Physics
3	SOE-B-EE-23-103	Basic Electrical and Electronics Engineering	3	0	0	3	30	20	50	**100**	EE
4	SOE-B-CSE-23-104	Basic Computation Skills (C-Programming)	3	0	0	3	30	20	50	**100**	CSE
5	SOE-B-ME-23-105	Engineering Graphics	4	0	0	4	30	20	50	**100**	Mech
6	SOS-B-HUM-23-106	Communicative English	2	0	0	2	15	10	25	**50**	Humanities
7	SOE-B-CE-23-107	Environmental Science	2	0	0	2	15	10	25	**50**	CE
8	SOE-B-EE-23-108	Basic Electrical and Electronics Engineering Lab	0	0	2	1	0	20	30	**50**	EE
9	SOE-B-CSE-23-109	Basic Computation skills (C-Programming) Lab	0	0	2	1	0	20	30	**50**	CSE
10	SOS-B-Phy-23-102	Applied Physics Lab	0	0	2	1		20	30	**50**	Physics
TOTAL			**19**	**00**	**06**	**22**	**180**	**160**	**360**	**700**	

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	SOS-B-Math-23-201	Engineering Mathematics-II	3	0	0	3	30	20	50	**100**	Maths
2	SOS-B-Chem-23-202	Applied Chemistry	2	0	0	2	15	10	25	**50**	Physics
3	SOE-B-ME-23-203	Engineering Mechanics	2	0	0	2	15	10	25	**50**	Civil
4	SOE-B-ME-23-204	Engineering Workshop	0	0	4	2	15	10	25	**50**	Mech
5	SOE-B-CSE-23-205	Python Programming	2	0	0	2	15	10	25	**50**	Chemistry
6	SOS-B-HUM-23-206	Indian Knowledge System (IKS)(ANNEXURE II)	3	0	0	3	30	20	50	**100**	CSE
7	SOM-B-MBA-23-207	Problem Solving & Design Thinking	3	0	0	3	30	20	50	**100**	Physics
8	SOE-B-Chem-23-208	Applied Chemistry Lab	0	0	2	1	0	20	30	**50**	Mech
9	SOE-B-CSE-23-209	Python Programming Lab	0	0	2	1	0	20	30	**50**	Humanities
10	SOS-B-ME-23-210	Engineering Mechanics Lab	0	0	2	1	0	20	30	**50**	
TOTAL			**15**	**00**	**10**	**20**	**150**	**160**	**340**	**650**	

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Engineering Mathematics-I (Matrices and Linear Algebra)**	**Course Code:**	**SOS-B-MAT-23-101**
Credits :	**3**	**No of Hours :**	**3 Hours/week**
Max Marks:	**100**		

Course Description:

The course will introduce basic concepts and techniques from linear algebra that will be required in later courses in areas such as machine learning, computer graphics, quantum computing. Also, to expose student to understand the basic importance of matrices.

Course Outcomes:

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

CO Number	Course Outcome
CO1	find basis of finite dimensional vector spaces.
CO2	learn about inner product, and how to transform a set of non-zero vectors into an orthonormal set.
CO3	learn to solve systems of linear equations, and to find inverse of a matrix by using Gauss-Jordan elimination method.
CO4	find rank/nullity and eigenvalues/eigenvectors of a matrix and learn about the diagonalization of a matrix.
CO5	understand the properties of linear transformation

Syllabus:

Unit-I:

Matrix operations. Rank of a matrix. Inverse of matrix. The Gauss-Jordan method. Solvability of systems of linear equations, Gaussian elimination. Row echelon form. Homogeneous and nonhomogeneous systems of linear equations.

Unit-II:

Eigen values, Eigen vectors, Diagonalization of matrices, Reduction of a quadratic form to canonical form. Vector in two and three dimensions. Algebraic properties. Dot products and properties.

Unit-III:

Vector space, subspace, linear span, linear dependence and independence, Basis and dimension of vector space, Row and column spaces. Linear Transformation.

Unit-IV:
Orthogonal vectors, norm of a vector, Inner product spaces, Gram-Schmidt Orthogonalization, Orthonormalisation, Rank and nullity, Rank-Nullity Theorem, Matrix representation of Linear Transformations.

Unit-V:
Application to the intersection of lines and planes, Properties and composition of linear transformations. Rotations, reflections and stretches. Translations using homogeneous coordinates. One-to-one and onto transformations.

Text Book

1. Gilbert Strang, "Introduction to Linear Algebra", Wellesley-Cambridge press.
2. J. Defranza and D. Gagliardi, "Introduction to Linear Algebra with Applications", McGraw-Hill.

Reference Book

1. Serge Lang, "Introduction to Linear Algebra", (2nd edition), Springer
2. Seymour Lipschutz, Marc Lipson, "Schaum's outlines of Linear Algebra", McGraw-Hill Education (India) Private Limited, New Delhi
3. K. Hoffman and R. Kunze, "Linear Algebra", Prentice Hall

CO-PO & PSO Correlation

Course Name: Engineering Mathematics - I												
Course Outcomes	Program Outcomes								PSO			
	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1	1							1			
CO2	1	2									2	2
CO3	1	1	1							2		
CO4	1		1						1		3	
CO5	1									1		

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

Program:	**B.Tech.**	**Semester :**	**1st**
Name of the Course:	**Environmental Science**	**Course Code:**	**SOE-B-CE-23-107**
Credits :	**2**	**No of Hours :**	**2 Hours/week**
Max Marks :	**50**		

Course Description:

The course will empower the undergraduate students by helping them to Gain in-depth knowledge of natural processes and resources that sustain 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 future ones. Adopt sustainability as a practice in life, society, and industry.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Gain in-depth knowledge of natural processes and resources that sustain life.
CO2	Develop critical thinking for shaping strategies for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
CO3	Adopt sustainability as a practice in life, society, and industry.

Syllabus:

Unit-I: Ecology, Environment & Natural Resources

Ecology, Environment & Ecosystem, Bio-diversity: Concept, Importance, and Threats & Conservation, Environmental degradation and its causes; Natural resources, Renewable and Non-renewable Resources & associated problems; Green Revolution & Organic farming, Population Forecasting.

Unit-II: Water and Wastewater Pollution

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

Unit-III: 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; Lapse rate & Temperature Inversion; Ambient Air Quality Standard; Air pollution Control Techniques for Gaseous and Particulate air pollutants & equipment used.

Unit-IV: Sustainability and Technology-Driven Solution

Application of Artificial Intelligence and Machine Learning in Agriculture, Smart Farming Technology: Controlled Environment Farming, Hydroponics, Aeroponics; Chemical farming vs Sustainable Natural Farming, Bio-Fertilizer; Develop a smart sustainable technology-driven Project.

Text Books:

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

Reference Books:

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

CO-PO & PSO Correlation

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

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

Programme	**B. Tech.**	**Semester :**	**I**
Name of the Course	**Applied Physics**	**Course Code:**	**SOS-B-PHY-23-102**
Credits	**2**	**No of Hours :**	**2 Hours/week**
Max Marks	**50**		

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 Applied Physics course is basically fundamentals of electronics, theory and applications of laser, fundamentals of X- rays, its characteristics, its production method and uses, basics of nuclear energy and nuclear reactor, 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 Applied Physics 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:

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

CO Number	Course Outcome
CO1	Know the fundamental principles of semiconductors
CO2	Get an notion about LASER
CO3	Acquire knowledge of Atomic and Nuclear physics and explore their technological applications in diverse fields.
CO4	Knowledge of propagation of electromagnetic energy through transmission lines and the design of propagation medium based on the requirements.
CO5	Gain basic knowledge of quantum mechanics and the origin of the Universe.

Syllabus:

Unit-I: 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-II: Lasers

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

Unit-III: 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-IV: Electromagnetism
Motion of Charged Particles in crossed electric & magnetic fields, Velocity Selector & Magnetic focusing, Gauss law, continuity equation, inconsistency 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-V: 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.

Books for Reference

1. Lengyel, Introduction to Laser Physics, Wiley Interscience 1971.
2. E. Siegman, An Introduction to Laser and Masers, McGraw Hill 1971.
3. P. Malvino, "Electronic Principles", Tata McGraw-Hill, 1979.
4. H. V. Malmstadt, "Electronics for Scientists", New York : W. A. Benjamin, 1962.
5. Beiser, Perspectives in Modern Physics, McGraw Hill, 1969.
6. M.A. Preston and R.K. Bhaduri, Structure of the nucleus, Addison- Wesley, 1975.
7. M.K. Pal, Theory of Nuclear Structure, Affiliated East West Press, 1982.
8. S. H. Patil, Elements of Modern Physics, Tata McGraw Hill, 1989.
9. A.K. Ghatak and S. Loknathan, Quantum Mechanics, Theory and Applications, McMillan India, 1984.

CO-PO & PSO Correlation

Course Name: Applied Physics												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2		1							1	2
CO2	1	1	1		1				1			
CO3	1	1	1									2
CO4	1	1	1	1					1			
CO5	1	1	1								2	

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-EE-23-103**
Credits	**3**	**No of Hours :**	**3 Hrs Per 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:

CO Number	After completing the course, the students will be able to:
CO1	Ability to define and explain the meaning/function of charge, current, voltage, power
CO2	Understand the behavior of inductance (L) and capacitance (C) in AC circuit
CO3	To analyze magnetic materials and their characteristics.
CO4	To understand semiconductors and their applications.
CO5	Understand the basics of analog and digital logics

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

Reference Books:

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

CO-PO & PSO Correlation:

Course Name: Basic Electrical & Electronics Engineering												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	2			2			2		1	1
CO2	3	3	2									
CO3	3	3	3							1		
CO4	3	3	3						2			
CO5	3	1	3			2						

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

Programme	**B.Tech.**	**Semester**	**I**
Name of the course	**Basic Computation Skills (C Programming)**	**Course Code**	**SOE-B-CSE-23-104**
Credits	**3**	**No of Hours**	**3 Hrs/Week**
Max Marks	**100**		

Course Description:

This course offers lecture, laboratory, and case studies to impart teaching and learning to develop problem solving approaches to systematic represent identified problem into design using flowcharts, algorithms and pseudocode leading towards programming through systemic refinements. This course focus on fundamental concepts of elementary c programming including Arrays, Strings, Pointers, Functions, Structures, Unions, Enum, Storage classes, Dynamic memory allocation and File Handling.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the semantics and syntax of C programming language.
CO2	Analyze problem domain, formulate solution and implement it using C programming language.
CO3	Learn the syntax, semantics and language constructs to write efficient code using C.
CO4	Appreciate the importance and use of pointers and dynamic memory allocation.

Syllabus:

Unit-I: Fundamentals of C Programming

Algorithm & Flowchart: Three construct of Algorithm and flowchart: Sequence, Decision (Selection) and Repetition.

Character Set, Identifiers and keywords, Data types, Constants, Variables. Operators: Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, other operators. Expression, statements, Library Functions, Preprocessor. Data Input and Output: getchar( ), putchar( ), scanf( ), printf( ), gets( ), puts( ), Structure of C program .

Unit- II: Control Structures

Branching: If statement, If-else Statement, Multiway decision. Looping: while do-while, for. Nested control structure: Switch statement, Continue statement Break statement, goto statement.

Unit-III: Functions and Parameters

Function: Introduction of Function, Function Main, Defining a Function, Accessing a Function, Function Prototype, Passing Arguments to a Function, Recursion. Storage Classes: Auto, Extern, Static, Register

Unit- IV: Arrays, String, Structure and Union

Array: Concepts, Declaration, Definition, Accessing array element, One-dimensional and Multidimensional array. String: Basic of String, Array of String, Functions in String.h Structure: Declaration, Initialization, structure within structure, Operation on structures, Array of Structure. Union: Definition, Difference between structure and union, Operations on a union

Unit- V: Pointer and File

Pointer: Introduction, Definition and uses of Pointers, Address Operator, Pointer Variables, Dereferencing Pointer, Void Pointer, Pointer Arithmetic, Pointers to Pointers, Pointers and Array, Passing Arrays to Function, Pointers and Function, Pointers and two-dimensional Array, Array of Pointers, Dynamic Memory Allocation.

Files: Types of Files, File operation- Opening, Closing, Creating, Reading, Processing File.

Text Books:

1. Yashavant Kanetkar ,Let Us C: Authentic guide to C programming language , 19th Edition ,Paperback 2022.
2. E Balagurusamy, Programming in ANSI C, 8/e, McGraw-Hill India, 2019.
3. Herbert Schildt, C: The Complete Reference, Fourth Edition, McGraw Hill Education, 2017.

References Books:

1. A. B. Chaudhuri, Flowchart and Algorithm Basics: The Art of Programming, Mercury Learning & Information, 2020.
2. Brajendra Singh, Jignesh Rawal, Pathik Rawal, Algorithm, Pseudocode and Flowchart: Learn Algorithm in Simple Steps,BeITReady, 2015
3. Laxmi Publications,The Art of Programming Through Flowcharts & Algorithms (First edition), Anil Bikas Chaudhuri, 2018.
4. Kamthane, Ashok N., “Programming in C,” 2/e. Pearson Education India, 2011.
5. Sumitabha Das, “Computer Fundamental and C Programming,” McGraw Hill Education, 1st edition.

CO-PO&PSO Correlation

Course Name: Basic Computation Skills (C Programming)												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1								3			
CO2	2	2							3			
CO3	3								2			
CO4		2	1			1					1	2
CO5								2				

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

Program	B.Tech.	Semester	I Sem
Name of the Course	Engineering Graphics	Course Code	SOE–B–ME-23-105
Credits	4	No of Hours	4 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 AutoCAD **(only for Term Work)**

Isometric Projection

Introduction, Isometric scale, Isometric projection and Isometric views of solids and objects.

Text books:

1. Engineering Drawing, Plane and Solid Geometry by N. D. Bhatt and V.M. Panchal– Charotor Publication House, Anand, Gujarat, India.
2. Engineering Drawing with an Introduction to Auto CAD by Dhaanjay A. Jolhe– Tata McGraw – Hill Publishing Co. Ltd, New Delhi, India.
3. Engineering Drawing by Basant Agrawal and C.M. Agrawal–Tata McGraw– Hill Publishing Co. Ltd, New Delhi, India.
4. Engineering Drawing by K. L. Narayana and P.L. Kannaiah–SciTech Publications (India) Pvt. Ltd. Chennai.
5. Engineering Graphics for Degree by K. C. John–PHI Learning Pvt. Ltd. New Delhi.
6. Engineering Graphics by A. R. Bapat–Allied Publications, New Delhi, India.

7. Engineering Drawing by D. N. Johle– S. Chand and Company Ltd., New Delhi, India.

Reference Books:

1. Fundamental of Engineering Drawing by W. J. Luzadder– Prentice Hall of India.
2. Machine Drawing Include Auto CAD Supplements by Basudeb Bhattacharyya– Oxford University Press, India.
3. Graphic Science by French and Vierck– Mc– Graw Hill international
4. Engineering Drawing and Graphics by K. Venugopal– New Age Publication.
5. Engineering Drawing by R. K. Dhawan– S. Chand and Company Ltd., New Delhi, India.
6. Engineering Drawing by N. B. Shaha and B. C. Rana– Person Education.
7. Engineering Drawing and Design by C. Jensen, J. D. Helsel and D. R. Short– Tata McGraw–hill Publishing Co. Ltd, New Delhi, India.
8. Engineering Drawing and Graphics by using Auto CAD by T. Jeyaproovan– Vikas Publication house, Pvt. Ltd. New Delhi, India.
9. Engineering Graphics by M. L. Dhabhade– Association of technical Authors, Pune India.
10. Engineering Drawing by B. V. R. Gupta, M. Raja Roy– I. K. International Pvt. Ltd, India.

CO–PO & PSO Correlation

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

Note: 1: Low 2: Moderate 3: High

Programme	**B.Tech.**	**Semester:**	**I**
Name of the Course	**Communicative English**	**Course Code:**	SOS-B-HUM-23-106
Credits	**2**	**No of Hours:**	**2 Hrs./ Week**
Max Marks	**50**	**L-T-P:**	**2-0-0**

Course Description:
This course is formulated to give students a perfect view of communication its scope and importance in business world. It is designed to study principles, elements, and practices of effective business communication. The course focuses on approaches for planning, creating, and transmitting business information within a variety of business situations found in the global perspective. This provides opportunities for improving academic and workplace language proficiency also.

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

CO Number	Course Outcome
CO1	Know the various elements, media and principles of effective business communication.
CO2	Demonstrate effective business drafting for the various situations.
CO3	Achieve good presentation skills.
CO4	Analyze a problem and devise a solution in a group.
CO5	Communicate business ideas in a public forum and interview.

Syllabus:

Unit I: Introduction to Business Communication & Listening Skill
Basic Forms of Communication, Process of Communication, Principles of Effective Business Communication, 7Cs of Communication, Types of Communication, Barriers of Communication, Verbal & Non-Verbal Communication, Listening, Types of Listening, Barriers to Listening, Overcoming Listening Barriers.

Unit II: Business Letter Writing & Resume Writing
Need, Functions and Kinds of letters, Structure of Letter Writing and Presentation Styles, Quotation Letters, Complaints and Adjustment letters, Sales letters. Resume / CV writing, Report Writing.

Unit III: Presentation Skill
Characteristics of Presentation, Planning, structuring and Delivery of presentation, use of visual aids

Unit IV: Group Communication
Group Communication, Group discussion, Methodology of Group Discussions, Guidelines of Group Discussion, Role Function in Group Discussions, Types of Non- functional Behaviour, Dealing with Abstract topics; Meetings: notice, agenda & minutes of Meeting.

Unit V: Personal Interview

Introduction to Interviews, Types of interviews, Interview questions, Success in an interview, Important non-verbal aspect, Interview- Dos and Don'ts.

Text Books:

1. Meenakshi Raman and Prakash Singh, Business Communication, Oxford University Press.
2. R. C. Sharma and Krishna Mohan, Business Correspondence and Report Writing, Tata McGraw Hill.

Reference Books:

1. A. Bovee, Thill, J. Business Communication Today, Pearson publication, New Delhi.
2. Sanjay Kumar and Pushplata, Communication Skills, New Delhi: Oxford University Press, 2011.

CO–PO & PSO Correlation

Course Name: Communicative English												
Course Outcome	Program Outcome								PSOs			
	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1				2	1			1			
CO2	2	3			3	1			2	3		
CO3			2		3	2		1			2	
CO4	2			1			2		2			1
CO5		2	2		2	2	2	1		2	2	

Note: 1: Low 2: Moderate 3: High

Program	**B.Tech.**	**Semester**	**1st**
Name of the Course	**Environmental Science**	**Course Code**	**SOE-B-CE-23-107**
Credits	**2**	**No of Hours**	**2 Hours/week**
Max Marks	**50**		

Course Description:

The course will empower the undergraduate students by helping them to Gain in-depth knowledge of natural processes and resources that sustain 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 future ones. Adopt sustainability as a practice in life, society, and industry.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Gain in-depth knowledge of natural processes and resources that sustain life.
CO2	Develop critical thinking for shaping strategies for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.
CO3	Adopt sustainability as a practice in life, society, and industry.

Syllabus:

Unit-I: Ecology, Environment & Natural Resources

Ecology, Environment & Ecosystem, Bio-diversity: Concept, Importance, and Threats & Conservation, Environmental degradation and its causes; Natural resources, Renewable and Non-renewable Resources & associated problems; Green Revolution & Organic farming, Population Forecasting.

Unit-II: Water and Wastewater Pollution

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

Unit-III: 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; Lapse rate & Temperature Inversion; Ambient Air Quality Standard; Air pollution Control Techniques for Gaseous and Particulate air pollutants & equipment used.

Unit-IV: Sustainability and Technology-Driven Solution

Application of Artificial Intelligence and Machine Learning in Agriculture, Smart Farming Technology: Controlled Environment Farming, Hydroponics, Aeroponics; Chemical farming vs Sustainable Natural Farming, Bio-Fertilizer; Develop a smart sustainable technology-driven Project.

Text Books:

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

Reference Books:

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

CO-PO & PSO Correlation

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

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-EE-23-108**
Credits	**1**	**No of Hours**	**1 Hr/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:

CO	After completing the course, the students will be able to:
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.

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, variance, transformers, rheostat. Some experiments can be done by MATLAB.

CO-PO & PSO Correlation:

Course Name: Basic Electrical & Electronics Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	2	2	2			2	2	2	2			1
CO2	3	3	2				3	3		1		
CO3	3	3	3				3	3				

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

Programme :	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Basic Computation Skills (C Programming) Lab**	**Course Code:**	**SOE-B-CSE-23-109**
Credits :	**1**	**No of Hours :**	**2 Hrs/Week**
Max Marks :	**50**		

Course Descriptions:

This course offers lecture, laboratory, and case studies to impart teaching and learning to develop problem solving approaches to systematic represent identified problem into design using flowcharts, algorithms and pseudocode leading towards programming through systemic refinements. This course focus on fundamental concepts of elementary c programming including Arrays, Strings, Pointers, Functions, Structures, Unions, Enum, Storage classes, Dynamic memory allocation and File Handling

Course Outcomes:

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

CO Number	Course Outcome
CO1	Write, debug, resolve syntax & logical errors and execute the programs.
CO2	Make the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
CO3	Use the concepts of functions and dynamic memory allocations for better and cleaner programs
CO4	Develop programs using various features like control statements, Functions, Arrays Strings, File, Pointer, Structure etc.

The following concepts will be covered in the lab:

- Structure of c program, character set, identifiers and keywords, data types, Constants, variables and development environment.
- Operator and expressions, decision making (if , if else , nested if else , switch case ,Break and continue etc .)
- Iterative construct (for, while, do-while), Arrays and Strings.
- Functions, User defined functions, build-in/library functions, Recursion, pointers, header files.
- Structures, unions, enum, Storage classes, dynamic memory allocation, file management.

Text Books:

1. Herbert Schildt, C: The Complete Reference, Fourth Edition, McGraw Hill Education, 2017.
2. E Balagurusamy, Programming in ANSI C, 8/e, McGraw-Hill India, 2019.
3. A. B. Chaudhuri, Flowchart and Algorithm Basics: The Art of Programming, Mercury Learning & Information, 2020.

CO-PO&PSO Correlation

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

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

Programme:	**B.Tech.**	**Semester :**	**I**
Name of the Course:	**Applied Physics Laboratory**	**Course Code:**	**SOS-B-PHY-23-110**
Credits :	**1**	**No of Hours :**	**2 Hours/week**
Max Marks:	**50**		

Course Description:

This Applied Physics Laboratory course includes the application and use of knowledge, methods, and techniques for various quantitative analyses and develops experimental and investigative scientific skills.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the use of instruments, methods for analyzing various parameters
CO2	Learn about basic laboratory work related Electronics, Laser

List of Experiments

1. To determine the moment of inertia of a fly wheel about its own axis of rotation.
2. To verify De Morgan's theorems by using combinational logic gates.
3. To determine the frequency of AC mains using sonometer.
4. To determine the value of acceleration due to gravity 'g' by a free fall method.
5. To determine the coefficient of viscosity of given liquid (Castor oil) by Stoke's method.
6. To verify characteristics of a p-n junction diode during the forward and reverse biasing modes.
7. To study the solar cell characteristics.
8. Determination of forbidden energy gap of SC diode.
9. To determine the divergence of laser beam.
10. Determination of He-Ne laser source using diffraction grating.

CO-PO & PSO Correlation

Course Name: Applied Physics Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	**2**	**2**	**2**			**2**	**2**	**2**	**1**			**1**
CO2	**3**	**3**	**2**				**3**	**3**		**1**	**2**	

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

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Engineering Mathematics-II (Calculus and Differential Equation)**	**Course Code:**	**SOS-B-MAT-23-201**
Credits :	**3**	**No of Hours :**	**3 Hours/week**
Max Marks:	**100**		

Course Description:

Calculus is the examination of continuous change and the rates change occurs. It handles the finding and properties of integrals and derivatives of functions. This is an introductory course consisting of Differential calculus, Partial derivatives, Integral Calculus (Multiple Integrals) and Ordinary Differential Equations

Course Outcomes:

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

CO Number	Course Outcome
CO1	apply notion of continuity and differentiability to functions of single and several variables
CO2	apply partial differentiation and find the extremum by using Lagrange multipliers
CO3	apply the notion of a definite integral from a one-dimensional to an n-dimensional space, and be able to describe and evaluate double and triple integrals.
CO4	familiar with the methods of solving ordinary differential equations.
CO5	learn the technique to solve higher order differential equation.

Syllabus:

Unit-I:

Review of single variable calculus: Review of Limit, continuity and differentiability of single variable functions, Indeterminate forms and L'Hospital rule, Mean Value theorem, Maclaurin and Taylor series expansions of functions of one variable.

Unit-II:

Functions of Several variables: Functions of several variables, Limits and continuity, Partial derivatives and differentiability, Linearization and differentials, Chain rule, Gradient vector, Tangent planes, Directional derivatives, Extreme values and saddle points, Lagrange multipliers, Taylor's formula, Partial derivatives with constrained variables.

Unit-III:

Multiple integral: Multiple integral, Double integrals, Change of order of integration, Area and volume by double integral, Double integrals in polar form, Triple integrals in rectangular coordinates, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals.

Unit-IV:

Ordinary Differential Equations: first order differential equations, variable separation method, Homogeneous Method, exact differential equations; reducible to exact form; Linear equation, Equation reducible to linear differential equation.

Unit-V:

Linear differential equations of higher order with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations

Text Book

1. M. D. Weir and J. Hass, "Thomas' Calculus," 12th edition, Pearson.
2. G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry, 9th Ed, Pearson.
3. B. S. Grewal, Higher "Engineering Mathematics" Khanna Publishers.
4. Erwin Kreyszig "Advanced Engineering Mathematics", John Wiley & Sons.

Reference Book

1. Huges-Hallett et al, Calculus: Single and Multivariable, 6th edition, John-Wiley & Sons (USA).
2. J. Stewart, Multivariable Calculus, Hybrid Edition.
3. Edwards and Penney, Multivariable Calculus with matrices, 6th edition.
4. Tom M. Apostol, Calculus Vol. II, 2nd edition, Wiley.
5. G. F. Simmons and S. G. Krantz, Differential Equations: Theory, Technique and Practice, Tata McGraw-Hill

CO-PO & PSO Correlation

Course Name: Engineering Mathematics - II												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1	2	1									
CO2	1	1	1						2			
CO3	1	1									1	
CO4	1	2	1									
CO5	1	1	1							1		3

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

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Applied Chemistry**	**Course Code:**	**SOS-B-CHE-23-202**
Credits :	**2**	**No of Hours :**	**2 Hours/week**
Max Marks:	**50**		

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

CO Number	Course Outcome
CO1	Demonstrate, apply and use scientific facts and concepts, scientific methods and techniques, scientific terminology, and methods of presenting scientific information
CO2	Facilitate the application of chemical principles in engineering and technology

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; 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.

Text Book

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 Book

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 & PSO Correlation

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

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

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Engineering Mechanics**	**Course Code:**	**SOE–B–ME-23-203**
Credits :	**2**	**No of Hours :**	**2 Hours/week**
Max Marks:	**50**		

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 the inertia and centroidconcept of geometric shapes.
CO5	Understand and apply the concept of kinetics and energy principles.

Syllabus:

UNIT–I:
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 by 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) by R.C. Hibbeler – Pearson
2. Engineering Mechanics by Meriam and Kreige – John Wiley and sons
3. Therodynamics by Cengel and Boles – TMH
4. Essential of Engg. Mechanics by 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 Outcome	Program Outcome								PSO			
	1	2	3	4	5	6	7	8	1	2		
CO1	3	2	1	2		1		1	3	1		
CO2	2	3	1	2		1		1	3	1		
CO3	2	2	1	2		1		1	3	1		
CO4	3	2	1	2		1		1	3	1		
CO5	3	2	1	2		1		1	3	1		

Note: 1: Low 2: Moderate 3: High

Program:	**B. Tech**	**Semester:**	**II Sem**
Name of the Course:	**Engineering Workshop**	**Course Code:**	**SOE–B–ME-23-204**
Credits:	**2**	**No of Hours:**	**04 hrs/week**
Marks:	**50**		

Course Description:

To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands–on training is given in different machine tools and instruments and use them to prepare joints of specific shape and size.

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:

S.No.	Content
1	**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.
2	**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 equipment's and its use in welding processes. 7. Demonstration of different welding tools / machines. 8. Demonstration on Arc Welding, Gas Welding, gas cutting and rebuilding of broken parts with welding.

	9. One simple job involving butt and lap joint
3	**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.

Text Books:

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

References Books:

1. Kent's Mechanical Engineering Hand book by 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 by Chapman, W.A.J. and Arnold E.–Viva Low price student Edition.
5. Elements of Workshop Technology by Chaudhary– Hajra Media Promoters & Publishers.
6. Workshop Technology - Vol I & II by Raghuwanshi – B.S.Dhanpat Rai and Sons.

CO–PO/PSO Mapping

CO Number	Program Outcome								PSO			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1	3		2	3		1	1		3			1
CO2	3	2	2	2	2	1	2	2		2		
CO3	3	2		2	2	1		2		3		
CO4	2	3	2	2	3	2		3	2		1	
CO5	2	3	1			1		2	2	3		

Note: 1: Low 2: Moderate 3: High

Programme:	**B.Tech.**	**Semester:**	**II**
Name of the Course:	**Python Programming**	**Course Code:**	**SOE-B-CSE-23-205**
Credits:	**2**	**No of Hours:**	**2 Hrs./ Week**
Max Marks:	**50**		

Course Description:

Python is a next generation multi-purpose programming language that allows different users to create applications of various domains. Students will be able to learn primary fundamentals of python programming and the potential of python is to achieve modern computing requirements.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Apply python for problem solving
CO2	Understand the concept of decision and loop control.
CO3	Perform operations with basic data types.
CO4	Handle the file and exceptions.
CO5	Understand the concepts of python classes and packages.

Syllabus:

Unit-I:

Introduction: History, Variables, Keywords, Basic Operators, Naming Conventions, Understanding python blocks. Data Types, Declaring and using Numeric data types: int, float etc., Executing code from the Command Line.

Unit-II:

Flow Control Conditional blocks: if, else, simple for loops, for loop using ranges, string, list and dictionaries. while loops, loop manipulation using pass, continue, break and else.

Unit-III:

Complex data types: Using string data type and string operations, Defining list and list slicing, Use of tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Functions

Unit-IV:

Exceptional Handling: Errors, Runtime Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions, raise, assert. File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations.

Unit-V:

Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance,

Polymorphism, Packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc.

Text Books:

1. Wesley J. Chun, "Core Python Applications Programming".
2. Charles Dierbach, "Introduction to Computer Science using Python".

Reference Books:

1. Mark Lutz, "Learning Python", 5th edition, O'reilly Publication.
2. John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications.

CO-PO & PSO Correlation

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

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

Programme:	**B.Tech.**	**Semester:**	**II**
Name of the Course:	**Indian Knowledge System**	**Course Code:**	**SOS-B-HUM-23-206**
Credits:	**3**	**No of Hours:**	**3 Hrs./ Week**
Max Marks:	**100**		

COURSE DESCRIPTION:
India has a rich tradition of intellectual inquiry and textual heritage that goes back several thousands of years. India was advanced in knowledge systems, traditions, and practices since antiquity. The whole range of knowledge systems is multifarious, from the Vedas, and Upanishads to scriptural, philosophical, scientific, technological and artistic sources. The disciplines and domains of knowledge include logic, philosophy, language, technology and crafts, polity, economics and governance, ethics and sociological orders, architecture and engineering, pure sciences, earth sciences, bio sciences, poetics and aesthetics, law and justice, grammar, mathematics and astronomy, metrics, agriculture, mining, metallurgy, trade and commerce, Ayurveda and Yoga, medicine and life sciences, geography, military science, weaponry, ship building, navigation and maritime traditions, biology and veterinary science, etc. The major knowledge tradition prescribes 14 Vidyas- theoretical domains – and 64 Kalas - crafts, skill sets and arts – that are useful in day-to-day living.

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

CO Number	Course Outcome
CO1	Understand the rich heritage of society, state and polity in ancient India
CO2	Acquire knowledge about Indian literature, culture, tradition and practices
CO3	Inculcate an understanding of Indian religion, philosophy, and practices
CO4	Understand, analyze and apply the ancient science, management and Indian knowledge system.
CO5	Acquire knowledge of Indian cultural heritage and performing arts

COURSE CONTENT:

UNIT-I: SOCIETY, STATE AND POLITY IN INDIA
State in Ancient India: Evolutionary Theory, Force Theory, Mystical Theory Contract Theory, Stages of State Formation in Ancient India, Kingship , Council of Ministers, Administration, Political Ideals in Ancient India, The Seven Limbs of the State, Society in Ancient India, Purusārtha, Varnāshrama System, Āshrama or the Stages of Life, Marriage, Four-class Classification, Slavery.

UNIT-II: INDIAN LITERATURE, CULTURE, TRADITION AND PRACTICES
Evolution of script and languages in India: Harappan Script and Brahmi Script. The Vedas, the Upanishads, the Ramayana and the Mahabharata, Puranas, Buddhist And Jain Literature in Pali, Prakrit And Sanskrit, Kautilya's

Arthashastra, Famous Sanskrit Authors, Indian Languages & Literature, Persian And Urdu, Hindi Literature.

UNIT-III: INDIAN RELIGION, PHILOSOPHY, AND PRACTICES
Pre-Vedic and Vedic Religion, Buddhism, Jainism, Six System Indian Philosophy, Shankaracharya, Various Philosophical Doctrines, Other Heterodox Sects, Bhakti Movement, Sufi movement, Socio religious reform movement of 19th century, Modern religious practices.

UNIT-IV: SCIENCE, MANAGEMENT AND INDIAN KNOWLEDGE SYSTEM
Astronomy in India, Chemistry in India, Mathematics in India, Physics in India, Agriculture in India, Medicine in India, Metallurgy in India, Geography, Biology, Harappan Technologies, Water Management in India, Textile Technology in India, Writing Technology in India, India's Dominance up to Pre-colonial Times.

UNIT-V: CULTURAL HERITAGE AND PERFORMING ARTS
Engineering and Architecture in Ancient India, Sculptures, Seals, coins, Pottery, Puppetry, Dance, Music, Theatre, drama, Painting, Martial Arts Traditions, Fairs and Festivals, Indian Cinema, Indian's Cultural Contribution to the World.

TEXT BOOKS:
1. Cultural Heritage of India-Course Material, V. Sivaramakrishna (Ed.), Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Indian Art and Culture, S. Baliyan, Oxford University Press, India
3. Romila Thapar, Readings In Early Indian History Oxford University Press , India

REFERENCE BOOKS:
1. Modern Physics and Vedant, Swami Jitatmanand, Bharatiya Vidya Bhavan
2. The wave of Life, Fritz of Capra
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
4. Yoga-darshanam with Vyasa Bhashya, GN Jha (Eng. Trans.) Ed. R N Jha, Vidyanidhi Prakasham, Delhi,2016
5. The Wonder that was India, Basham, A.L., (34th impression), New Delhi, Rupa & co
6. Aspects of Political Ideas and Institutions in Ancient India, Sharma, R.S., Delhi, Motilal Banarsidass,

पाठ्यक्रम: भारतीय ज्ञान प्रणाली (क्रेडिट-2)

यूनिट-I: भारत में समाज, राज्य और राजनीति
प्राचीन भारत में राज्य: विकासवादी सिद्धांत, बल सिद्धांत, रहस्यमय सिद्धांत अनुबंध सिद्धांत, प्राचीन भारत में राज्य गठन के चरण, शासन, प्राचीन भारत में मंत्रिपरिषद, प्रशासन, राजनीतिक आदर्श, राज्य के सात अंग, प्राचीन भारत में समाज, पुरुषार्थ, वर्णाश्रम प्रणाली, आश्रम या जीवन के चरण, विवाह, चार वर्ग वर्गीकरण, गुलामी।

यूनिट- II: भारतीय साहित्य, संस्कृति, परंपरा और व्यवहार

भारत में लिपि और भाषाओं का विकास: हड़प्पा लिपि और ब्राह्मी लिपि, वेद, उपनिषद, रामायण और महाभारत, पुराण, पाली, प्राकृत और संस्कृत में बौद्ध और जैन साहित्य, कौटिल्य का अर्थशास्त्र, प्रसिद्ध संस्कृत लेखक, भारतीय भाषाएँ और साहित्य, फ़ारसी और उर्दू, हिंदी साहित्य।

यूनिट-III: भारतीय धर्म, दर्शन और व्यवहार
पूर्व-वैदिक और वैदिक धर्म, बौद्ध धर्म, जैन धर्म, छह प्रणाली भारतीय दर्शन, शंकराचार्य, विभिन्न दार्शनिक सिद्धांत, अन्य विषम संप्रदाय, भक्ति आंदोलन, सूफी आंदोलन, 19 वीं सदी के सामाजिक धार्मिक सुधार आंदोलन, आधुनिक धार्मिक प्रथाएं।

यूनिट-IV: विज्ञान, प्रबंधन और भारतीय ज्ञान प्रणाली
भारत में खगोल विज्ञान, भारत में रसायन विज्ञान, भारत में गणित, भारत में भौतिकी, भारत में कृषि, भारत में चिकित्सा, भारत में धातु विज्ञान, भूगोल, जीव विज्ञान, हड़प्पा प्रौद्योगिकी, भारत में जल प्रबंधन, भारत में वस्त्र प्रौद्योगिकी, भारत में लेखन प्रौद्योगिकी, पूर्व-औपनिवेशिक काल तक भारत का प्रभुत्व प्राचीन भारत में व्यापार।

यूनिट-V: सांस्कृतिक विरासत और प्रदर्शन कला
प्राचीन भारत में इंजीनियरिंग और वास्तुकला, मूर्तियां, मुहरें, सिक्के, मिट्टी के बर्तन, कठपुतली, नृत्य, संगीत, रंगमंच, नाटक, पेंटिंग, मार्शल आर्ट परंपराएं, मेले और त्यौहार, भारतीय सिनेमा, दुनिया में भारतीय सांस्कृतिक योगदान।

पाठ्य पुस्तकें:
1. भारत की सांस्कृतिक विरासत, वी. शिवरामकृष्ण (संपा.), भारतीय विद्या भवन, मुंबई, 5वां संस्करण, 2014
2. भारतीय कला और संस्कृति, एस. बालियान, ऑक्सफोर्ड यूनिवर्सिटी प्रेस, भारत
3. रोमिला थापर, रीडिंग्स इन अर्ली इंडियन हिस्ट्री, ऑक्सफोर्ड यूनिवर्सिटी प्रेस, इंडिया

संदर्भ ग्रंथ:
1. आधुनिक भौतिकी एवं वेदान्त, स्वामी जीतात्मानन्द, भारतीय विद्या भवन
2. द वेव ऑफ लाइफ, फ्रिट्ज ऑफ कैपरा
3. पतंजलि योग सूत्र, रामकृष्ण मिशन, कोलकाता
4. योग दर्शनम विथ व्यास भाष्य, जीएन झा, एड. आर एन झा, विद्यानिधि प्रकाशम, दिल्ली, 2016
5. द वंडर दैट वाज़ इंडिया, बाशम, ए.एल., (34वीं छाप), नई दिल्ली, रूपा एंड कंपनी
6. आस्पेक्ट्स ऑफ़ पोलिटिकल आइडियाज एंड इंस्टीटूशन्स इन अन्सिएंट इंडिया, शर्मा, आर.एस., दिल्ली, मोतीलाल बनारसीदास,

CO-PO Correlation

Course Name: Indian Knowledge System												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1	1				1	1	1	1	1		1	
CO2				2	1			1				2
CO3		1		3	1	1		1			1	
CO4	1	1		2	1	1	3	1		1		
CO5	1		1		2		1	1	1			

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

Program	**B.Tech.**	**Semester**	**02**
Name of the Course	**Problem Solving & Design Thinking**	**Course Code**	**SOM-B-MBA-23-207**
Credits	**03**	**No of Hours**	**3 Hrs/Week**
Max Marks	**100**		

Course Description:

Design Thinking is about approaching things differently with a strong user orientation and fast iterations with multidisciplinary teams to solve complex problems. Design thinking adopts human empathy approach to identify problems or market needs, and then find solutions through creative brainstorming. Design Thinking is a structured method of developing and delivering products, services and experiences that address the unsaid human needs. The structured approach and the use of empathy to innovate, (re)solves many critical business problems and deliver products and services that delight customers. The importance is increasing with the growth of automation and digitalization, as it focuses on the actual human response to a product or service and identifies how to improve customer satisfaction. Design Thinking equips every professional to understand, solve complex business problems that are difficult to decipher. Professionals with applied skills would provide a positive impact on organizational top line and bottom line by developing low-cost working prototypes for various needs and test them in real time. Design-led Business takes advantage in building higher competitiveness with due focus on values and virtues governed by design thinking using the concepts of systematic vision, concern for human, believe in teamwork, innovative spirit and rational thinking. Design thinking creates a collaborative, interconnected work environment where decisions are made quickly through research, prototyping, and testing. This is a mental skill to produce customer-driven solutions as a business game-changer eventually, especially in times of crisis and transformations, otherwise.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understanding the human behaviour towards a product/process/service/system with a user's perspective.
CO2	Analyzing the users' requirement and define the problem.
CO3	Developing ideas and solutions through brainstorming and design iterations to solve the users' problem.
CO4	Applying the ideas to develop a prototype or solution based on the concept and analysis like a sample.
CO5	Evaluating the effectiveness of the prototype or solution through user-centric tests and soliciting satisfactory feedback.

Syllabus:

Unit-I: Empathy

Introduction to Design Thinking as an Art; Need, Expectation and Appreciation; Design Thinking as a Process; Design Thinking vs Traditional Thinking; Design

Thinking vs Critical Thinking; Creative Thinking vs Innovative Thinking; Principles of Design Thinking - Human-centricity, Empathy, Collaboration, Ideation, Iteration, Action; Approaches of Design Thinking (User-/Customer-Centric, Entrepreneurial, Innovative Mind-set); Building Innovation Culture; Design Thinking and Innovations for Managing Crisis and Stress; Design Thinking in Professional and Social Life; Examples on Successful Design Thinking.

Unit-II: Define
Lead User Research; Exploring Pain Points; Product Innovation; Designing the problem statement; Sharp key-questions to explore solution; Pitch Design and Communication, Visualization, Storytelling; Plan to address the need (a solution); Confirm users towards the issue with basic trouble.

Unit-III: Idate
Rules of ideation; Generation of ideas; Big ideas; Selection of a (Desirable-Feasible-Viable) idea; Visualization of idea; Brainstorming for Creative Solutions; Right Brain Thinking; Immersive Research: Tool and Techniques, Challenge Framing and Ideation Techniques; Design Thinking as an enabler; Journey mapping; Convergence and Divergence Design Tools, Narrowing of Ideas; and Storytelling for Impactful Delivery.

Unit-IV: Prototype
Transforming ideas into Shapes – Prototypes, Representations; NPD Project; Collaborative Product Development; Miniature of Product; Managing Constraints; Innovation; Recommendation of Test Cycles; Achieving Product Integrity, Demonstration of Prototypes; Redesigning.

Unit-V: Test
Testing of Success for the Prototype; Refine and Redesign a Prototype; Creating Primary Demand; Concept Development; Product innovation; Confirm with the End-user; Cyclical and Iterative tracking and Testing.

Text Book:
1. Change by Design, Tim Brown & Barry Katz, Harper Collins e-Books.

Reference Books:
1. Hidden in Plain Sight by Jan Chipchase,
2. The Moment of Clarity and Sense-making by Christian Madsbjerg,
3. Design Thinking for Strategic Innovation by Idris Mootee.

4.

CO-PO & PSO Correlation

Course Name: Problem Solving & Design Thinking												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	2	3	1	2	2	1	2	2	3	3	2
CO2:	2	2	3	1	2	2	1	2	2	3	3	3
CO3:	2	3	3	1	2	2	1	3	2	3	2	2
CO4:	2	3	3	1	3	2	2	3	2	3	3	2
CO5:	2	2	3	2	2	2	2	2	2	3	3	3

Note: 1: Low 2: Moderate 3: High

Programme:	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Applied Chemistry Lab**	**Course Code:**	**SOS-B-CHE-23-208**
Credits :	**1**	**No of Hours :**	**2 Hours/week**
Max Marks:	**50**		

Course Description:

This Applied Chemistry Laboratory is common to first year branches of UG Engineering. The course includes apply and use knowledge, methods and techniques for various quantitative analysis and develop experimental and investigative scientific skills.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the use of instruments, sensors and methods for analyzing various parameters
CO2	Collect, process, and analyze data using ICT tools

Syllabus:

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 Book

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. Agarwal, East–West Press.

Reference Book

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

CO-PO & PSO Correlation

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

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

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Python Programming Lab**	**Course Code:**	**SOE-B-CSE-23-209**
Credits:	**1**	**No of Hours :**	**2 Hrs./week**
Max Marks:	**50**		

Course Descriptions:

This course introduces the basic concepts of procedural and object-oriented programming using python programming language. This course also provides practical knowledge and hands-on experience in designing and implementing data structures. Activities covered include introduction to python programming language, datatypes, operators, loop structures, decision-making statements, fundamental data structures, functions, Classes and Objects, Constructor, File Handling, Exception Handling and Numpy module.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Distinguish between procedural, object-oriented and functional programming paradigm using python programming language.
CO2	Use basic data structures like list, string, tuple, set and dictionary in python.
CO3	Implement various functional programming concepts like class, functions, mutable and immutable data, and recursion.
CO4	Utilize standard Python packages to develop software applications.

The following concepts will be covered in the lab:

1. Python environment by implement basic python programs.
2. To implement simple statements and basic mathematical expressions.
3. Use of existing operators with basic and advanced mathematical calculation using conditional statements.
4. Looping-based problems such as prime number, Fibonacci and factorial programs, etc. by using looping conditions.
5. Implementing real-time/technical applications using Lists, Tuples.
6. Implement real life/ scientific/ technical problems using Sets and Dictionaries.
7. Implement real life/ scientific/ technical problems using text strings and functions.
8. Understand the data communication during compile/run time using the concept of file handling.
9. Understand the concept of exception handling in file handing.
10. Explore various existing standard python libraries.

Text Books

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

Reference Books

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021

CO-PO & PSO Correlation

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

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

Programme :	**B.Tech.**	**Semester :**	**II**
Name of the Course:	**Engineering Mechanics Lab**	**Course Code:**	**SOE–B–ME-23-210**
Credits:	**1**	**No of Hours :**	**2 Hrs./week**
Max Marks:	**50**		

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Apply Knowledge of mathematics, science and Engineering applications
CO2	Demonstrate the fundamental law of the force system.
CO3	Analyze the force system in complicated structures/ Trusses.
CO4	Demonstrate the working of lifting machines in industrial applications.
CO5	Analyze the friction in mechanical systems.

List of Experiments (Any Ten)

1. Verify law of polygon of forces
2. Verify law of moments
3. Verification of laws of parallelogram & Lami's theorem
4. Comparison of coefficient of friction of various pair of surfaces and determination of angle of repose
5. Equilibrium of parallel forces – simply supported beam reactions.
6. Determine the stiffness of helical tension spring.
7. Numerical analysis of Concurrent force systems.
8. Numerical analysis of a truss structure.
9. Numerical analysis of Parallel force systems.
10. To determine the variation of bending moment under moving point load.

To find MA, VR, Efficiency, Ideal Effort, Effort lost in friction for various loads and establish law of machine and calculate maximum efficiency. Also check the reversibility of a machine.

11. Study of lifting machines.
12. Differential axle and wheel
13. Weston's differential pulley block
14. Single purchase crab

15. Double purchase crab
16. Worm and worm wheel
17. Screw jack.

Equipment/Machines/Instruments/Tools/Software Required:

- Bell Crank Lever Apparatus
- Bending Moment Apparatus
- Law of Polygon Forces
- Differential Wheel and Axle
- Winch Crab "Single Purchase "
- Winch Crab "Double Purchase "
- Screw Jack
- Fletcher Trolley
- Inclined Plane
- Worm and Worm Wheel "Single Purchase "
- Worm and Worm Wheel "Double Purchase "
- Worm and Worm Wheel "Simple "
- Parallel Forces
- Compound Pendulum
- Fly wheel size (25mm)

CO–PO & PSO Correlation

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

Note: 1: Low 2: Moderate 3: High