UPL UNIVERSITY
OF
SUSTAINABLE TECHNOLOGY

Evaluation Reforms NEP 2020

First year Bachelor of Engineering

Shroff S R Rotary Institute of Chemical Technology,

Ankleshwar

EFFECTIVE FROM A.Y. 2025-2026

Teaching Scheme BE (Semester-I)

Sub Code	Subject	Teaching Scheme (hrs. / week)			Total	Credit	Examination Scheme				
		L	T	P	Hr	C	SEE	CCE	I/TW	V	Total
BSC101	Mathematics -I	3	1	0	4	4	50	50	25	25	150
BSC102	Engineering Physics	3	0	2	5	4	50	50	25	25	150
ESC103	Basic Electrical Engineering	3	0	2	5	4	50	50	25	25	150
ESC104	Basic Mechanical Engineering	3	0	2	5	4	50	50	25	25	150
SEC105	Engineering Graphics	1	0	2	3	2	50	50	25	25	150
IKS106	Indian Knowledge System	2	0	0	2	2	50	50	00	00	100
CCA107/ CCA108/ CCA109	Sports and Fitness/ NCC/ NSS	0	0	4	4	2	00	00	50	00	50
	Total	**15**	**1**	**12**	**28**	**22**	**300**	**300**	**175**	**125**	**900**

Teaching Scheme BE (Semester-II)

Sub Code	Subject	Teaching Scheme (hrs/week)			Total	Credit	Examination Scheme				
		L	T	P	Hr	C	SEE	CCE	I/TW	V	Total
BSC110	Mathematics-II	3	1	0	4	4	50	50	25	25	150
BSC111	Engineering Chemistry	3	0	2	5	4	50	50	25	25	150
ESC112	Basic Civil Engineering	2	0	2	4	3	50	50	25	25	150
ESC113	Programming for Problem Solving	2	0	2	4	3	50	50	25	25	150
SEC114	Workshop Practices	0	0	4	4	2	00	00	50	50	100
AEC115	English and Communication Skills	1	0	2	3	2	50	50	25	25	150
PCC 116 to 121	Branchwise Core Course	2	0	0	2	2	50	50	00	00	100
VAC122	Environmental Studies and Sustainability	2	0	0	2	2	50	50	00	00	100
	Total	**15**	**1**	**12**	**28**	**22**	**350**	**400**	**150**	**150**	**1050**

PCC Subject List branch wise-

Branch	Subject	Subject Code
Chemical Engineering	Introduction to Chemical Engineering	PCC116
Mechanical Engineering	Engineering Mechanics	PCC117
Electrical Engineering	Basic Electronics	PCC118
Chemical Technology	Introduction to Chemical Technology	PCC119
Environmental Science and Technology	Fundamentals of Environmental Engineering	PCC120
Computer Engineering & Information Technology	Fundamentals of Cyber Security	PCC121

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

Mathematics –I (BSC101)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	1	0	4	4	50	50	25	25	150

COURSE OVERVIEW: This course is designed to introduce undergraduate students to the fundamentals of basic mathematics. It assumes prior knowledge of mathematics at the 12th-grade science level, along with familiarity with key laws, principles, and theories. The course aims to develop an understanding of core mathematical principles and their applications across various fields.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (48)
	SECTION-A		
1	**Matrix:** Elementary row operations in Matrix, Row echelon and reduced row echelon forms, Rank by echelon forms, Inverse by Gauss-Jordan method, Solution of system of linear equations by Gauss elimination and Gauss Jordan methods, Eigen values and Eigen vectors, Cayley-Hamilton theorem.	1,2, 3,6	10
2	**Improper Integrals :** Definition of Improper Integrals, Types of Improper Integrals, Convergence and divergence of the integrals	2	5
3	**Beta and Gamma functions**: Definition of Beta and Gamma functions, Properties of Beta and Gamma functions, Relation between Beta and Gamma function (without proof).	1	6
	SECTION-B		
4	**Sequence and Series :** Convergence and divergence of sequences, The Sandwich Theorem for Sequences, The Continuous Function Theorem for Sequences, Bounded Monotonic Sequences, Convergence and divergence of an infinite series, geometric series, term test for divergent series, Combining series, Harmonic Series, The p - series, The Comparison test, The Limit Comparison test, Ratio test, Root test, Alternating series test, Absolute and Conditional convergence	3,4	10
5	**Indeterminate Forms :** L'Hospital 's Rule, Indeterminate Forms : $\frac{0}{0}, \frac{\infty}{\infty}, \infty \cdot 0, \infty - \infty, 0^0, \infty^0, 1^\infty$	6	7
6	**Ordinary Differential Equations of first order :** Differential Equations, Ordinary Differential Equations of First Order and First Degree, Variable separable, Homogeneous differential equations,	5	10

	Nonhomogeneous differential equations, Exact differential equations, Non-exact differential equations reducible to exact form, Linear differential equations, Nonlinear differential equations reducible to linear form.		

LIST OF TUTORIALS

1. Tutorial-1 (Matrix)
2. Tutorial-2 (Matrix)
3. Tutorial-3 (Improper Integrals)
4. Tutorial-4 (Beta and Gamma functions)
5. Tutorial-5 (Sequence and Series)
6. Tutorial-6 (Sequence and Series)
7. Tutorial-7 (Sequence and Series)
8. Tutorial-8 (Indeterminate Forms)
9. Tutorial-9 (Ordinary Differential Equations of first order)
10. Tutorial-10 (Ordinary Differential Equations of first order)

TEXT BOOKS:

1. Ravish R Singh & Mukul Bhatt, Mathematics-II, Mc Graw Hill Education Pvt Limited (2019)
2. Dr. H.C. Patel, Dr. A.R. Patel & Dr. Atul Patel, Mathematics-I, Mahajan Publication, 2nd Edition (2019-20)

REFERENCE BOOKS:

1. Maurice D. Weir, Joel Hass, Thomas' Calculus, Early Transcendental, 13e,Pearson, 2014.
2. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10e, Wiley, 2016.
3. James Stewart, Calculus: Early Transcendental with Course Mate, 7e, Cengage,2012
4. 4. Anton and Rorres, Elementary Linear Algebra, Applications version, Wiley India Edition.
5. T. M. Apostol, Calculus, Volumes 1 & 2, Wiley Eastern.

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/122104018
2. https://archive.nptel.ac.in/courses/111/105/111105122/
3. https://archive.nptel.ac.in/courses/122/104/122104017/
4. https://archive.nptel.ac.in/courses/111/108/111108081/

COURSE OUTCOMES

CO1	**Define** matrix, Beta & Gamma functions, sequence and series.
CO2	**Explain** types of improper integral, use of Gauss-elimination & Gauss-Jordan method.
CO3	**Calculate** rank of matrix, convergence and divergence of sequence and series.
CO4	**Analyze** the indeterminate forms, different tests for series.
CO5	**Evaluate** solution of differential equation of first order & first degree.
CO6	**Solve** Indeterminate Forms, system of linear equations.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

Engineering Physics (BSC102)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

COURSE OVERVIEW

This course introduces fundamental concepts in physics with a focus on applications in engineering. Covering semiconductors, semiconductor devices, measurement techniques, thermodynamics, mechanical properties of solids, and superconductivity, it equips students with essential scientific principles for modern engineering solutions. This course blends theoretical understanding with real-world applications, preparing engineering students to apply physics principles in electronics, materials science, and mechanical systems.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (36)
	SECTION-A		
1	**Unit-1: Semiconductors** Introduction to semiconductors,Properties of semiconductors,Formation of Energy Bands in Solid(Band Theory),Classification of Bands (Conduction Band, Valence Band and Forbidden Energy Gap),Types of semiconductors: Intrinsic and extrinsic semiconductors (N- type and P- type),Carrier generation and recombination,Direct and indirect band gap Semiconductors.	1	7
2	**Unit -2: Semiconductor Devices** P-N Junction Diode, Zener Diode, Solar cell, LED-Light Emitting Diode, LDR-Light Dependent Resistor, Logic Gates (AND Gate, OR Gate, NOT Gate, NAND Gate, NOR Gate),Semiconductor LASER.	2	6
3	**Unit -3: Measurements** Four probe method: -for bulk material and for thin sheet, Hall effect, Hot point probe measurement, UV-Vis Spectroscopy, Deep Level Transient Spectroscopy (DLTS),Vander Pauw measurement.	3	6
	SECTION-B		
4	**Unit -4: Thermodynamics** Introduction, thermal equilibrium, Zeroth law of thermodynamics, Heat, internal energy and work, First law of thermodynamics, thermodynamic processes, Second law of thermodynamics, Reversible and irreversible processes, Entropy, Carnot engine	4	6
5	**Unit -5: Mechanical Properties of solids** Introduction, Elasticity, Stress, Strain, Hooke's law, Stress-strain curve, Elastic moduli, applications of elastic behaviour of materials.	5	5
6	**Unit -6: Superconductivity** Introduction of superconductivity, Critical temperature, Properties of superconductor: Electrical resistance, Effect of magnetic field, Meissner effect,	6	6

	Isotopic mass effect, Impurity effect, Critical magnetic field, Critical current and critical current density, Types of Superconductors: -Type- I and Type- II superconductors, BCS theory, Cooper pairs. Applications of super conductors.		

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. To plot I- V characteristics of P-N junction diode.
2. To plot the I-V Characteristic of LED.
3. To plot I- V characteristics of Zener diode.
4. To determine the gravitational acceleration ‘g’ using simple pendulum.
5. To determine the resistivity of semiconductor material by four probe Method.
6. To determine the efficiency of given solar cell.
7. To study the characteristics of LDR.
8. To study the Energy gap of Semiconductor.
9. To measure amplitude, time period and frequency in Cathode Ray Oscilloscope (CRO).
10. To verify the truth table of Logic gates.
11. To perform the half wave and full wave rectifier using P-N junction diode.
12. To verify Snell’s law in virtual lab.
13. To study the Hall-Effect.
14. To verify Hook's law and determine the force constant (k) of a given spring.
15. To calculate the beam divergence and spot size of the given laser beam in virtual lab.

REFERENCE BOOKS

1. Engineering Physics, Malik and Singh, Tata Mc Graw Hill
2. Engineering Physics by Dattu R Joshi, McGraw hill Publications
3. Concepts of Physics Vol. I, H C Verma, Bharti Bhawan Ltd. New Delhi.
4. Concepts of Physics Vol. II, H C Verma, Bharti Bhawan Ltd. New Delhi.
5. Physics text book of 11th and 12th Science,National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110016
6. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.(1995).
7. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
8. Electronic Devices and Circuit Theory (11th Edition), Robert L. Boylestad & Louis Nashelsky, Pearson Education.
9. Semiconductor Material and Device Characterization (3rd Edition), Dieter K. Schroder, Wiley-IEEE Press.
10. Solid State Physics & Electronics, R.K. Puri and V.K. Babbar, S. Chand & Company

ONLINE RESOURCES

1. https://archive.nptel.ac.in/courses/108/108/108108122/
2. https://archive.nptel.ac.in/courses/112/104/112104203/
3. https://archive.nptel.ac.in/courses/115/103/115103108/
4. https://archive.nptel.ac.in/courses/115/102/115102025/

COURSE OUTCOMES

CO1	The student will demonstrate understanding of basic principles, properties and applications associated with semiconducting materials.
CO2	The student will demonstrate understanding of principles, properties and real world applications associated with semiconductor devices.
CO3	The student will gain knowledge of the different measurements techniques to characterize various materials and devices.
CO4	Students will be able to understand and apply the fundamental principles of thermodynamics.
CO5	Students will be able to understand the concepts of elasticity, stress, and strain. They will also evaluate the mechanical behaviour of materials and their applications in real-world contexts.
CO6	The student will demonstrate understanding of basic theory, properties and applications of Superconductivity.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Mathematics –II (BSC110)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	1	0	4	4	50	50	25	25	150

COURSE OVERVIEW:

This course is designed to introduce undergraduate students to the fundamentals of basic mathematics. It assumes prior knowledge of mathematics at the 12th-grade science level, along with familiarity with key laws, principles, and theories. The course aims to develop an understanding of core mathematical principles and their applications across various fields.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (48)
	SECTION-A		
1	**Ordinary Differential Equation of higher order :** Ordinary differential equations of higher orders, Homogeneous Linear Ordinary differential equations of Higher Order with Constant Coefficients, Nonhomogeneous ODEs Nonhomogeneous Linear Differential Equations of Higher Order with Constant Coefficients, Method of Variation of Parameters, Cauchy's Linear Equations, Legendre's Linear Equations.	2,3	10
2	**Series Solution of Differential Equations :** Ordinary point & Singular point, Power-Series Method, Series Solution about an Ordinary Point.	1	6
3	**Power Series:** Power series, Radius of convergence of a power series, Taylor and McLaurin series.	6	6
	SECTION-B		
4	**Partial Differentiation :** Functions of several variables, Limits and continuity, Test for nonexistence of a limit, Partial differentiation, Differentiability & Chain rule, Implicit differentiation.	1	7
5	**Applications of Partial Differentiation:** Directional derivative, Tangent plane and Normal line, Total differentiation, Local Extreme Values (Maximum and Minimum Values), Extreme Values with Constrained Variables, Method of Lagrange Multipliers.	5	9
6	**Partial Differential Equation :** Introduction, Formation of Partial Differential Equations, Linear Partial Differential Equations of First Order, Nonlinear Partial Differential Equations of First Order, Homogeneous Linear Partial	4	10

	Differential Equations with Constant Coefficients, Classification of Second Order Linear Partial Differential Equations, Method of Separation of Variables		

LIST OF TUTORIALS

1. Tutorial-1 (Ordinary differential equations of higher orders)
2. Tutorial-2 (Ordinary differential equations of higher orders)
3. Tutorial-3 (Series Solution of Differential Equations)
4. Tutorial-4 (Power Series)
5. Tutorial-5 (Partial Differentiation)
6. Tutorial-6 (Partial Differentiation)
7. Tutorial-7 (Applications of Partial Differentiation)
8. Tutorial-8 (Applications of Partial Differentiation)
9. Tutorial-9 (Partial Differential Equation)
10. Tutorial-10 (Partial Differential Equation)

TEXT BOOKS:

1. Ravish R Singh & Mukul Bhatt, Mathematics-II, Mc Graw Hill Education Pv Limited (2019)
2. Dr. H.C. Patel, Dr. A.R. Patel & Dr. Atul Patel, Mathematics-I, Mahajan Publication, 2nd Edition (2019-20)

REFERENCE BOOKS:

1. Introduction to Linear Algebra with Application, Jim Defranza, Daniel
2. Gagliardi, Tata McGraw-Hill
3. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley
4. India Edition.
5. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.
6. Calculus, Robert T. Smith & Ronald B. Minton, McGraw-Hill
7. Calculus, Volumes 1 and 2, T. M. Apostol, Wiley Eastern

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/content/storage2/courses/122104018/node79.html
2. https://archive.nptel.ac.in/courses/111/101/111101153/
3. https://archive.nptel.ac.in/courses/111/107/111107111/

COURSE OUTCOMES

CO1	**Define** Ordinary point, Singular point and Partial differentiation.
CO2	**Explain** the difference between ordinary differential equation & partial differential equation.
CO3	**Apply** different types of methods like Method of Variation of Parameters to solve Ordinary Differential Equation of higher order.
CO4	**Classify** the types of Second Order Linear Partial Differential Equations
CO5	**Evaluate** equation of tangent plane, normal line & extreme values of function**.**
CO6	**Solve** the Power, Taylor and McLaurin series.

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B.E. Semester II

Engineering Chemistry (BSC111)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

COURSE OVERVIEW

This course is designed to introduce undergraduate students to the fundamental concepts of basic sciences, with a focus on Chemistry. It assumes a foundational understanding of chemistry at the HSC (Science) level and familiarity with core theoretical principles. The objective of the course is to explore the core concepts of Chemistry and demonstrate their applications in various branches of engineering.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (36)
	SECTION-A		
1	**General Chemistry**: Types of chemical bond: Ionic bond, Covalent bond, Covalent Coordinate bond ,Hydrogen bond, Twelve Principle of Green Chemistry, Normality, Molarity, Molality, Preparation of Solutions	1	5
2	**Water Technology**: Introduction, Hardness of Water, Types of Hardness, Boiler Corrosion, Scale & Sludge, Caustic Embrittlement, Softening of water: Reverse Osmosis, Lime soda Process, Zeolite Process, Waste water treatment of Domestic and Industrial Waste Water.	2	7
3	**Metal, Alloy & Corrosion**: Physical Properties of Metal, Alloy & need of Alloying metals, Introduction to Corrosion, Dry Corrosion, Wet Corrosion, Galvanic Corrosion, Differential Aeration Corrosion, Corrosion control: Cathodic Protection Method, Coating, Inhibitor.	3	6
	SECTION-B		
4	**Polymer and Rubber**: Introduction, Classification based on Source, Structure, Molecular forces. Synthesis, properties and application of Polyethylene(PE), Polypropylene(PP), Polyvinyl Chloride (PVC), Polystyrene (PS). Definition of rubber, Types of rubber, Vulcanization of rubber, Application of rubber.	4	7
5	**Fuel and Combustion**: Introduction, Types of fuel, Calorific Value, Characteristics of good fuel, Analysis of coal – ultimate and proximate	5	6

	analysis, Natural gas, Biogas, Refining of Petroleum by Fractional distillation.		
6	**Analytical Techniques**: Measurement and understanding of pH, Conductance, UV-Visible Spectroscopy and its Application, IR Spectroscopy and its application.	6	5

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. Determine the strength of given acidic solution using standard solution of base.
2. Analysis of Steel Alloy.
3. Analysis of Brass Alloy.
4. To determine hardness of water by EDTA method.
5. To determine Alkalinity of a given Water Sample.
6. Determination of Saponification Value of Oil.
7. Determination of chloride content of water.
8. Study of decomposition reaction of $ZnCO_3$ by Gravimetric analysis.
9. To determine the moisture content in coal.
10. Preparation of (any one) polystyrene, urea formaldehyde, phenol formaldehyde.
11. To determine the pH-values of given samples of solution by pH-meter.

TEXT BOOKS

1. A text book of Applied Chemistry by J. Rajaram, Tata McGraw Hill Co. New Delhi
2. A textbook of Engineering Chemistry by Shashi Chawla, Dhanpatrai Publishing Co. Ltd.

REFERENCE BOOKS

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co.
2. Engineering Chemistry Willey India Publisher
3. Engineering Chemistry by Marry Jane & Shultz, Cencage Learning Publisher
4. Engineering Chemistry by N. Krishnamurthy, P. Vallinaygam and D. Madhavan, Prentice Hall of India Pvt. Ltd.
5. Engineering Chemistry by K. Sesha Maheswaramma and Mridula Chugh, Pearson India Education Pvt Ltd.
6. Engineering Chemistry by B K. Sharma, Krishna Prakashan Media (P) Ltd.
7. Essential of Physical Chemistry by Bahl and Tuli., S Chand & Co. Ltd, New Delhi.
8. Fundamentals of Computing and Programming in C, First Edition, by Pradip Dey, Manas Ghosh, Oxford University Press, 2009

ONLINE RESOURCES

1. https://nptel.ac.in/courses/113105028
2. https://nptel.ac.in/courses/103108100
3. https://nptel.ac.in/courses/105107207
4. https://nptel.ac.in/courses/113104082

COURSE OUTCOMES

CO1	**Define** the types of chemical bonding, preparation of basic solutions
CO2	**Understand** the importance of Water technology in daily life
CO3	**Apply** knowledge of corrosion chemistry to protect metals
CO4	**Analyze** the properties of various type of rubber for specific purpose
CO5	**Compare** the properties & application of various fuels for specific purpose
CO6	**Choose** appropriate spectroscopic technique for structural identification & Purity

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

English and Communication Skills (AEC115)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
1	0	2	3	2	50	50	25	25	150

COURSE OVERVIEW: The rationale of the curriculum is to help students refresh their knowledge of English language. It also targets the understanding of grammar, focusing on comprehension, and reading, speaking and writing skills. This would be developed through balanced and integrated tasks.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (12)
	SECTION-A		
1	**Vocabulary building**: Introduction to Word Formation, Types of word formation processes: compounding, clipping, blending, derivation, creative respelling, coining and borrowing, Acquaintance with prefixes and suffixes Synonyms, antonyms, and standard abbreviations	1	2
2	**Phonetics:** IPA Transcription Introduction to different accents	2	3
3	**Identifying Common Errors:** Writing: Tenses , Subject-verb agreement, Misplaced modifiers, Prepositions Modal Auxiliaries, Redundancies	3	2
	SECTION-B		
4	**Basic Writing Skills:** Sentence Structures , Importance of proper punctuation, ,Organizing principles of paragraphs in documents	4	2
5	**Nature and Style of Writing**: Describing , Defining , Classifying Writing introduction and conclusion	5	1
6	**Writing Practices:** Comprehension, Letter Writing, Email etiquettes, Memo writing	6	2

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. Word Formation-1
2. Word Formation-2
3. Listening Comprehension
4. Transcription and dictionary usage
5. Common Everyday Situations: Conversations and Dialogues
6. Communication at Workplace
7. Common errors in writing
8. Reading Comprehension
9. Letter Writing, Precise Writing
10. Email Writing: Formal and Informal

TEXT BOOKS:

1. Bhavika Vyas & Dhara Tejura, English, Mahajan Publishing House, Ahmedabad

REFERENCE BOOKS:

1. Technical English, Dr. M. Hemamalini, Wiley. 2014
2. Practical English Usage, Michael Swan, OUP. 1995
3. Remedial English Grammar, F.T. Wood, Macmillan. 2007
4. Oxford Language Reference, (Indian Edition) OUP
5. On Writing Well, William Zinsser, Harper Resource Book. 2001
6. Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press.2006
7. Communication Skills, Sanjay Kumar and Pushp Lata, Oxford University Press.2011
8. Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press
9. The Study of Language, George Yule, CUP, 4th Edition. 2010
10. A Course in English Phonetics, T R Kansakar, Orient Longman. 1998
11. Spoken English, R K Bansal and J B Harrison, Orient Longman. 2013

ONLINE RESOURCES:

1. http://www.english-online.org.uk/
2. http://www.learnenglish.de/

COURSE OUTCOMES

CO1	**Present** ideas using various forms of vocabulary in varied situations in oral and written communication.
CO2	**Identify** the phonetic symbols and the transcription pattern to learn correct pronunciation.
CO3	**Apply** the dynamics of various rules of grammar and check its validation while they speak and write language correctly.
CO4	**Analyze** grammar effectively to make themselves competent Listener, Speaker, Reader and Writer by exposing to various set of situations.
CO5	**Relate** to various formal and informal documents of day to day life and Professional set up.
CO6	**Revise** the qualities of writing in diverse situation by using the nuances such as conciseness, clarity, accuracy, organization, and coherence.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Basic Civil Engineering (ESC112)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CEE	I/TW	V	Total
2	0	2	4	3	50	50	25	25	150

COURSE OVERVIEW: Understanding of basic principles of Engineering is required in various field of engineering.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (24)
	SECTION-A		
1	**Introduction to Civil Engineering, Building Materials:** **Introduction to Civil Engineering** : Branches of Civil Engineering, Role of Civil Engineer in Society, **Building Materials:** Introduction to construction materials like Bricks, Cement, Timber, Sand, Aggregates, Mortar, Concrete	1	3
2	**Surveying, Leveling and Mapping:** **Introduction:** Definition of Surveying, Aims and applications, Fundamental principles of surveying, Classification of surveying. **Linear Measurement:** Instruments used in chain surveying, Selection of stations, Chaining, Ranging, Offsetting, Errors in chaining and correction, Numerical **Angular Measurement:** Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing and correction of bearings for local attraction, Numerical.	2	6
3	**Leveling:** Aims and applications, Definition of various terms, Instruments for leveling, Methods of leveling, Computing reduced levels by HI and rise & fall method, Definition of contour, Characteristics of contours of different terrains and application of contour maps, introduction to Global positioning system(GPS), remote sensing(RS) and Geographical information system(GIS), Numerical	3	6
	SECTION-B		
4	**Building Construction, Planning:** **Building Construction**: Classification of buildings, Types of loads acting on buildings, Building	4	5

	components and their functions. **Planning:** Definition and concept of plan of a simple residential building, Elementary principles and basic requirements for building planning, elevation and section of a residential building.		
5	**Water Resource Engineering** Introduction to dams, weirs, barrages and check dams, Rainfall Conservation, Waste water basic Introduction, treatment process and disposal methods.	5	2
6	**Transportation Engineering:** Role of transportation in national development, Introduction to road traffic and traffic control, Introduction to mass transportation system,	6	2

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. Unit conversation Exercise.
2. Chart preparation of various materials. Collection of rate and sample. (field visit).
3. Components of building (field visit).
4. Planning of a residential building(plan, elevation& section of simple 1 room)
5. Linear measurements (Chain Survey) (in field with instrument)
6. Angular measurements (Compass Survey) (in field with instrument)
7. Introduction to Theodolite
8. Determine R.L of given point by Dumpy level. (in field with instrument)
9. Presentation on BRTS / mass transportation system (city bus)
10. Seminar on green building & smart city

TEXT BOOKS:

1. R. P. Rethaliya, "Elements of civil engineering"
2. Dr. R. B. Khasiya, "Basic Civil Engineering"

REFERENCE BOOKS

1. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, Arun kumar Jain, 16th
2. Edition, Laxmi Publication Delhi.
3. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education, India Pvt. Ltd.
4. Building drawing, M.G.Shah, C.M.Kale and S.Y.Patki, Tata McGraw Hill
5. Building Construction, Dr. B. C. Punmia, Ashokkumar Jain, Arunkumar Jain,
6. Laxmi Pub. Delhi.
7. Highway and Traffic Engineering, Khanna and Justo and L.R Kadiyali, S. Chand Publication.

ONLINE RESOURCES

1. http://nptel.ac.in/courses/105107122/
2. http://nptel.ac.in/courses/105107157/
3. http://nptel.ac.in/courses/105101087/
4. http://nptel.ac.in/courses/105104100/

COURSE OUTCOMES

CO1	**Describe** the use of different materials in Civil Engineering
CO2	**Translate** the readings of angular and linear measurements in the field book for its understanding.
CO3	**Use** different equipment for levelling
CO4	**Identify** various aspect of the building**,** various building components, method of constructions , and services
CO5	**Develop** water conservation methods, water -waste water quality and advances in civil engineering
CO6	**Evaluate** various public transportation system, and pavements

UPL University of Sustainable Technology

Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

Basic Mechanical Engineering (ESC104)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

COURSE OVERVIEW:

This course provides a foundational understanding of thermal and mechanical engineering concepts. It covers energy-related terms, the Zeroth and First Laws of Thermodynamics, and explores prime movers and renewable/non-renewable energy sources, along with environmental concerns. Students study gas laws, thermodynamic processes, and steam properties using steam tables and calorimeters. The course explains major heat engine cycles and their efficiencies. It also includes the construction and working of I.C. engines, steam boilers, air compressors, and pumps. Refrigeration and air conditioning systems are introduced, along with various types of engineering materials and their practical applications.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (36)
	SECTION-A		
1	**Basic Terminology and Energy:** Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth law and First law Applications of Energy sources like Fossil fuels, Nuclear fuels, Hydrogen fuel, Hydro, Solar, Wind, and Bio-fuels, Environmental issues like Global warming and Ozone depletion	**1**	**04**
2	**Properties of Gases:** Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined gas law, Gas constant, Relation between C_p and C_v, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Polytropic process. **Properties of Steam:** Steam formation, Types of steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of steam tables, steam calorimeters.	**2**	**07**
3	**Heat Engines:** Heat engine cycle and Heat engine, working Substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles. **Internal Combustion Engines:** Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies.	**3**	**07**
	SECTION-B		
4	**Steam Boilers:** Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and	**4**	**09**

	accessories.		
5	**Air Compressors and Pump**s: Types and operation of Reciprocating and Rotary air compressors, significance of Multistage, Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming. **Refrigeration & Air Conditioning:** Refrigerant, Vapor Compression refrigeration system, Vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.	**5**	**06**
6	**Engineering Materials:** Types, properties and applications of ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer.	**6**	**03**

LIST OF PRACTICALS:

1. To understand construction and working of various types of boilers.
2. To understand construction and working of different boiler mountings.
3. To understand construction and working of different boiler accessories.
4. To understand construction and working of various types of Steam Calorimeters.
5. To understand construction features of four stoke petrol and diesel engines.
6. To understand construction features of two stoke petrol and diesel engines.
7. To determine brake thermal efficiency of an I. C. Engine.
8. To understand construction and working of different types of Air Compressors.
9. To understand construction and working of different types of Pumps.
10. To demonstrate Vapour compression refrigeration cycle of domestic refrigerator, window air conditioner and split air conditioner.

TEXT BOOKS:

1. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
2. Basic Mechanical Engineering by Pravin Kumar, Pearson Education

REFERENCE BOOKS:

1. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
2. Elements of Mechanical Engineering by Sadhu Singh, S. Chand Publication
3. Introduction to Engineering Materials by B.K. Agrawal, McGraw Hill Publication, New Delhi

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/112/106/112106293/
2. www.vlab.co.in

COURSE OUTCOMES:

CO1	**Explain** the various sources of energy and basic terminology of Mechanical engineering.
CO2	**Analyze** working fluids, particularly ideal gases and steam, through appropriate calculations.
CO3	**Utilize** various thermodynamic cycles to understand the design and functioning of IC engines.
CO4	**Understand** the functioning and practical applications of steam boilers and various energy transformation systems.
CO5	**Explain** various applications along with the construction and working of Air compressors, Pumps and Refrigeration & Air Conditioning system.
CO6	**Describe** the properties of different engineering materials and discuss their practical applications.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

Engineering Graphics (SEC105)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
1	0	2	3	2	50	50	25	25	150

COURSE OVERVIEW:

Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (36)
	SECTION-A		
1	**Introduction to Engineering Graphics:** Drawing instruments and accessories, BIS – SP 46. Use of plane scales, Diagonal Scales and Representative Fraction	1	4
2	**Engineering Curves:** Classification and application of Engineering Curves, Construction of Conics, Cycloidal Curves and Involutes along with normal and tangent to each curve	2	6
3	**Projections of Points and Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes **Projections of Planes:** Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane	3	8
	SECTION-B		
4	**Projections of Solids:** Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes	4	6
5	**Orthographic Projections:** Fundamental of projection along with classification, Projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view	5	6
6	**Isometric Projections:** Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing of simple objects	6	6

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW):

1. Practice sheet: dimensioning methods, different types of line, plain Scale and diagonal Scale
2. Problems based on Engineering curves
3. Problems based on Projection of points and lines
4. Problems based on Projection of plane
5. Problems based on Projection of solid
6. Problems based on Orthographic projection
7. Problems based on Isometric projection

TEXT BOOKS:

1. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi
2. A Text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi

REFERENCE BOOKS:

1. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand
2. Engineering Drawing by Jolhe D A, Tata McGraw Hill Edu. New Delhi

ONLINE RESOURCES:

1. https://nptel.ac.in/courses/112102304

COURSE OUTCOMES:

CO1	**Understand** and **apply** Fundamentals of Engineering Drawing
CO2	**Draw** and **interpret** various engineering curves with accurate construction of tangents and normals
CO3	**Analyze** and **draw** Projections of Points, Lines and Planes
CO4	**Generate** projections of geometric solids with given orientations to reference planes
CO5	**Improve** their visualization skills so that they can apply these skills in developing new products
CO6	**Develop** their technical communication skill in the form of communicative drawings

UPL University of Sustainable Technology

Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Workshop Practice (SEC114)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
0	0	4	4	2	0	0	50	50	100

COURSE OVERVIEW:

Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (48)
	SECTION-A		
1	Introduction, Workshop layout, Importance of various sections/shops of workshop, Type of jobs done in each shop, General safety rules and work procedure of work shop.	1	6
2	Carpentry Shop: Exercise & Demonstration of various tools, basic measuring instruments, materials, Marking and Measurement in shop.	2	10
3	Fitting Shop: Exercise & Demonstration of various tools, basic measuring instruments, materials, Marking and Measurement in shop.	3	10
	SECTION-B		
4	Tin Smithy Shop: Exercise & Demonstration of various tools, basic measuring instruments, materials, Marking and measurement in shop.	4	8
5	Welding and Smithy Shop: Demonstration of various tools, basic measuring instruments, materials, Marking and Measurement in Shop.	5	10
6	Machine Shop: Demonstration of various tools, basic measuring instruments, materials, Marking and Measurement in Machine Shop.	6	4

LIST OF PRACTICALS:

1. Introduction to Mechanical Workshop.
2. Prepare job in Carpentry Shop.
3. Prepare job in Fitting Shop.
4. Prepare job in Tin Smithy Shop Demonstration of Welding joints like Lap joint, Lap Tee joint, Edge joint, Butt joint and Corner joint.
5. Demonstration of job in Welding Shop.

6. Demonstration of job in Smithy Shop.
7. Demonstration of job in Machine Shop (Lathe Machine).
8. Demonstration of job in Machine Shop (Drilling Machine).

TEXT BOOKS:

1. Elements of Workshop Technology –Vol.I & II – Hazara and Choudhay by Media promoters & Publisher private limited.
2. A Course in Workshop Technology - Vol I & II- B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi.

REFERENCE BOOKS:

1. Comprehensive Workshop Technology (Manufacturing Processes). S.K. Garg by Laxmi Publications.
2. Workshop familiarization - E.Wilkinson by Pitman engineering craft series.
3. Mechanical workshop practice - K.C. John by PHI publications.
4. Basic Workshop Practice Manual - T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi.
5. Manufacturing Technology, Vol. I and Vol. II, Rao P.N, by Tata McGraw Hill publications House.

COURSE OUTCOMES:

CO1	**Understand** the workshop layout, importance of different sections, job types, safety rules, and standard procedures.
CO2	**Demonstrate** basic carpentry skills using hand tools and instruments for marking, measuring, cutting, and joining wood.
CO3	**Perform** fitting operations using tools and instruments with accurate marking, filing, and drilling techniques.
CO4	**Carry out** sheet metal work like cutting, bending, and joining using smithy tools and proper measurements.
CO5	**Understand** and **demonstrate** welding and forging operations using appropriate tools, materials, and safety procedures.
CO6	**Operate** basic machine tools like lathe and drilling machines to perform turning, facing, and related machining operations.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Engineering Mechanics (PCC117)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	50	50	00	00	100

COURSE OVERVIEW:

The objective of this course is to build foundational knowledge in Engineering Mechanics, focusing on statics, force equilibrium, stress, deformation, and material behaviour under various load conditions.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (24)
	SECTION-A		
1	**Introduction to Engineering Mechanics**: Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy.	1	4
2	**Friction**: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.	2	4
3	**Centroid and Centre of Gravity**: Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications;	3	4
	SECTION-B		
4	**Moment of Inertia:** Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia. Moment of Inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.	4	4
5	**Introduction to Kinetics of Rigid Bodies**: Basic terms, general principles in dynamics; Types of motion, Instantaneous center of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies.	5	4
6	**Mechanical Vibrations**: Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems.	6	4

TEXT BOOKS:

1. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
2. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
3. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

REFERENCE BOOKS

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill.
3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education

ONLINE RESOURCES:

1. https://archive.nptel.ac.in/courses/122/104/122104014/

COURSE OUTCOMES:

CO1	**Define** key engineering mechanics terms such as force, moment, and equilibrium.
CO2	**Analyze** the effect of friction in the design of mechanical components
CO3	**Evaluate** center of gravity for bodies with uniform and varying density.
CO4	**Compute** the moment of inertia for basic and composite sections.
CO5	**Solve** fundamental concepts in kinetics including force, acceleration, and inertia.
CO6	**Analyze** free and forced vibration responses of single degree of freedom systems.

UPL University of Sustainable Technology

Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Programming for Problem Solving (ESC113)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	2	4	3	50	50	25	25	150

COURSE OVERVIEW:

This course introduces students to the foundational principles of programming and logic building using two widely adopted programming languages: **C and Python**. It starts with basic computing and programming concepts, algorithmic thinking, and data representation, gradually building skills to develop modular programs using functions, control structures, arrays, pointers, and file handling techniques.

In the second half, students transition to Python programming, exploring its simplified syntax and powerful built-in data structures. Emphasis is placed on practical problem-solving, code implementation, and comparing the programming paradigms of C and Python. The course concludes with simple integrated projects to solidify understanding.

COURSE CONTENT:

Sr. No.	Topics	COs	Hrs (24)
	SECTION-A		
1	**Fundamentals of Programming and Logic Building:** Fundamentals of Programming and Logic Building, Algorithms and Flowcharts, Introduction to Programming Language, Compilation, Interpretation and Execution, Structure of a C Program, C Tokens, I/O Functions	1	04
2	**Control Structure in C:** Simple statements, Decision making statements, Looping statements, Nesting of control structures, break and continue, goto statement	2	04
3	**Array And String:** **Array**: Concepts of array, one and two dimensional arrays, declaration and initialization of arrays **String:** string, string storage, Built-in string functions	2	03
	SECTION-B		
4	**C Functions And Pointer:** **Functions:** Declaration, Definition, Calling, Recursion, **Pointer:** Introduction to Pointers, Call by Value and Call by Reference,	3	04

	Dynamic Memory Allocation		
5	**Introduction To Python Programming:** Importance of Python, Python Basics: Syntax, Variables, Data Types, Operators and Expressions Control Structures: Conditional Statements, Loops, Functions, Recursion	4&5	04
6	**Introduction To Data Structure Using Python:** **String:** Introduction, Functions and Operation On String **List:** Introduction, Functions and Operation On List **Tuple:** Introduction, Functions and Operation On Tuple **Dictionaries:** Introduction, Functions and Operation On Dictionaries **Sets:** Introduction, Functions and Operation On Sets	6	05

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW):

1. Design a flowchart and write an algorithm to find largest number among three numbers.
2. Write a program to read three numbers from keyboard and find out maximum out of these three.(nested if/Switch Case)
3. Problems involving Looping Control structure
   a.Write a C program to input an integer number and check the last digit of number is even or odd.
   b.Write a C program to find the sum and average of different numbers which are accepted by user as many as user wants
   c.Write a program to calculate average and total of 5 students for 3 subjects (use nested for loops)
4. Problem Solving using Array
   a.Write a C program to read and store the roll no and marks of 20 students.
   b.Write a program to find out which number is even or odd from list of 10 numbers.
5. Problem Solving using String
   a.Write a program to delete a character in given string.
   b.Write a program to reverse string.
6. Write a function Exchange to interchange the values of two variables, say x and y.
7. Write a program to find factorial of a number & Fibonacci series using recursion.
8. Write a C program to swap the two values using pointers.
9. Use malloc() to create a dynamic array to store and display n elements.
10. Write a Python program that checks whether a number is prime and prints all prime numbers in a given range.
11. Accept a string and Count vowels and consonants and alsoConvert the string into a list of words and reverse each word.
12. Create a dictionary with student names as keys and marks as values. Display names of students who scored more than 75.
13. Write a program to Input two sets of student names and Perform union, intersection, and difference operations

TEXT BOOKS:

1. Programming in ANSI C By Balagurusamy, MC-Graw Hill Publication
2. Let Us C By Yashavant Kanetkar, BPB Publications
3. Python Programming: Using Problem Solving Approach By Reema Thareja, Oxford University Press
4. Introduction to Computing and Problem Solving with Python By Jeeva Jose, P. Sojan Lal, Khanna Book Publishing

REFERENCE BOOKS:

1. Programming in C By Stephen G. Kochan, Pearson Education
2. The C Programming Language By Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall
3. Python Programming: An Introduction to Computer Science By John Zelle, Franklin, Beedle & Associates
4. Python for Everybody: Exploring Data in Python 3 By Charles Severance, CreateSpace Independent Publishing

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc24_cs42/preview
2. https://www.programiz.com/
3. https://www.geeksforgeeks.org/an-introduction-to-flowcharts/

COURSE OUTCOMES:

CO1	**Understand** the basic concepts of programming, algorithms, and flowcharts for logic building.
CO2	**Develop** and debug C programs using variables, control structures, arrays, strings, functions, and pointers.
CO3	**Implement** modular and recursive programming techniques using C functions and manage memory dynamically using pointers.
CO4	**Demonstrate** proficiency in writing Python programs using variables, control structures, functions, and recursion.
CO5	**Compare** and contrast key programming concepts between C and Python, including memory handling, syntax, and data handling.
CO6	**Use** Python's built-in data structures such as strings, lists, tuples, dictionaries, and sets for data manipulation.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Fundamentals of Cyber Security (PCC121)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	50	50	0	0	100

COURSE OVERVIEW

The Fundamentals of Cyber Security course offers a concise introduction to the key aspects of cyber security. It covers the basics of cyberspace, types of cybercrimes, and common vulnerabilities. Learners explore various cyber threats like malware, phishing, and DoS attacks, along with real-world case studies. The course also introduces essential security practices, tools, and safe online behaviour. Legal aspects, including cyber laws and policies, are discussed to highlight regulatory frameworks. Additionally, it touches on cyber forensics and evidence handling, and concludes with emerging challenges such as AI-based threats and IoT security.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (24)
	SECTION-A		
1	**Foundations of Cyberspace and Cyber Crimes** Introduction to cyberspace, categories of cybercrimes, historical cyber incidents, forms of hacking (ethical and unethical), cracking, network, and web vulnerabilities.	1	04
2	**Cyber Threat Landscape** Overview of cyber threats: malware types, phishing techniques, password and denial-of-service (DoS) attacks, man-in-the-middle (MitM), rogue software. Introduction to cyber warfare and terrorism, real-life case studies.	2	05
3	**Security Tools and Best Practices** Cyber hygiene and safe practices, privacy and data protection principles, use of security controls, tools and technologies for securing devices and networks, secure social media use, safe e-commerce and digital payments. Reporting platforms (e.g., CERT-In, Cyber Crime Portal), case studies	3	04
	SECTION-B		
4	**Cyber Law and Policy Framework** Cyber laws and regulations, importance of cyber security policies, modern digital crimes, role of government and private players, challenges of jurisdiction in cyberspace. Real-world legal case discussions.	4	04
5	**Introduction to Cyber Forensics** Basics of cyber forensic investigations, preliminary evidence handling, understanding investigation procedures, maintaining chain of custody, anti-forensics techniques, legal aspects, sample case studies.	5	03
6	**Emerging Trends and Challenges in Cyber Security**	6	04

	Evolving threats: AI-based attacks, deepfakes, cloud and IoT vulnerabilities, mobile and BYOD security, protection of critical infrastructure (e.g., power, banking, transport), future trends in cybersecurity policy and legislation.		

TEXT BOOKS

1. Fundamentals of Cyber Security by Rajat Khare, Devesh Tyagi

REFERENCE BOOKS

1. Computer Security Fundamentals (5th Edition) by William Chuck Easttom
2. Cybersecurity Fundamentals by Kutub Thakur and Al-Sakib Khan Pathan
3. Introduction to Cyber Security: Guide to the World of Cyber Security by Anand Shinde

ONLINE RESOURCES

1. https://www.khanacademy.org/computing/computer-science/internet-intro
2. https://www.cert-in.org.in

COURSE OUTCOMES

CO1	Remember the concepts of cyberspace, cybercrimes, and types of cyberattacks.
CO2	Analyze various cyber threats and real-world incidents.
CO3	Apply cybersecurity practices and tools for data protection.
CO4	Understand cyber laws, policies, and legal challenges.
CO5	Explain the basics of cyber forensics and investigation procedures.
CO6	Evaluate emerging trends and challenges in cybersecurity.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Environmental Studies and Sustainability (VAC122)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	50	50	0	0	100

COURSE OVERVIEW

To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyse climate changes, concept of carbon credit and the challenges of environmental management.
To impart knowledge on the causes, effects and control or prevention measures of environmental pollution.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (24)
	SECTION-A		
1	**ENVIRONMENT:** Definition, scope and importance of environment, need for public awareness. Ecosystem: Structure and function of ecosystem, Energy flow in an ecosystem, food chains, food webs and ecological succession.	1	4
2	**ENVIRONMENTAL POLLUTION CONTROL AND MANAGEMENT:** Environmental pollution: Types, causes, effects and control, Air, water, soil, noise, light and radioactive pollution. Global warming and climate change, Ozone layer depletion, Acid rain. Solid waste management. Control measures of urban and industrial waste.	2	4
3	**NATURAL RESOURCES:** Renewable and Non-Renewable Resources, Land resources and land-use change, Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment and forests. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (International& Inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources and growing energy needs.	3	4
	SECTION-B		
4	**BIODIVERSITY AND CONSERVATION:** Importance of biodiversity, Types of biodiversity: genetic, species and ecosystem diversity, values of biodiversity, conservation of biodiversity.	4	4
5	**SUSTAINABILITY:** Sustainability- concept, definition, needs for environment, economic and social aspects of sustainability, Sustainable Development Goals.	5	4
6	**SUSTAINABLE PRACTICES:** Zero waste and 4Rs concept, Circular economy and concept of ISO 14000, Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports.	6	4

TEXT BOOKS

1. Bharucha, E. (2015). Textbook of Environmental Studies.
2. Benny Joseph, _Environmental Science and Engineering‘, Tata McGraw-Hill, New Delhi, 2016
3. Carson, R. (2002). Silent Spring. Houghton Mifflin Harcourt
4. Gilbert M.Masters, _Introduction to Environmental Engineering and Science‘, 2nd edition, Pearson Education, 2004.

REFERENCE BOOKS

1. Climate Change: Science and Politics. (2021). Centre Science and Environment, New Delhi.
2. Gadgil, M., & Guha, R. (1993). This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) (1999). Global Ethics and Environment,London, Routledge.
4. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. (2006). Principlesof Conservation Biology. Sunderland: Sinauer Associates.

ONLINE RESOURCES

1. https://archive.nptel.ac.in/courses/127/105/127105018/
2. https://archive.nptel.ac.in/courses/127/106/127106004/

COURSE OUTCOMES

CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation
CO2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4	To be familiar with biodiversity conservation and its significance.
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energy Cycles and the role of sustainable urbanization.
CO6	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Fundamentals of Environmental Engineering (PCC120)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	50	50	00	00	100

COURSE OVERVIEW

This course provides a foundational understanding of environmental management, concept of solid waste, different treatments used to remove impurities from wastewater, control mechanism of air pollutants and control technologies and legislation for environmental protection. The course encourages environmental consciousness and ethical responsibility in engineering practice.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs. (24)
	SECTION-A		
1	**Introduction:** Role of Environment Engineers, introduction to environment management and sustainability- concept, scope and need, principles.	1	2
2	**Wastewater management & treatment:** sources and characteristic parameters-BOD, COD, TSS, pH etc, Effluent treatment plant, sewage treatment and its layouts, Preliminary and Primary Treatment: Screening, grit removal, flow equalization, primary clarifiers.	2	5
3	**Solid waste management:** Sources and classification of solid waste, physical, chemical, biological characteristics of solid waste, Collection methods, types of collection systems, resource recovery and disposal of solid waste: introduction of sanitary landfilling.	3	5
	SECTION-B		
4	**Introduction to air pollution:** Major air pollutants (PM, SOx, NOx, CO, VOCs), sources (natural and anthropogenic), Introduction of Gravity settling chambers, cyclone separators, electrostatic precipitators.	4	5
5	**Environmental Law and Policy:** Need for environmental law, evolution of environmental legislation in India, salient features of : The Environment (Protection) Act, 1986), The Water (Prevention & Control of Pollution) Act, 1974, and The Air (Prevention & Control of Pollution) Act, 198.	5	4
6	**Occupational Health and Personal Protective Equipment:** Classification of occupational health hazards, dangerous properties of chemical and their health effects, routes of entry of toxic material into human body Need of PPE, factors for selection of PPEs, non-respiratory	6	3

	equipment, respiratory equipment, effective use of PPEs, inspection and maintenance of PPEs, specification of safety PPEs.		

TEXTBOOKS

1. R. Rajagopalan, Environmental Management, Oxford University Press
2. R.B. Singh, Environmental Geography, Rawat Publications
3. Tchobanoglous, G., Theisen, H., & Vigil, S., *Integrated Solid Waste Management: Engineering Principles and Management Issues*, McGraw Hill Education
4. Metcalf & Eddy, *Wastewater Engineering: Treatment and Resource Recovery*, McGraw Hill Education
5. Wark, K., Warner, C.F., Air Pollution: Its Origin and Control, Addison-Wesley
6. R. Divan & A. Rosencranz, Environmental Law and Policy in India, Oxford University Press
7. Kibert, C. J., Sustainable Construction: Green Building Design and Delivery, Wiley.

REFERENCE BOOKS

1. S.K. Garg, Water Supply and Wastewater Engineering, Khanna Publishers
2. C.P. Leslie Grady Jr., Biological Wastewater Treatment, CRC Press
3. Rao, M.N. & Rao, H.V.N., Air Pollution, Tata McGraw-Hill
4. Peavy, H.S., Rowe, D.R., Tchobanoglous, G., Environmental Engineering, McGraw-Hill
5. S.C. Shastri, Environmental Law, Eastern Book Company

ONLINE RESOURCES

1. https://nptel.ac.in/courses/103107215
2. https://archive.nptel.ac.in/courses/103/107/103107215/

COURSE OUTCOMES

CO1	To recognize concept, scope, need and principles of Environmental Engineering.
CO2	To describe water quality parameters and apply basic principles of water and wastewater treatment processes.
CO3	To understand fundamentals of Solid waste management
CO4	To identify the sources, characteristics, and control methods of air pollution.
CO5	To interpret environmental acts and regulations
CO6	To understand the fundamental concepts of occupational health and safety

UPL University of Sustainable Technology

Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Basic Electronics (PCC118)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CEE	I/TW	V	Total
2	0	0	2	2	50	50	00	00	100

COURSE OVERVIEW

This course introduces the fundamental principles of electronic components and circuits. It covers the working and applications of diodes, special purpose diodes, transistors (BJT, FET, IGBT), and operational amplifiers. Students will also learn digital number systems and basic logic gates, with a focus on both theoretical concepts and practical testing methods.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs. (24)
	SECTION-A		
1	**Diode theory and applications:** Basic idea about forward bias, reverse bias and VI characteristics, ideal diode, Zener diode, Zener diode as voltage regulator, Testing of diode with multi-meter, half wave rectifier, full wave rectifier, bridge rectifier, RC filter.	1,2,3	5
2	**Special purpose diodes:** Light emitting diode (LED). Photo diode, Fast Recovery Diodes, Seven Segment display, Photo transistor, Opto-coupler.	4,5	3
3	**Bipolar junction transistors and its biasing**: BJT operation, BJT voltages and currents, CE, CB and CC characteristics. Testing of bipolar junction transistor with multi-meter.	3,4	4
	SECTION-B		
4	**Field effect transistors (FET):** Architecture of FET, JFET, MOSFET (N-channel, P-channel), IGBT. Testing of MOSFET & IGBT.	2,3,6	3
5	**Operational Amplifier:** Introduction of Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, Slew rate, Bandwidth, input offset voltage, Input bias Current and Input offset Current.	5,6	4
6	**Digital number systems and Logic Gates:** Decimal numbers, Binary numbers, Octal numbers, Hexa-Decimal numbers, Number Base Conversion examples, Basic logic gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR and their truth tables.	1,2,6	5

TEXT BOOKS

1. "Principles of Electronics" by V.K. Mehta and Rohit Mehta
2. "Basic Electronics and Linear Circuits" by N.N. Bhargava, D.C. Kulshreshtha, and S.C. Gupta
3. "Fundamentals of Digital Circuits" by A. Anand Kumar

REFERENCE BOOKS

1. Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford, 2016
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8

ONLINE RESOURCES

1. https://nptel.ac.in/courses/122106025
2. https://nptel.ac.in/courses/108105132
3. https://nptel.ac.in/courses/117104072
4. https://swayam.gov.in/course/3595-basic-electronics
5. eSIM available on FOSSEE website: https://fossee.in/

COURSE OUTCOMES

COs	Statement
CO1	Recall and describe the fundamental concepts of diodes, transistor types, number systems, and logic gates.
CO2	Explain the working principles of diodes, transistors, operational amplifiers, and logic circuits with appropriate circuit diagrams and parameters.
CO3	Use testing equipment like multi meters to test diodes, BJTs, MOSFETs, and IGBTs, and implement rectifier circuits and logic gate circuits.
CO4	Differentiate between various diode types and transistor configurations based on characteristics and applications.
CO5	Assess the performance of electronic components like voltage regulators, filters, amplifiers, and logic circuits based on parameters and functionality.
CO6	Design and test different basic analog and digital circuits for real-world applications.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

Basic Electrical Engineering (ESC103)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CEE	I/TW	V	Total
3	0	2	5	4	50	50	25	25	150

COURSE OVERVIEW:

This syllabus provides a foundational understanding of electrical engineering principles. It covers DC and AC circuits, including circuit laws, analysis methods, and theorems. It introduces key concepts in electrostatics, magnetism, and electromagnetic induction. The course includes basic working principles and construction of electrical machines like DC motors, transformers, and induction motors. It concludes with essential safety practices, grounding methods, and protective devices in electrical systems.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (36)
	SECTION-A		
1	**D. C. Circuits:** Introduction of Electrical Current, Voltage, Power and Energy; Sources of Electrical Energy – Independent and Dependent Source, Ideal electrical circuit elements - Resistor, Inductor and Capacitor; Fundamental laws of electric circuits - Ohm's Law and Kirchhoff‟s Laws; Analysis of series, parallel and series-parallel circuits; Star – Delta conversion; Node and Mesh analysis; Superposition, Thevenin and Norton’s theorem	1	7
2	**Electrostatics:** Electric charge and Laws of electrostatics; Definitions – Electric field, electric field intensity, electric flux and flux density; Electrostatic induction; Dielectric strength; Capacitor- Types of capacitors, Capacitor connected in series and parallel, Energy stored in a capacitor	2	6
3	**Magnetism and Electromagnetism:** Magnetic circuits, Difference between electric and magnetic circuits; Faradays Laws of electromagnetic induction; Lenz's Law; Fleming's Rules; Statically and dynamically induced EMF; Concepts of self-inductance, mutual inductance and coefficient of coupling; B-H characteristics; Hysteresis and Eddy current losses	3	6
	SECTION-B		
4	**AC Circuits:** Representation of sinusoidal waveforms, peak and RMS values, Phasor diagram, Representation of AC quantities, real power, reactive power,	4	7

	apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations, Series and parallel resonance. Three phase balanced circuits, voltage and current relations in star and delta connections, Power measurement in three phase circuits		
5	**Electrical Machines:** Working principles & construction of DC generator, Working principles & construction DC motor, Working principles & construction Transformer, Three phase Induction Motor	5	5
6	**Safety & protection:** Safety precautions in handling electrical appliances; Electric shock, First aid for electric shock other hazards of electrical laboratories & safety rules; Grounding & earthing - Importance of grounding and earthing, equipment for grounding, Methods of earthing; Circuit protection devices: Fuses, MCB, ELCB & Relays.	6	5

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. Verification of Ohm's Law: Measure voltage and current across a resistor; verify linear relationship.
2. Verification of Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL)
3. Superposition Theorem Verification: Analyze a two-source network and verify superposition principle
4. Thevenin's and Norton's Theorems: Find equivalent circuits for a given network and verify load behavior.
5. To determine the impedance and plot the phasor diagram of R-L - C series circuit.
6. Study of Resonance in Series RLC Circuits: Plot frequency vs. current and observe resonant frequency.
7. Power Measurement in a Three-Phase System Using Two Wattmeter Method: Determine active power and power factor of a balanced load.
8. To study the various cut section models of Electrical Machines.
9. To verify Staircase and Go-down wiring connection practice and its application.
10. Demonstration of Circuit Protection Devices (Fuses, MCB, ELCB, Relay): Understand operation and applications of protection devices.
11. First Aid for Electrical Shock (Demonstration and Simulation): Learn safety practices and first aid protocols.

TEXT BOOKS

1. "Basic Electrical Engineering" – D.P. Kothari and I.J. Nagrath, Publisher: Tata McGraw-Hill Education
2. "Basic Electrical Engineering" – V.K. Mehta and Rohit Mehta, Publisher: S. Chand Publishing

REFERENCE BOOKS

1. "Electrical Technology" Vol. 1 – B.L. Theraja and A.K. Theraja, Publisher: S. Chand

ONLINE RESOURCES

1. https://nptel.ac.in/courses/108/105/108105112
2. https://nptel.ac.in/courses/108108076

COURSE OUTCOMES

CO1	State the concepts of basic Laws such as Ohm's Law and Kirchhoff's Law, star delta transformation for solving resistive series, parallel and series-parallel circuits.
CO2	Understand the basic concepts of electrostatics.
CO3	Understand the basic concepts of magnetic circuits and electro magnetism.
CO4	Apply the concepts of AC Quantities in the mathematical operation on AC waveforms and to draw pharos diagram and waveforms for purely resistive, purely inductive and purely capacitive as well as series and parallel R-L-C circuits.
CO5	Discuss the working principle of Electrical machines- Transformer, DC Generator and DC Motor.
CO6	Understand the importance of safety and the precaution to be taken while working with electrical equipments and accessories. Understand the working principle, usage and construction of circuit protection devices such as fuse, MCB, ELCB & Relays

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Introduction to Chemical Engineering (PCC116)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	50	50	00	00	100

COURSE OVERVIEW

This course provides a foundational understanding of chemical engineering, introducing chemical plant, core concepts such as unit operations, unit processes, and modes of operation in process industries. It familiarizes students with the structure and workflow of chemical plants, including the role of chemical engineers.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs. (24)
	SECTION-A		
1	**Introduction** What Is Chemical Engineering? Scope of chemical engineering, Historical development of chemical engineering, Chemical Engineering vs Chemistry, Relevance in society and industry	1	4
2	**Overview of Chemical Industries** What is a chemical process industry (CPI), Classification of Chemical Industries: based on product type, based on scale and operation, Various sections of chemical plants, important chemical process industries	2	5
3	**Role of a Chemical Engineer** Career diversities in chemical engineering, roles in the Chemical Industry Beyond the Plant: diverse functions like product development and project management and finance	3	3
	SECTION-B		
4	**Introduction to Unit Operations and Unit Processes** Unit operations and unit processes, Anatomy of a chemical engineering plant, commonly used equipment, Process flow representation (PBD, PFD), Basic PFD Symbols	4	4
5	**Unit Dimension and Principles of Chemical Engineering** Fundamental quantities and units, unit conversion practice, key process variables: temperature, pressure, density, viscosity, composition, mass fraction, mole fraction and flow rate. Concept of pressure, Antoine equation, Dalton's law, Raoult's law, Henry's law.	5	4
6	**Energy, Safety, Environment & Ethics in Chemical Engineering** Energy, types of energy, introduction to energy efficiency and conservation in chemical industries, personal safety and its importance,	6	4

	sustainability, importance of environmental protection in chemical industry, ethics and professional responsibility.		

TEXTBOOKS

1. Introduction to Chemical Engineering: For Chemical Engineers and Students by Uche P. Nnaji, Wiley, ISBN: 978-1-119-59222-8, October 2019

REFERENCE BOOKS

1. Andersen, L. B.; Wenzel, L. A. Introduction to chemical engineering; McGraw Hill Book Company, New York, 1961.
2. Ghosal, S. K.; Sanyal S. K.; Datta, S. Introduction to Chemical Engineering; McGraw Hill
3. Education, 1st Ed, 2007

ONLINE RESOURCES

1. https://archive.nptel.ac.in/courses/103/103/103103165/ (NPTEL sessions (Unit 1 and 2) on basic principles and calculations in chemical engineering delivered by Prof S K Majumdar, Chemical Engineering Department, IIT Guwahati)

COURSE OUTCOMES

CO1	Recognize the scope and importance of chemical engineering in industry and society.
CO2	Identify common types of chemical industries and their products.
CO3	Describe the general functions and responsibilities of chemical engineers.
CO4	Name basic unit operations and processes along with commonly used equipment in chemical industries.
CO5	Understand fundamental concepts and terminologies related to chemical engineering processes.
CO6	State the importance of energy, safety, environment, and ethics in chemical engineering.

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester II

Introduction to Chemical Technology (PCC119)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	50	50	0	0	100

COURSE OVERVIEW

This course provides foundational knowledge in chemical technology, equipping students with the essential understanding of chemical processes, industrial operations, and material transformations. Structured according to Bloom's Taxonomy, the course aims to develop a progression of learning from acquiring basic facts to applying knowledge in industrial and problem-solving contexts.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs. (24)
	SECTION-A		
1	**Overview of Chemical Technology** Definition and scope, Difference between chemical technology and Chemical Engineering, Historical development of chemical industries, Role of chemical technologists, Recent developments in the field of Chemical Technology.	1	04
2	**Core Principles, Importance of following essential terms and their applications in Chemical Technology** Material and Energy Balances, Thermodynamics, Reaction Engineering	2	04
3	**Introduction to Unit Operations and Unit Processes in Chemical Technology :** Definitions, examples, Difference between Unit Operation and Unit Process, key features and applications	3	04
	SECTION-B		
4	**Fundamental and applications of Chemical Process Industries** Pharmaceutical Technology, Dyes and Pigments Technology Glass and Ceramics Technology, Polymer and Rubber Technology, Petrochemical and Refining	4	04
5	**Introduction to Process Control and Instrumentation:** Fundamentals of Process Control and Instrumentation and its applications	5	04
6	**Emerging Trends** Green Chemistry and Engineering, Process Intensification, Biochemical	6	04

	Engineering, Nanotechnology in Processes, Digital and Smart Manufacturing (Industry 4.0)		

TEXT BOOKS

1. Outlines of Chemical Technology by Dryden's, M. Gopala Rao, Marshall sittig, 3rd Ed, 2015.
2. Chemical Process Industries by R. Norris Shreve & Joseph A. Brink
3. Unit Operations of Chemical Engineering by McCabe, Smith & Harriott
4. Elementary Principles of Chemical Processes by Richard M. Felder, Ronald W. Rousseau
5. Chemical Process Industries by R.N. Shreve & J.A. Brink
6. Green Chemistry: Theory and Practice by Paul T. Anastas & John C. Warner

REFERENCE BOOKS

1. Chemical Technology: An Integral Textbook by Andreas Jess & Peter Wasserscheid
2. Coulson & Richardson's Chemical Engineering Volumes 1–6
3. Dryden's Outlines of Chemical Technology by M.Gopal Rao & Marshall Sittig
4. Perry's Chemical Engineers' Handbook by Don W. Green & Marylee Z. Southard

ONLINE RESOURCES

1. https://archive.nptel.ac.in/courses/103/107/103107082/
2. MIT Open course lecture available on Internet etc.
3. Delnet

COURSE OUTCOMES

CO1	Recall fundamental concepts, terminology commonly used in chemical technology.
CO2	Explain the core principles of Chemical Technology
CO3	Illustrate the various unit operations and unit processes carried out in industries.
CO4	Elucidate the applications of Chemical Technology
CO5	Illuminate the process Control and Instrumentation
CO6	Elaborate the emerging trends in Chemical Technology

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

Indian Knowledge System (IKS106)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
2	0	0	2	2	50	50	0	0	100

COURSE OVERVIEW

This foundational course on the Indian Knowledge System (IKS) introduces students to the rich intellectual, scientific, philosophical, and cultural traditions of India. Aligned with Bloom's Taxonomy, the course aims to gradually build cognitive skills from basic knowledge recall to the ability to critically analyze and creatively apply traditional wisdom in modern contexts.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs. (24)
	SECTION-A		
1	**Introduction to IKS** (What is knowledge System, Characteristic Features of Indian Knowledge System) **Why IKS?** (Macaulay's Education Policy and its impact, Need of revisiting Ancient Indian Traditions) **Scope of IKS** (The Universality of IKS (from Micro to Macro), development form Earliest times to 18th Century CE) **Tradition of IKS** (Ancient Indian Education System: Home, Gurukul, Pathashala, Universities and ancient educational centres)	1	04
2	**Bharatiya civilization** Genesis of the land, antiquity of civilization, on the trail of the lost river, discovery of the Saraswati river, the Saraswati-Sindhu civilization, Tapi , Narmada river .	2	04
3	**Development of knowledge system** Traditional knowledge system, the vedas, main schools of philosophy (6+3), ancient education system, the takṣasila university, the nalanda university, alumni, knowledge export from bharata.	3	04
	SECTION-B		
4	**Literature and scholars** Literature, life and works of Agastya, Lopamudra, Ghoṣa, Valmiki, Patanjali, Vedavyasa and Yajnavalkya.	4	04

5	**Science, Engineering & Technology** Pre-harappan and sindhu valley civilization, dyes and pigment , paints , polymers , rubber , pharmaceuticals , glass and pottery, metallurgy, engineering science and technology in the vedic age and post-vedic records.	5	04
6	**Life & environment** Ethnic studies, life science in plants, anatomy, physiology, agriculture, ecology and environment	6	04

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW): NA

TEXT BOOKS

1. Introduction to Indian Knowledge System- concepts and applications, B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93-91818-21-0
2. Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230,
3. Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334,
4. B. C. Chauhan, A Textbook on The Knowledge System of Bharata, ISBN-13- 979-8885750882, Garuda Prakashan, 2023. 2.
5. S. Raha, Histrory of Science in India, Vo.1, National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata, 2014

REFERENCE BOOKS

1. Concise history of science in India- D.M. Bose, S.N Sen, B.V. Subbarayappa.
2. Positive sciences of the Ancient Hindus- Brajendranatha seal, Motilal Banrasidas, Delhi 1958.
3. P. Kohle, Pride of India- A Glimpse of India's Scientific Heritage, Samskrit Bharati, Publishers, 2006.
4. K. D. Verma, Vedic Physics, 1 st edition, Motilal Banarsidass Publishers, 2012. 3. S. Soni, India's Glorious Scientific Tradition, Ocean Books Pvt. Ltd., 2010.
5. MacDonnell A.A- History of Sanskrit literature
6. Winternitz M- History of Indian Literature Vol. I, II & III
7. Dasgupta S.N & De S.K- History of Sanskrit literature Vol. I.
8. Ramkrishna Mission- cultural heritage of India Vol. I, II & III.
9. Majumdar R. C & Pushalkar A.D- History & culture of the Indian people, Vol. I, II & III.
10. Keith A.B- History of Sanskrit literature.

ONLINE RESOURCES

1. https://onlinecourses.swayam2.ac.in/ntr25_ed18/preview
2. https://onlinecourses.swayam2.ac.in/imb24_mg21/preview
3. https://onlinecourses.swayam2.ac.in/nou25_ge95/preview

COURSE OUTCOMES

After completing the course, student will be able to

CO1	Describe the concept of Indian Knowledge system
CO2	Classify the concepts of Indian Civilization
CO3	Relate to the development of Indian knowledge system
CO4	Categorize the various developments in literature
CO5	Revise about the developments in engineering and technology
CO6	Value about life and environment

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

Sports & Fitness (CCA107)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
0	0	4	4	2	0	0	50	0	50

COURSE OVERVIEW

This course provides comprehensive knowledge of yoga, sports specialization, and physical fitness testing to promote holistic health, skill development, and performance enhancement. Students will gain practical and theoretical understanding to manage lifestyle diseases, improve fitness, and excel in selected sports

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (48)
1	**Yoga and Meditation** • Importance of Yoga in Physical and Mental well-being • Basic Yoga Postures (Asanas) and Their Benefits • Breathing Techniques (Pranayama) • Guided Meditation for Stress Relief and Focus • Yoga as cure of Each Life-Style Diseases (Obesity, Diabetic, Hypertension, Asthma, Back-Pain)	1	08
2	**Sports Specialization** • Fundamentals of individual and team sports (e.g., Volleyball, Basketball, Football, Cricket, Kabbadi, Table Tennis, Athletics Event – Running, Jumping, Throwing) • History, Rules, Skills & Techniques • Role of Sports Psychology and Nutrition in Performance.	2	16
3	**Test and Measurement in Physical Education** • Importance of Test & Measurement • Purpose and Importance of Physical Fitness Testing • Common fitness Tests (e.g., AAHPERD Physical Fitness Test, BMI, Harvard Step Test)	3	08
4	**Manual Log-Book (Assignment & Project)** • Any one of the games as specialization (History, Skill-Technics, Rules & regulation) • Yoga & Meditation (2 Asanas to cure Each Lifestyle Diseases) • Viva & practical of Asanas (Practical) • Physical Fitness Test AAHPERD (Practical)	4	16

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. Performance and viva of minimum 2 Asanas for each lifestyle disease (e.g., Obesity, Diabetes, Hypertension, Asthma, Back Pain), including explanation of benefits and technique.
2. Conducting and recording of AAHPERD Physical Fitness Test, including measurements of strength, endurance, flexibility, speed, and cardiovascular fitness.
3. Demonstration of skills, techniques, and basic rules of any one selected game (e.g., Volleyball, Football, Cricket), along with viva on history and fundamentals.
4. Participation in guided meditation and breathing techniques (Pranayama) for stress relief, focus, and emotional balance, followed by a reflective journal or viva.

TEXT BOOKS

1. Health and Physical Education (Dr. V.K. Sharma)
2. Yoga Education – Philosophy and Practice (Dr. S.K. Mangal & Shubhra Mangal)

REFERENCE BOOKS

1. “Yoga Education: Philosophy and Practice" by Aruna Goel
2. NCERT "Health and Physical Education"
3. "Measurement and Evaluation in Physical Education and Exercise Science" (5th Ed.) by Alan C. Lacy & Douglas N. Hastad.
4. A New Era of Physical Education, Sports & Yoga

ONLINE RESOURCES

1. https://nsrs.kheloindia.gov.in
2. https://yoga.ayush.gov.in
3. https://www.cdc.gov/physicalactivity

COURSE OUTCOMES

CO1	Students will learn to use yoga and meditation for stress relief, mental focus, and managing lifestyle diseases such as obesity, diabetes, hypertension, asthma, and back pain.
CO2	Students will develop sport-specific skills, understand rules and techniques, and apply psychological and nutritional concepts to enhance sports performance.
CO3	Students will be able to conduct, record, and analyze standard physical fitness tests to assess and monitor individual performance and fitness levels.
CO4	Students will practically apply their learning by documenting sports skills, yoga asanas, and fitness assessments, enhancing their hands-on experience.

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B.E. Semester I

National Cadet Corps (CCA108)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
0	0	4	4	2	0	0	50	0	50

COURSE OVERVIEW

This course is designed to inculcate unity and discipline in the students and orient student towards Army life.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (48)
1	**NCC and National Integration & Awareness:** Aims and Objectives of NCC, Organization &Training, National Integration: Importance and Necessity, Freedom Struggle and Nationalist Movement in India, National Interests, Objectives, Threats and Opportunities, Unity in Diversity	1,2	8
2	**Drill:** Foot drill, Drill with arms, Ceremonial drill	3	16
3	**Personality Development and Leadership:** Introduction to Personality Development, Self-Awareness - Know yourself/ Insight, Change your mind set, Interpersonal relationship and communication, Communication Skills, Types of Leadership, Time Management, Stress Management Skills, Sociability: Social Skills, Values / Code of Ethics	4,5	8
4	**Map reading:** Introduction to types of Maps and Conventional Signs, Scales & Grid System, Topographical forms and technical terms, Relief, Contours and Gradients, Cardinal points and Types of North, Types of bearings and use of Service Protractor, Prismatic compass and its use & GPS, Setting a Map, finding North and own position, Map to Ground, Ground to Map	6	16

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. To instill a sense of national integration and awareness among NCC cadets
2. To develop discipline, coordination, and teamwork among NCC cadets through drill exercises
3. To enhance the overall personality and leadership qualities of NCC cadets
4. To impart skills in map reading and navigation to NCC cadets

TEXT BOOKS

1. National Cadet Corps by R. Gupta, Ramesh Publishing House, New Delhi

REFERENCE BOOKS

1. Cadet Hand Book (Army) by NCC, New Delhi

ONLINE RESOURCES

1. https://indiancc.nic.in/

COURSE OUTCOMES

CO1	Analyze the role of NCC in fostering national unity and promoting a sense of patriotism among youth.
CO2	Develop a comprehensive understanding of the principles and significance of national integration.
CO3	Acquire proficiency in various drill commands and movements used in NCC training
CO4	Enhance self-awareness and self-confidence through structured personality development exercises
CO5	Apply leadership principles in practical scenarios, including organizing events, leading teams, and managing resources efficiently
CO6	Demonstrate practical skills in map reading through field exercises, orienteering activities, and navigation challenges

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Shroff S R Rotary Institute of Chemical Technology

B.E. Semester I

National Service Scheme (CCA109)

Teaching Scheme (Hrs./week)				Credit	Examination Scheme				
L	T	P	Total		SEE	CCE	I/TW	V	Total
0	0	4	4	2	0	0	50	0	50

COURSE OVERVIEW

This course is focused on developing student personalities through community service and promoting social responsibility among students.

COURSE CONTENT

Sr. No.	Topics	COs	Hrs (48)
1	**Fundamental of NSS:** Introduction of NSS, Origin of NSS, AIMS & Objective of NSS,NSS MOTTO, NSS Emblem, NSS Day NSS Anthem & Motivational song •Uhte Samaj k Liye Uthe Uthe •Ham sab Mil kar Desh ko Apni •Hum Honge Kamyab Hum honge Kamyab	1,2	10
2	**Youth population in India and its characteristics** Introduction to India: Physical, socio-economic and demographic background, study of Indian population composition (Age composition), youth composition, youth policy importance of youth policy youth policy in India, NSS as youth organization.	2,3	14
3	**Activity Based Program:** Shramdaan: Tree plantation, cleaning, Watering, Weeding, Any other activities, Swatchatha Programme, Visit and Conserving Ancient monuments and heritage site, Socio Economic Survey of Village/slum, Nature Camp, Environmental Education etc.	3,4	12
4	**Awareness Program:** Seminar, Workshop, celebration of national and international day, Personality development program, group activities, Women Empowerment Programme, Health Camps, Blood grouping awareness, Water Conservation Programme	5,6	12

LIST OF PRACTICALS AND TERM WORK (9 to 10 Experiments/TW)

1. To know the fundamental AIMS & Objective of NSS
2. To develop discipline, coordination, and teamwork among NSS volunteers during social activities.
3. To enhance the overall personality and leadership qualities of NSS Volunteers.
4. To impart the various awareness program, seminar and camps.

TEXT BOOKS

1. Prof. B.K. Shivanna, "National Service Scheme" Printing Press KSOU, Mysore 201 1
2. Madhu Ahuja, Students Leaders in the National Service Scheme (NSSS) in Delhi : A case study 1986 (New Delhi : Dept. of Management and Extension , Lady Irwin College, University of Delhi, 1986)
3. Chatterjee, B., Social service opportunities for students in Slum Areas (reprint : Delhi
4. Delhi School of Social Work, University of Delhi 1973)

REFERENCE BOOKS

1. NSS Manual 2006, Ministry of youth Services and Sports, Govt. of India, New Delhi.

ONLINE RESOURCES

1. https://nss.gov.in/

COURSE OUTCOMES

CO1	To understand the concept of National Service Scheme
CO2	To introduce the concept and importance of values and Ethics in youths
CO3	To motivate the NSS volunteers actively participate in community activities.
CO4	Know the organizational structure and its functions at national to Institutional level.
CO5	Learn the skills of critical thinking and Decision making
CO6	Appreciate the culture of Shramdaan and its benefits through working as a team or group.