

SEMESTER II

Program: B.Tech
Semester: Second
Course: Chemistry I
Course Code: 8BSC103

L	T	P	C
3	1	0	4

Course Learning Objective:

CLO 1: To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.

CLO 2: The knowledge gained on spectroscopy, stereochemistry will provide a strong platform to understand the concepts on these subjects for further learning

CLO 3: To acquire knowledge of the basic 3D structure in organic chemistry including stereochemistry, aromaticity and reaction mechanism.

CLO 5: To develop knowledge on the physical state and electrochemistry of molecules and significance of corrosion.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: Learn about the bonding in a molecular structure of simple and complex molecule, magnetism and isomerism in complex molecule.

CO 2: Learn about limitations of classical mechanics and solution in terms of quantum mechanics for atomic/molecular systems. Gain insight into the basic principles of UV, IR and NMR spectroscopic techniques. Use spectroscopic techniques to determine structure and stereochemistry of known and unknown compounds.

CO 3: Learn about aromaticity of organic compound identify and differentiate prochirality and chirality at centres, axis and determine the absolute configuration. Evaluate the stability of various conformers of acyclic and cyclic systems

CO 4: Learn about the rate of reaction, order and molecularity of reaction, mechanism of a simple as well as catalytic reaction.

CO 5: Learn about the phases and the electrochemical behavior of the molecules, EMF of cell and its application.

Course Content:

Topics	Hours
Unit I: : Chemical Bonding	
Ionic bond: Radius ratio rule, . Metallic Bond: valence bond and band theories, defects in solids, Werner's Theory, Bonding in Transition metal complexes, Ligands, coordination complexes, Crystal Field Theory, Octahedral and Tetrahedral complexes, CFSE, Jahn Teller theorem, magnetism, and isomerization in coordination compounds..	9
Unit II: Spectroscopic techniques and applications	
Principles of spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging.	4
Unit III: Organic Structure and Stereochemistry	
Covalent bond: Lewis structure, Valence Bond theory, Molecular orbital theory, Molecular orbital of diatomic and polyatomic system, hybridization, conjugated molecules, Huckel molecular orbital theory of conjugated systems. Isomerism, Geometrical isomerism: cis–trans and syn-anti isomerism; Optical isomerism & Chirality; Wedge, Fischer, Newmann and Sawhorse Projection formulae and interconversions; Conformational studies of ethane, n-butane, Cyclohexane	9
Unit IV: Kinetics and Catalysis:	
Order & molecularity of reactions, kinetics of zero, first & second order reaction Characteristics of catalyst, types of catalysis, theories of catalysis; Acid base catalysis, Enzyme catalysis, Important catalysts in industrial processes; Hydrogenation using Wilkinson's catalyst,	9
Unit V: Phase and Chemical equilibrium	
Phase Rule: Terms Involved, Phase diagram of one component (Water) their applications. Law of chemical equilibrium, equilibrium constants and their significance, Weak and strong electrolytes, Standard electrode potential and its application , EMF and its measurement and application, the Nernst equation , Chemical and Electrochemical corrosion, Factors affecting the rate of corrosion.	9

Suggested Reading:

1. *University chemistry*, by B. H. Mahan
2. *Chemistry: Principles and Applications*, by M. J. Sienko and R. A. Plane
3. *Fundamentals of Molecular Spectroscopy*, by C. N. Banwell
4. *Engineering Chemistry (NPTEL Web-book)*, by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. *Physical Chemistry*, by P. W. Atkins
6. *Organic Chemistry: Structure and Function* by K. P. C. Volhardt and N. E. Schore.
7. *Engineering Chemistry* by Jain & Jain.
8. *Engineering Chemistry* by O P Agarwal.
9. J. D. Lee Concise Inorganic Chemistry ELBS, 1991.
10. R. G. Mortimer Physical Chemistry 3rd Ed., Elsevier (2009).
11. William Kemp, Organic Spectroscopy, 3rd Ed., 2008 Macmillan.

Program: B.Tech
Semester: Second
Course: Chemistry I Lab
Course Code: 8BSC103P

L	T	P	C
0	0	3	1.5

List of Laboratory Experiments/Demonstrations:

1. Determination of surface tension and viscosity
2. To draw the pH-titration curve of strong acid vs strong base.
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Determination of the rate constant of a reaction
6. Determination of cell constant and conductance of solutions
7. Synthesis of a polymer/drug
8. Saponification/acid value of an oil
9. Chemical analysis of a salt
10. Models of potential energy surfaces
11. Preparation of N/10 solution
12. Estimation of strength HCl solution supplied by titrating it against N/10 NaOH solution.
13. Adsorption of acetic acid by charcoal

Program: B.Tech
Semester: Second
Course: Mathematics II
Course Code: 8BSC104

L	T	P	C
3	1	0	4

Course Learning Objective:

CLO 1: The subject helps the students to develop the fundamentals and basic concepts of Differential Equation. Students will be able to solve problems related to engineering applications by using these techniques.

CLO 2: Apply the principles of Power series to solve a variety of practical problems in Engineering and Applied Science.

CLO 3: Apply the concept of Partial Differential Equation to solve various equations like wave equation, heat equation etc.

CLO 4: Apply the concept of line, surface and volume integral with various theorems to solve practical problems.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: To introduce the basic concepts required to understand, construct, solve and interpret ordinary differential equations.

CO 2: To teach methods to solve differential equations of various types.

CO 3: To give an idea about Power series solutions; Legendre polynomials, Bessel functions.

CO 4: To give an ability to apply knowledge of Partial Differential equation on engineering problems.

CO 5: Formulate and solve problems related to vector calculus in the field of Industrial Organization Engineering.

Course Content:

Topics	Hours
Unit I: First order ordinary differential equations	6
Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.	
Unit II: Ordinary differential equations of higher orders	6
Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation.	
Unit III: Power series	4
Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.	
Unit IV: Partial Differential Equations	10
Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates.	
Unit V: Vector calculus	6
Gradient, curl and divergence ; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	

Suggested Readings:

1. G.B. Thomas and R.L. Finney, *Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.*
2. Erwin kreyszig, *Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.*
3. W. E. Boyce and R. C. DiPrima, *Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.*
4. S. L. Ross, *Differential Equations, 3rd Ed., Wiley India, 1984.*
5. E. A. Coddington, *An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.*
6. E. L. Ince, *Ordinary Differential Equations, Dover Publications, 1958.*
7. J. W. Brown and R. V. Churchill, *Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.*
8. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.*
9. B.S. Grewal, *Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.*

Program: B.Tech
Semester: Second
Course: Programming for Problem Solving
Course Code: 8ESC103

L	T	P	C
3	0	0	3

Course Learning Objective:

The objective of this course is to help the students

CLO 1: To impart basic knowledge about simple algorithms, fundamentals of Programming Skills particularly in C Programming Language.

CLO 2: To enable how to implement conditional branching, iteration and recursion.

CLO 3: To enable them to use functions, arrays, pointers, strings and structures in solving problems.

CLO 4: To understand how to solve problems related to matrices, searching, sorting, use files to perform read and write operations.

Course Outcome:

On the completion of the Course, the students will be able to:

CO1: Understand the fundamentals of computer and C programming language, along with flow chart and algorithm to solve given program.

CO2: Able to choose the loops and decision-making statements to solve the problem.

CO3: Gain the knowledge of function, array , pointer and structure.

CO4: Learn about implementation of file Operations in C programming for a given application.

Course Content:

Topics	Hours
Unit 1: Introduction to Programming	
Introduction to Programming (Flow chart/pseudocode, compilation etc.), Variables (including data types)	2
Unit II: Arithmetic expressions	
Arithmetic expressions and precedence	2
Unit III: Conditional Branching and Loops	
Writing and evaluation of conditionals and consequent branching, Iteration and loops.	8
Unit IV: Arrays	
Arrays (1-D, 2-D), Character arrays and Strings	6
Unit V: Basic Algorithms	
Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity	6
Unit VI: Function and Recursion	
Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.	8
Unit VII: Structure and Pointers	
Pointers, Structures (including self referential structures e.g., linked list, notional introduction)	6
Unit VIII: File handling	
	2

Suggested Reading:

1. E. Balagurusamy – *Programming in ANSI C, 3rd Edn.*, TMH, New Delhi, 2004
2. *Programming with C*, B.S.Gottfried (TMH)
3. Y. Kanetkar – *Let us C, 4th Edition*, BPB Publication, New Delhi; 2002
4. *The C Programming Language*, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
5. *C Programming with problem solving*, J.A. Jones & K. Harrow, Dreamtech Press
6. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice

Program: B.Tech
Semester: Second
Course: Programming for Problem Solving
Course Code: 8ESC103P

L	T	P	C
0	0	4	2

Tutorial and Lab:

Tutorial 1: Problem solving using computers: Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions: Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions: Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops: Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting: Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings, memory structure: Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value: Lab 7: Simple functions

Tutorial 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration): Lab 8 and 9: Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls: Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation Lab 11: Pointers and structures

Tutorial 12: File handling: Lab 12: File operations

Program: B.Tech
Semester: Second
Course: Workshop Practice
Course Code: 8ESC104

L	T	P	C
1	0	0	1

Course Learning Objective:

- CLO 1:** Students able to understand different tool & equipment for work shop practice.
CLO 2: Students acquire skills for the preparation of different Carpentry/fitting/welding models.
CLO 3: Students able to understand the safety precaution in the workshop
CLO 4: Student acquires skills of Application orientated tasks.

Course Outcome:

On the completion of the Course, the students will be able to:

- CO 1:** Understand the concepts of various manufacturing methods such as casting, forming machining.
CO 2: Understand the additive manufacturing with its implication in manufacturing.
CO 3: Ability to Produce Fitting jobs as per specified dimensions with the use of various fitting tools.
CO 4: Understand the basic concepts of electrical & electronics and understand the working principle of motors.
CO 5: Ability to understand the recyclable plastics & non-recyclable plastics and various manufacturing process & also understand the various additives & fillers used in plastics & its implications.
CO 6: Understand the various the types of welding such as Arc welding, TIG, MIG & various advanced welding & its practical implications in industrial arena.

Course Content:

Topics	Hours
Unit 1:	
Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods	3
Unit II:	
CNC machining, Additive manufacturing	1
Unit III:	
Fitting operations & power tools	1
Unit IV:	
Electrical & Electronics	1
Unit V:	
Carpentry	1
Unit VI:	
Plastic moulding, glass cutting	1
Unit VII:	
Metal casting	1
Unit VIII:	
Welding (arc welding & gas welding), brazing	1

Suggested Reading:

1. *Workshop technology* by Hajara Chaudhary
2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “*Elements of Workshop Technology*”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
3. Kalpakjian S. And Steven S. Schmid, “*Manufacturing Engineering and Technology*”,
4. 4th edition, Pearson Education India Edition, 2002.
5. (iii)Gowri P. Hariharan and A. Suresh Babu, “*Manufacturing Technology – I*” Pearson Education, 2008.
6. Roy A. Lindberg, “*Processes and Materials of Manufacture*”, 4th edition, Prentice Hall India, 1998.
7. Rao P.N., “*Manufacturing Technology*”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Program: B.Tech

Semester: Second

Course: Workshop Practice Lab

Course Code: 8ESC104P

L	T	P	C
0	0	4	2

Workshop Practice: (60 hours)

1. Machine shop- 10 hours
2. Fitting shop - 8 hours
3. Carpentry - 6 hours
4. Electrical & Electronics - 8 hours
5. Welding shop - 8 hours (Arc welding 4 hrs + gas welding 4 hrs)
6. Casting - 8 hours
7. Smithy- 6 hours
8. Plastic moulding & Glass Cutting - 6 hours

Program: B.Tech
Semester: Second
Course: Environmental Science
Course Code: 8MC101

L	T	P	C
3	0	0	0

Course Learning Objective:

CLO 1: Knowledge: to help students, gain a variety of experiences and acquire a basic understanding of the environment and its associated problems.

CLO 2: Awareness: to help students acquire an awareness of and sensitivity to the total environment and its allied problems.

CLO 3: Attitudes: to help students to acquire a set of values and promote a feeling of concern for the environment and provide motivation for actively participating in environmental improvement and protection.

CLO 4: Participation: to provide students with an opportunity to be actively involved at all levels, working towards the resolution of environmental problems.

CLO 5: Skills: to help students to acquires the skills for identifying and solving environmental problems

CLO 6: Evaluation Ability: to evaluate environmental measures and education programs in terms of ecological, economic, social and aesthetic factors.

Course Outcome:

On the completion of the Course, the students will be able to:

CO 1: Articulate the interconnected and interdisciplinary nature of environmental studies; an integrative approach to environmental issues with a focus on sustainability

CO 2: Predict the consequences of human actions on the web of life, global economy and quality of human life, develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development

CO 3: Acquire values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventing the future ones

CO 4: Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world, adopt sustainability as a practice in life, society and industry.

Course Content:

Topics	Hours
Unit 1: Multidisciplinary nature of environmental studies, Natural Resources Definition, scope and importance need for public awareness. Renewable and non-renewable resources: Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.	8
Unit II: Ecosystems, Biodiversity and its conservation Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Energy flow in the ecosystem. • Ecological succession. • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem:- a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) • Introduction – Definition: genetic, species and ecosystem diversity. • Bio geographical classification of India • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values • Biodiversity at global, National and local levels.	10

<ul style="list-style-type: none"> • India as a mega-diversity nation • Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. • Endangered and endemic species of India • Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. 	
Unit III: Environmental Pollution, Social Issues and the Environment	
<p>Definition, Cause, effects and control measures of:-</p> <ol style="list-style-type: none"> a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards <ul style="list-style-type: none"> • Solid waste Management: Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution. • Pollution case studies. • Disaster management: floods, earthquake, cyclone and landslides. • From Unsustainable to Sustainable development • Urban problems related to energy • Water conservation, rain water harvesting, watershed management • Resettlement and rehabilitation of people; its problems and concerns. Case Studies • Environmental ethics: Issues and possible solutions. • Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust Case Studies. • Wasteland reclamation. • Consumerism and waste products. • Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • Issues involved in enforcement of environmental legislation. • Public awareness. 	10
Unit IV: Human Population and the Environment, Field work	
Population growth, variation among nations.	8

- | | |
|---|--|
| <ul style="list-style-type: none"> • Population explosion – Family Welfare Programme. • Environment and human health. • Human Rights. • Value Education. • HIV/AIDS. • Women and Child Welfare. • Role of Information Technology in Environment and human health. • Case Studies. • Visit to a local area to document environmental assets-
river/forest/grassland/hill/mountain • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural • Study of common plants, insects, birds. • Study of simple ecosystems-pond, river, hill slopes, etc. | |
|---|--|

Suggested Reading:

1. *G. Kiely – Environmental Engineering Irwin/ McGraw Hill International Edition, 1997*
2. *M. L. Davis and S. J. Masen, Principles of Environmental Engineering and Science, McGraw Hill International Edition, 2004*
3. *E. Bharucha, Environmental Studies, University Grants Commission, New Delhi and Bharati Vidyapeeth Institute of Environment and Research, Pune*

Program: B.Tech

Semester: Second

Course: Character Building and Holistic Development of Personality 1 (Spiritual & Mental Health)

Course Code: 8VAC101

L	T	P	C
2	0	0	2

Course Learning Objective:

CLO 1: To prepare the student to develop Manomaya Kosha (Development of mind).

CLO 2: To enable the students to develop Vijnanamaya Kosha (Intellectual Development).

CLO 3: To develop an understanding of Anandamaya Kosha (Spiritual Development).

CLO 4: To help the students in understanding the virtue of Vasudhaiva-Kutumbakam (the whole world is one family) and also to transform students into ideal personalities by inculcating sanskaaras.

Course Outcome:

On completion of the Course, the students will be able to:

CO 1: Develop a good understanding of Manomaya Kosha.

CO 2: Adapt the concept of constructive roles.

CO3: Analyze the understanding of spiritual development.

CO4: Correlate the importance of world as a family and enable them to develop Manomaya Kosha, Vijnanamaya Kosha, Anandmaya Kosha.

Course Content:

Topics	Hours
Unit I: Cognitive Intellectual Development (Manomaya Kosha)	
<ul style="list-style-type: none"> • Character Building : Meaning, Concept, Constituent elements of character and means/ways of character building. • Manomaya Kosha : General Introduction, Meaning and Concept. • Manomaya Kosha : Objectives, Characteristics and Significance. • Benefits of developed Manomaya Kosha and deficiencies due to underdeveloped Manomaya Kosha. • Means, Activities and Programmes to develop Manomaya Kosha. 	4
Unit II: Cognitive Intellectual Development (Vijnanamaya Kosha)	
<ul style="list-style-type: none"> • Vijnanamaya Kosha : General Introduction, Meaning and Concept. • Objectives, Characteristics and Significance. • Benefits of developed Vijnanamaya Kosha and deficiencies due to underdeveloped Vijnanamaya Kosha. • Means, Activities and Programmes to develop Vijnanamaya Kosha. 	4
Unit III: Cognitive Intellectual Development (Anandamaya Kosha)	
<ul style="list-style-type: none"> • Anandamaya Kosha : General Introduction, Meaning and Concept. • Objectives, Characteristics and Significance. • Benefits of developed Anandamaya Kosha and deficiencies due to underdeveloped Anandamaya Kosha. • Means, Activities and Programmes to develop Anandamaya Kosha. 	8
Unit IV: Moral Spiritual Development (To draw inspiration from important events of the lives of great men of India to serve the society and nation).	
<ul style="list-style-type: none"> • Social and National Awakening : Chanakya, Birsa Munda, Lala Lajpat Rai, Jyotiba Phule, Adi Shankaracharya, Veer Savarkar, • Women from other countries dedicated to India : Annie Besant, Emily Shankle Bose, Mary Reed. • Leading Scientists: Acharya Sushruta, Acharya Charak, Aryabhata, Jagdish Chandra Basu, Homi Jahangir Bhabha, A.P.J Abdul Kalam • Women's Awakening : Lakshmi Bai, Rani Durgavati, Rani Chenamma, Rani Ahilya Bai Holkar • Those who sacrificed all: Bhagat Singh, Khudiram Bose, Chandrashekhhar Azad, Mahatma Gandhi. • Seekers of Self-reliant India: Vinoba Bhave, Jai Prakash Narayan, Verghese Kurian, M.S.Swaminathan. • Unique Personality of India : Dr.Rajendra Prasad, Sardar Ballabh Bhai Patel. 	8

Suggested Reading:

1. *My Idea of Education, Swami Vivekanand, Advaita Ashram, Kolkata*
2. *Rabindranath Tagore : An Interpretation, Sabyasachi Bhattacharya, Penguin Delhi*
3. *Women Who Created History, NCERT, New Delhi*