Syllabus of First Year

B. Tech. (Chemical Engineering)

(Overall Structure and Revised Syllabus w. e. f. 2018-19)

Faculty of Science and Technology

University Institute of Chemical Technology

KBC North Maharashtra University, Jalgaon

(Academic Year 2018 – 19)

B. Tech. (Chemical Engineering) Revised Syllabus w. e. f. 2018-19
(Overall Structure and Revised Syllabus w. e. f. 2018-19)

Semester-I (First Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
BSL-101	Mathematics-I	03	01	04	-	-	4.0
BSC-102	Physics	03	01	04	03	1.5	5.5
BSC-103	Chemistry-I	03	01	04	03	1.5	5.5
HMC-101	Communication Skills	02	-	02	02	01	3.0
ESC-101	Engineering Graphics	01	-	01	04	02	3.0
NC-101	Induction Program	-	-	-	-	NC	NC
						Total Credit	**21**

Semester-II (First Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
BSL-104	Mathematics-II	03	01	04	-	-	4.0
BSL-105	Thermodynamic-I	03	01	04	-	-	4.0
ESL-102	Electrical & Electronics Engineering	03	01	04	-	-	4.0
ESC-103	Computer Lab (Programming for problem solving)	03	-	03	04	02	5.0
ESL-104	Material Science &Technology	03	-	03	-	-	3.0
5555	Environmental Studies	-	-		-	NC	NC
						Total Credit	**20**

Semester-III (Second Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
BSC-206	Chemistry-II	03	01	04	03	1.5	5.5
ESL-205	Engineering and Solid Mechanics	03	01	04	-	-	4.0
CHL-201	Thermodynamics-II	03	01	04	-	-	4.0
ESC-206	Engineering Workshop	01	-	01	04	02	3.0
CHC-202	Transport Phenomena	03	01	04	-	-	4.0
NC-202	Constitution of India	-	-	-	-	NC	NC
						Total Credit	**20.5**

Semester-IV (Second Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
CHC-203	Heat Transfer	03	01	04	03	1.5	5.5
CHC-204	Fluid Mechanics	03	01	04	03	1.5	5.5
HML-202	Industrial Management and Economics	03	-	03	-		3.0
CHL-205	Chemical Process Technology	03	-	03	-	-	3.0
CHL-206	Material and Energy Balances Computations	03	01	04	-	-	4.0
						Total Credit	**21**

Semester-V (Third Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
CHC-307	Particle & Fluid Particle Processing	03	-	03	03	1.5	4.5
CHC-308	Mass Transfer-I	03	01	04	03	1.5	5.5
CHC-309	Chemical Reaction Engineering-I	03	01	04	03	1.5	5.5
HML-309	Psycho-Social Dimensions of Industrial Management	03	-	03	-	-	03
Elective-I	Open Elective	03	-	03	-	-	03
CHL-310	Numerical Method in Chemical Engineering	02	-	02	02	01	03
NC-303	Essence of Indian Traditional Knowledge	-	-		-	NC	NC
						Total Credit	**24.5**

Semester-VI (Third Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
CHC-311	Chemical Reaction Engineering-II	03	01	04	03	1.5	5.5
CHL-312	Process Technology and Economics	03	-	03	-	-	3.0
CHC-313	Mass Transfer-II	03	01	04	03	1.5	5.5
Open Elective	Elective-II	03	-	03	-	-	3.0
Professional Elective Courses	Elective-III	03	-	03	-	-	3.0
						Total Credit	**20.0**

Semester-VII (Fourth Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
CHC-414	Modelling, Simulation and CAD	03	01	04	03	1.5	5.5
CHL-415	Instrumentation & Instrumental Analysis	03	-	03	-	-	3.0
Elective-IV	Professional Elective Course	03	-	03	-	-	3.0
CHC-416	Process Dynamics & Control	03	-	03	03	1.5	4.5
CHC-417	Process Equipment Design & Drawing	01	-	01	02	01	2.0
						Total Credit	**18**

Semester-VIII (Fourth Year)

Course Code	Course Title	Teaching Hours	Tutorial	Credits	Practical Hours	Credits	Total Credits
CHP-418	Industrial Training/Project	-	-	-	24	12	12
CHP-419	Technical Seminar & Colloquium	-	-	-	06	03	03
						Total Credit	**15**

(NC = Non-Credit Course)

Total Credits (21+20+20.5+21+24.5+20+18+15) = **160**

Course Title: Mathematics- I

Course Code: BSL-101

Theory: 03Hrs. + 01 Tutorial/Week **Credits: 4.0**

Course Prerequisite:

The background expected includes a prior knowledge of mathematics from H.S.C. (Science) and familiarity with various principles and theorems.

Course Objectives:

The necessity for the foundation of Engineering and Technology being Mathematics, the main objective is to provide sufficient practice in the mathematical methods presented and develop mathematical skill and enhance thinking and decision-making power of student.

Unit –I: Linear Algebra

Elementary transformations on a matrix; Rank of a matrix; normal forms; Consistency and solutions of systems of linear equations; orthogonal matrix; Eigen values and Eigen vectors; Cayley-Hamilton's theorem (without proof). (10)

Unit –II: Differential Calculus and Its Applications

Successive differentiation – standard results; Leibnitz's theorem; Expansions of functions: Maclaurin's theorem, Taylor's theorem; Application of Taylor's theorem. (10)

Unit –III: Partial Differentiation

Partial derivatives of first and higher orders; Homogeneous functions – Euler's Theorem; Total derivatives; Change of variables. (10)

Unit –IV: Applications of Partial differentiations

Jacobians - properties; Errors and approximations; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers for single constraints. (10)

Unit –V: Complex Numbers

Definition and geometrical representation; De-Moivre‟s theorem (without proof); Roots of complex numbers by using De-Moivre‟s theorem; Circular functions of complex variable –

definition; Hyperbolic functions; Relations between circular and hyperbolic functions; Real and imaginary parts of circular and hyperbolic functions; Logarithm of Complex numbers. (10)

Text/Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 10th Edition.
2. B S Grewal, "Higher Engineering Mathematics", Khanna Publication.
3. H K Das, "Advanced Engineering Mathematics", S. Chand & Company.
4. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2008.
5. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

Course Outcomes:

After completion of this course students will be able to:

a) Apply knowledge of mathematics in engineering and technology.

b) Identify, formulate and solve engineering problems.

c) Design Mathematical models for engineering problems and solve them.

d) Use partial derivative to find total derivative of implicit functions and to find Jacobians.

e) Find error and approximate values of problems related to engineering field.

Course Title: Physics

Course Code: BSC-102

Theory:-3 Hrs./week + 1Hr. **Practical:-3 Hrs. /week**

Total Credits (Theory + Practical):-5.5

Course Prerequisite:

This course is aimed at introducing the fundamentals of basic sciences to undergraduate students. The background expected includes a prior knowledge of physics and mathematics from H.SC. (science) and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principles of science(physics) and their applications in different areas.

Course Objective:

The objective of this course is to provide learner with basic concepts and knowledge of sciences (various principles, theories, laws etc.) and to analyze it from experiments. The learner can apply the same in Chemical Engineering and Technology.

UNIT I:

Laws of electrostatics, electric current and the continuity equation, laws of magnetism, Ampere's law, Faraday's laws. Maxwell's equations. polarization, permeability and dielectric constant, polar and nonpolar dielectrics, internal fields in a solid, Clausius-Mossotti equation, Millikan's oil drop experiment.

Magnetic materials: Magnetization, permeability and susceptibility, diamagnetic, paramagnetic, ferromagnetic, antiferromagnetic &ferromagnetic materials, Hysteresis, applications. (10)

UNIT II:

Interference: Conditions for interference of light, Interference in thin films, Newton's Rings experiment.

Diffraction: Fresnel & Fraunhofer diffraction, diffraction grating, Characteristics of diffraction grating and its applications.

Polarization: Introduction, polarisation by reflection, double refraction, scattering of light, circular and elliptical polarisation, optical activity, polariods, applications of polaroids. (10)

UNIT III:

Introduction to quantum physics, blackbody radiation, Stefan's law. Explanation using the photon concept, photoelectric effect, Einstein's equation, photo-multiplier tubes, solar cell-working, merits and demerits. Production and detection of ultrasonic waves, properties and application of ultrasonic waves. (10)

UNIT IV:

Semiconductors: energy band diagram for conductor, semiconductor and insulator, Fermi level & Fermi function. Position of Fermi level in semiconductors in intrinsic and extrinsic semiconductors. Effect of temperature on the Fermi level.

Superconductivity: principle of superconductivity, properties of superconductors, Type-I and Type-II superconductors, applications of superconductors. (10)

UNIT V:

X-Rays: Production & properties of X-Rays, characteristics and continuous X-rays, Moseley's law, engineering applications of X-rays.

LASER: Principle and working, spontaneous and stimulated emission, population inversion, types of LASER-solid state, semiconductor and gas, application of LASERS. (10)

Text/Reference Books:

1. Concepts of Modern Physics, S. L. Gupta and S. Gupta.
2. Concept of Modern Physics, AurtherBiser, EditionThree.
3. Engineering Physics, R. K. Gaur & S.L. Gupta.
4. Applied Science - II by S. J. Walzade& S. N.Narkhede
5. Physics for Scientist and Engineers-5th Edition, Paul Tipler, Gene Mose
6. Text book of Engineering Physics, M. N. Avadhanulu, P. G. Kshrisagar, S. Chand Publication
7. M. R. Srinivasan, "Physics for Engineers", New Age International Publishers.
8. "Optics", S. Chand Publication, N. Subrahmanyam, M.N.Avadhanulu.
9. "Engineering Physics", Sanjay Jain, Universities Press (India) Pvt Ltd.
10. "Semiconductor physics devices", Donald A. Neamen, MC Graw Hill Publication.

Course Outcomes:

After successful completion of this course the student will be familiar with

a) The concepts of Electromagnetism, basic laws related to magnetic and dielectric properties of material.
b) The concepts of Optics such as interference, diffraction and polarization
c) Some of the basic laws of quantum mechanics, Photoelectric effect
d) Basic concepts of Semiconductors, superconductors.
e) The X-rays, LASERS, Principles, production, properties and applications of X-rays and LASERS.

Physics Lab

Practical:-3 Hrs. / week **Credits: -1.5**

Course Prerequisite:

In this laboratory, course emphasis is on the understanding of basic principles, characteristic – properties of different instruments used in a field of optics, Heat and thermodynamics, Modern Physics and electronics. The learner here can use this knowledge and apply in various branches of engineering as required.

Course Objective:

The objective of the laboratory is to impart the fundamental knowledge of physics to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use of different equipment's, basic principles, properties etc. which they can apply in various disciplines of engineering during their studies and in future.

Practical's List:

1. Determination of Stefan's constant.
2. Newton's Rings for the determination of radius of planoconvex lens.
3. Determination of specific rotation of given solution using polarimeter.
4. Determination of wavelength of Laser light by using diffraction grating.
5. To study I-V Solar cell characteristics.
6. To study I-V Characteristics of Photo-cell.
7. Surface Tension by capillary rise method.
8. e/m by Magnetron method.
9. Determination of Planck's constant using photocell.
10. Determination of divergence of He-Ne Laser beam.
11. Determination of conductivity of the sample by four probe method.
12. Thermal conductivity by Lee's method.

Text/Reference Books:

1. N Avadhanulu, A. A. Dani, P M Pokley, "Experiments in Engineering Physics", S.Chand Publication.

2. S P Singh, "Advanced Practical Physics", Pragati Prakashan.

Course Outcomes: After successful completion of this lab student will be able to:

a) Use the latest techniques, skills, and modern tools necessary for engineering practices.

b) Design a component, system or process to meet desired needs with in realistic constraints.

c) Can be able to determine the values of constants such as Stefan's constant, Planck's constant specific charge *etc*.

Course Title: Chemistry-I

Course Code: BSC-103

Theory:-3 Hrs./week + 1Hr. Tutorial **Credit:4.0**

Total Credits (Theory + Practical):-5.5

Course Prerequisite:

The background expected includes a prior knowledge of chemistry, H.S.C. (Science) and familiarity with various laws, principles and theories.

Course Objectives:

This course provides basic knowledge of chemistry for undergraduate students of technology. It will develop their fundamentals to build own interface of applied chemistry concepts with industrial applicability in branch of chemical technology. This course will introduce to basic concepts of bonding, quantum chemistry, synthetic methodology, reagents in organic synthesis and influence of structure and its properties on bonding and chemical reactions.

UNIT-I: Quantum Theory

Introduction to quantum theory for chemical system: Postulates of quantum mechanics, Schrodinger equation, Application to hydrogen atom, Atomic orbitals (10)

UNIT-II: Chemical Bonding in Molecules

Coordination Chemistry, Magnetic properties and electronic spectra of complexes, bioinorganic-chemistry (haemoglobin, myoglobin, chlorophyll), organometallic chemistry.(10)

UNIT-III: Reactivity of organic molecules

Factors influencing acidity, basicity, and nucleophilicity of molecules, kinetics Vs thermodynamic control reaction. (10)

UNIT-IV: Selective name reactions

Aldol condensation, Perkin reactions, Michael addition, Mannich reaction, Reagans: $LiAlH_4$, $NaBH_4$, DCC, SeO2, crown ether. Rearrangement: Pinacol rearrangement, Beckman rearrangement, Favorskii rearrangement, Wolff rearrangement. (10)

UNIT-V: Strategies for synthesis of organic compounds

Reaction intermediates. Introduction to green chemistry, principles and concepts of green chemistry. Waste production, problem and prevention. Alternative reaction media, solvent-less reaction, Industrial uses of aqueous solvents. (10)

Text/Reference Books:

1) Molecular Quantum Mechanics, Fifth Edition, Peter W. Atkins and Ronald S. Friedman

2) Principles of Quantum Mechanics, Authors: Shankar, R.

3) Organic Chemistry, I L Finar, Vol-I and Vol-II

4) Organic Chemistry, Morrison and Boyd,

5) Organic Chemistry, S H Pine

6) Organic Reaction Mechanism, P S Kalsi

8) Organic Chemistry; Jonathan Clayden, Nick Greeves, Stuart Warren, OUP Oxford.

9) Organic Reaction Mechanisms; V. K. Ahluwalia, Rakesh Kumar Parashar; Edition 4;
Publisher: Alpha Science International, 2011.

10)Concise Inorganic Chemistry, 5th Ed; J. D. Lee; John Wiley & Sons

11)Green Chemistry 3rd Edition; Mike Lancaster; Royal Society of Chemistry

Course outcome:

Student will be able to

a) Appreciate quantum theory of chemical system.

b) Appreciate co-ordination chemistry

c) Write simple organic mechanism

d) summaries newer methods in organic synthesis

e) understand environmental friendly chemistry.

Chemistry –I Lab

Practical: 03Hrs./ Week **Credits: 1.5**

Course Objectives:

Course objective are practical applicability of theoretical concepts of basic organic chemistry and thermodynamics to its practical applications.

About 08-10 experiments to illustrate the concept learn in chemistry -I

Suitable number of experiments from following categories.

1) Identification of organic compounds through group detection, physical constant (MP/BP)

2) Synthesis of Organic compound involving reactions such as oxidation, esterification, nitration, sulphonation etc.

3) Measurements of kinetics of simple reactions.

Text/Reference Books:

1) Qualitative organic and inorganic analysis by Kulkarni and Pathak.
2) T.Y. Practical chemistry by A.M.Nemade, V.S.Zope.

Course outcome:

Student will able to

i) Identify the simple organic compound

ii) Identify reaction rate parameter,

iii) Perform and optimize the reaction conditions.

Course Title: Communication Skills

Course Code: HMC-101

Theory: 02Hrs. /Week **Credits:2.0**

Course Objectives:

To achieve the following objectives through this course:

a) To make the student industry ready in terms of his/her ability to communicate effectively

b) To augment the ability of the student to create, compose and render presentations with or without the help of media

c) To understand the importance of public speech and the role language plays in that.

d) To enhance the ability of written communication by giving a primer on English

UNIT I: **Communication Skills:** Introduction to major grammatical models. Phonological and syntactical structure of present-day English. Language of science and technology. Aspects of style. Vocabulary building, spelling patterns, some common errors, Reading and Comprehension Organizing principles of paragraphs in documents (05)

UNIT II: Communication Effectiveness: Importance of proper punctuation Formal and informal communication. The art of listening. Listening Comprehension, Strategies for effective communication, Social perception communication, written communication. Writing introduction and conclusion. Managerial report writing. Graphical representation of technical data, Technical presentations design and delivery. Resume Writing, Business etiquettes, social grace.

(05)

UNIT III: Personality Development: Concept of Soft Skills, Problem solving, decision making, Positive Attitude and mindset, Communication at Work place, Analytical Skills, Basic Writing Skills, Desire to learn and to be trained, coping with stress, Précis Writing Essay Writing, Multitask ability, Time Management, Model of success and failure in adjustment.

(05)

UNIT IV: Interpersonal skills and rapport: Work Ethics, Personal Integrity &commitment, Flexibility, Team work and spirit, Group process, Group task performance, Adaptation development processes, Cultural influences on personality and social behaviour. Managing Ability, Aggression and its management. (05)

UNIT V: Problem solving co-operation and competition, Motivational Skills:

Personality and social phenomenon. Negotiation Skills, Networking with industries and institutions. Approaches to the study of personality. Models of healthy & mature personality; Describing oneself and SWOT analysis, Emotional Intelligence. (05)

Course Outcomes: Upon successful completion of this course the student will be able to:

a) Understand the importance of communicating effectively

b) Communicate effectively by removing barriers

c) Address an audience effectively and deliver speeches without inhibition

d) Create and deliver effective e-presentations

e) Understand the meaning and utility of Active Listening in communication

f) Use the vocabulary more effectively

g) Expand and enrich grammatical structure and vocabulary in English

h) Comprehend thoughts through body language and use it as a tool to understand non-verbal.

Communication Skills

Practical: 02Hrs. /Week **Credits: 1.0**

Practical's List:

1) Pronunciation & Spelling

2) Stress and Intonation

3) Errors in Spoken English

4) Business Letter (Layout)

5) Job application with Resume preparation

6) Newspaper Reading

Text/Reference Books:

1. English Pronouncing Dictionary, Cambridge University Press, India, 2012.

2. A Textbook of English Phonetics for Indian Students by T. Balasubramanian, Macmillan Publisher,

Course Title: Engineering Graphics

Course Code: ESC-102

Theory: 01 Hrs./Week **Credits: 1.0**

Course Prerequisite:

Engineering Graphics is the language of engineers. The concepts of Engineering Graphics are used to develop, express the ideas, and convey the instructions which are used to carry out jobs in the field Engineering. The course illustrates the techniques of graphics in actual practice. This preliminary course aims at building a foundation for the further course in drawing and other allied subjects. This subject is useful in developing drafting and sketching skills of students.

Course Objective:

The student after studying this subject will be able to:-

1. Draw different engineering curves and know their applications.
2. Draw orthographic projections of different objects.
3. Visualize three dimensional objects and draw Isometric Projections.
4. Understand the basic concepts of projection of different entities.
5. Visualize and draw views of objects in various positions.
6. Develop lateral surfaces of different solids

Course Contents:

Unit - I: Introduction to Engineering Graphics

Principles of Engineering Graphics and their significance, usage of Drawing Instruments and Supporting Material, Letters and Numbers as per BIS: SP46-2003, Scale (Plane, diagonal & Vernier scale) .

Curves and Conic Section draw ellipse by directrix and arc of circle method. draw parabola by directrix and rectangle method. Draw hyperbola by rectangle and directrix method. Cycloid, Epicycloid, Hypocycloid and Involute. (04)

Unit – II: Orthographic Projections

Orthographic Projection: Types of lines, Methods of dimensioning, first angle method of projection and third angle method of projection. Principle of Orthographic Projections, Projections of Points, Projection of Line, Lines inclined to both the Planes.

Projection of different simple shapes e.g. Circle, Triangle, Rectangle, Pentagon and Hexagon on principle plane (Inclined to one plane and to both planes). Conversion of pictorial view into sectional orthographic views. (04)

Unit – III: Projection of Solids

Introduction to solids, prism, cone, cylinder, pyramid, cube, tetrahedron. Projection of above solids with axis inclined to one plane and both planes. (04)

Unit – IV: Section of Solids

Introduction, section planes, true shapes of section, section plane parallel to VP, section plane parallel to HP, section plane perpendicular to HP and section plane inclined to VP, section plane inclined to HP. Section of prism, section of pyramid, section of cone, section of cylinder. (04)

Unit – V: Isometric Projection

Introduction to pictorial views, Isometric axes, lines and plane, true scale and Isometric scale. Isometric projection and Isometric View Conversion of given orthographic view into isometric projection. (04)

Engineering Graphics Lab

Practical: 04 Hrs/Week **Credits: 2.0**

Course Contents:

1. One drawing sheet on Lettering & Numbering
2. One drawing sheet on Engineering curves: Three different curves are to be draw using any one method
3. One drawing sheet on Projection of lines and Planes: Two problems on projection of lines and two problems on projection of planes
4. One drawing sheet on Projection of Solids: Two problems on two different solids
5. One drawing sheet on Section of Solids: Two problems on two different solids
6. One drawing sheet on Isometric Projections: Isometric views of two objects

Text/Reference Books:

1. Engineering Drawing: N.D. Bhatt, V. M. Panchal, by Charotar Publication
2. Engineering Drawing: M. L. Dobhade (Vol I + II), by Vision Publications
3. Engineering Drawing: P. S. Gill, by S. K. Kataria Publications
4. Engineering Drawing: Mali and Chaudhari
5. Engineering Drawing: H. G. Phakatkar, By NiraliPrakashan
6. Engineering Drawing: Venugopal and Prabhu Raja V

Course Outcomes:

Upon successful completion of this course the student will be able to:

a) Use various drawing instruments to layout and draw a sheet.

b) Explain several types of lines used, Lettering, Numbering and Dimensioning and Scales.

c) Draw and explain Planes of projection, quadrants and first angle & third angle method of projection. To draw front view, Top View and side View of Simple objects.

d) Illustrate Principles of Isometric projection and Isometric view.

e) Explain energy management strategy and energy audit.

f) Illustrate with principle various conventional energy producing devices and energy absorbing devices.

g) Illustrate with principle various power transmission elements, drives, direction and flow control valves.

University Institute of Chemical Technology
North Maharashtra University, Jalgaon

Induction programme for First Year B. Tech students

Slot/Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
I 7.00-8.00	Physical Exercise/Yoga /meditation																				
Breakfast																					
II 9.30-11.25	Registration	English test	Sunday	Universal Human Values						Sunday	Universal Human Values						Sunday	Universal Human Values		PPT Presentation	Interaction
III 11.30-1.25		Dept Visit		Creative Arts and Activities							Creative Arts and Activities							Creative Arts			Exam
1.30-2.25 Lunch																					
IV 2.30-3.55	Directors Address	Orientation	Familiarization with University/Institute/Dept				Lecture by Eminent person	literary	Social Visit	Sunday	Lecture by Eminent person	literary	Inspirational Movie	literary	Tree Plantation	Social visit	Sunday	Lecture by Eminent person	Water Conservation	PPT Presentation	Feedback
V 4.00-5.00	Interaction with parents	Mentor mentee groups	Personality Development		Swaccha Bharat		Gardening				Interactions							Gardening			Valedictory
VI 5.00-6.00	Games/English classes																				
VII 8.30-9.30	Informal Interactions in Hostel																				

Programme Coordinator

Semester-II

Course Title: Mathematics- II

Course Code: BSL-104

Theory: 03Hrs. + 01 Tutorial/ Week **Credits: 4.0**

Course Prerequisite:

Mathematics H.S.C. and BSL-101 (Mathematics-I) course of F. Y. B. Tech. (Semester-I).

Course Objectives:

To make aware students about the importance and symbiosis between Mathematics and Engineering. To develop the ability of mathematical modelling of systems using differential equations and ability to solve the differential equations.

Unit –I: Linear Differential Equations of n^{th} Order with Constant Coefficient

Solution of LDE of order n with constant coefficients, Method of variation of parameters (only second order), Cauchy's linear equation and Legendre's linear equation. (10)

Unit –II: Applications of Linear Differential Equations and Partial Differential equations

Applications of linear differential equations to Chemical Engineering, Applications of Partial Differential equations to one dimensional heat flow equation and two-dimensional heat flow equation. (10)

Unit –III: Laplace Transform

Definition and existence of Laplace transforms, Theorems and Properties of Laplace Transform (without proof), Laplace Transform of some special functions, Inverse Laplace Transform, Convolution Theorem, Solution of linear differential equations using Laplace Transform. (10)

Unit –IV: Multiple Integrals and Their Applications

Double integrals and their evaluation; Change of order for integration; Double integrals in polar coordinates; Triple integrals; Application of multiple integrals to find area, volume, surface area. (10)

Unit –V: Complex Variable

Analytic function, Harmonic function, Cauchy Riemann equations, Cauchy integral formula, Cauchy integral theorem, Residue theorem and Bilinear transformation. (10)

Text/Reference Books:

1. Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley Eastern Ltd, 10th Edition.
2. B S Grewal, “Higher Engineering Mathematics”, Khanna Publication.
3. H K Das, “Advanced Engineering Mathematics”, S. Chand & Company.
4. N.P. Bali and M. Goyal, “A text book of Engineering Mathematics”, Laxmi Publications, 2008.
5. T. Veerarajan, “Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.
6. S. C. Gupta, “Fundamental of Statistics”, Publisher: Himalaya Publishing House Pvt. Ltd.; Seventh Edition (2016).

Course Outcomes:

After completion of this course students will be able to:

a) To apply knowledge of mathematics in engineering and technology.
b) Draw the rough sketch of Cartesian and polar curves.
c) To use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
d) To use the knowledge of multiple integrals in finding the area and volume of any region bounded by the given curves.
e) Evaluate multiple integrals using spherical polar and cylindrical polar coordinates.
f) Able to understand analytic function of a complex variable. Able to apply Cauchy Integral theorem and Cauchy residue theorem to solve contour integrations.

Course Title: Thermodynamic-I

Course Code: BSL-105

Theory: 03Hrs. + 01 Tutorial/ Week **Credits: 4.0**

Course Prerequisite:

The background expected includes a prior knowledge of physical chemistry, H.S.C. (Science) and familiarity with various basic laws, principles and theories.

Objectives:

Course objective are practical applicability of theoretical concepts of basic organic chemistry and thermodynamics to its practical applications.

UNIT-I: Introduction to Thermodynamics

Scope of thermodynamics, systems and process, homogeneous and heterogeneous system, closed and open systems, state functions, equilibrium, reversible process, irreversible process. (10)

UNIT-II : First law of thermodynamics and gas laws

work, energy, first law of thermodynamics, internal energy, Gas law: Boyl's law, Charls law, Avogadro's law, ideal gas equation, van der waals constant.

(10)

UNIT-III: Second law of thermodynamics

Heat engine, Carnot theorem. Heat effect: latent heat, sensible heat, standard heat of formation, reaction and combustion. Entropy, Enthalpy, Second law of thermodynamics. (10)

UNIT-IV: Some applications of the laws of Thermodynamics

Flow processes, continuity equation, energy balance, flow in pipes, flow through nozzles, ejectors, throttling process, compressors. (10)

UNIT-V: Refrigeration

Coefficient of performance, refrigerator capacity, Vapour- compression cycle, Absorption refrigeration, heat pump, Liquefaction processes. (10)

Text/Reference Books:

1) J M Smith, H C Van Ness and M M Abbott, Introduction to Chemical Engineering Thermodynamics, 7th edition, McGraw- Hill International Edition, 2005.

2) M J Moran, H N Shapiro, D D Borttner and M B Bailey, Principal of Engineering Thermodynamics, 8th Edition, Willey.

3) K.V. Narayanan, A textbook of chemical engineering thermodynamics, PHI, Delhi,2001.

Course outcome: Student will be able to

a) Appreciate the thermodynamic aspects

b) Apply mass and energy balances

c) Study basic laws of gases

d) Solve the problems involving the liquefaction, refrigeration and different power cycles.

Course Title: Electrical & Electronics Engineering

Course Code: ESL-102

Theory: 03Hrs. + 01 Tutorial/ Week **Credits: 4.0**

Course Prerequisite: The course provides basic knowledge of electrical engineering. Course explores the knowledge of electrical, magnetic circuit and AC circuit. Course also provides the basic working operation of different electrical machine along with their characteristics and applications. It also provides ideas of electrical installation and different switches. Higher standards of safety and precautions are important in any industry Chemical industries therefore electrical safety and safety measures also incorporated in the course. Energy calculation and optical use of electrical energy are important in view of entrepreneur, electric tariff also included in the syllabus.

Course Objectives:

1. Students will able to understand the basic concept of electric power, energy in the field of chemical engineering and technology.
2. Students will able to understand the characteristic of motor for suitability of different applications in chemical engineering and technology.
3. Students will able to control and use electrical appliances in chemical engineering and technology.
4. Students will able to calculate power and energy for efficient, economical process of plants.
5. Students will able to apply good electrical safety precaution even in temporary works.

Unit-I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, open and short circuit in series and parallel circuit, effect of temperature on resistance. Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Loop analysis, Superposition and Thevenin Theorems. Magnetic circuit**:** Concept of magnetic circuit, MMf, Flux and reluctance. Magnet circuit, composite magnetic circuit, Comparison of magnetic and electric circuit, B-H curve, hysteresis and eddy current loss. (10)

Unit-II: AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, 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 in three phase circuit, Measurement of power in three phase circuit. (10)

Unit-III: Transformers

Magnetic materials, ideal and practical single-phase transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. (10)

Unit-IV: Electrical Machines

DC Motor: Construction of DC motor, working operation, back emf, need of starter, classification of DC motors, torque, speed, characteristic of DC motor, speed control and applications.

AC Motor; Construction, working operation of three phase induction motor, Torque slip characteristic of induction motor, loss components and efficiency, Slip ring induction motor and applications. Classification and application of single phase motors (10)

Unit-V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, small and medium industrial electric tariff, power factor improvement and battery backup. Electrical safety precaution and measures in chemical industry. (10)

Text / Reference Books:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.
6. B L Theraja, “ Electrical Technology Vol-I and II”, S Chand Publication
7. V N Mittal, “Basic Electrical Engineerin”

Course Outcome: Upon completion of course, students will able to

a) Apply basic knowledge of science and mathematics for understanding basic electrical engineering problems.
b) Understand the working principles of different motors and their applications in chemical engineering and technology.
c) Understand power consumption, energy cost in view of efficient use of electrical energy.
d) Select correct rating of fuse and MCBfor protection scheme and safety.
e) Use modern electrical machines tools in the field of chemical engineering and technology with higher safety standard.

Course Title: Computer Lab (Programming for problem solving)

Course Code: ESC-103

Theory: 03Hrs./ Week **Credits: 3.0**

Course Prerequisite: This course provides students with a comprehensive study of the C programming language. Introduction to program design and problem solving using the C programming language. Programming topics include control structures, functions, arrays, pointers, and file I/O.

Course Objectives: To impart knowledge so that the student will:

1. Learn the fundamentals, structure and syntax of C Language.
2. Write simple programs in C Language.

UNIT-I:

What is C ?, The C Character set, Constant, Variables & Keywords, Types of C Constants, Rules for constructing Integer Constants, Rules for constructing Real Constants, Rules for constructing Character Constants, Types of C Variables, Rules for constructing Variable Names, C keywords, Comments in a C Program, Types of instructions, Type Declaration instruction, Arithmetic instruction, Integer and Float Conversion, Type Conversion in Assignments, Hierarchy of Operations, Associativity of Operations, Control instructions, Data Types Revisited: Integers, long & short, signed & unsigned, Chars, signed & unsigned, Float & Doubles, Console Input/Output: Types of I/O, Console I/O Function, Formatted Console I/O Functions, Unformatted Console I/O Functions, Decision Control Instruction: The if statement, Multiple Statements within if, The if-else statement, Nested if-else, Use of Logical Operators, The else if Clause, The !Operator.(08)

UNIT-II:

Loop Control Instruction: Loops, the while Loop, Tips & Traps, More Operators, The for Loop, Nesting of Loops, Multiple Initializations in the for Loop, The break Statement, The continue Statement, The do-while Loop, The Odd Loop, Case Control Instruction: Decisions using switch, The Tips & Traps, switch versus if-else Ladder, The goto Keyword. (08)

UNIT-III:

Functions: What is a Function? Why use Functions? Passing Values between Functions, Scope Rule of Functions, Order of Passing Arguments, Using Library Functions, Pointers: Call by Value and Call by Reference, An Introduction to Pointers, Pointer Notation, Back to Function Calls, Recursion Function. (08)

UNIT-IV:

Arrays: What are Arrays? A Simple Program using Array, More on Arrays, Array Initialization, Array Elements in Memory, Bounds Checking, Passing Array Elements to a Function, Pointers and Arrays, Passing an Entire Array to a Function, The Real Thing, Multidimensional Array: Two Dimensional Arrays, initializing a Two-Dimensional Array, Memory Map of a Two-Dimensional Array, Pointers and Two Dimensional Arrays, Pointer to an Array, Passing 2-D Array to a Function, Array of Pointers. (08)

UNIT-V:

Strings: What are Strings? More about Strings, Pointers and Strings, Standard Library String Functions, Handling Multiple Strings: Two-Dimensional Array of Characters, Array of Pointers to strings, Limitations of Array of Pointers to Strings, Structures: Why use Structures? Declaring a Structure, Accessing Structure Elements, How Structure Elements are Stored? Array of Structure. (08)

Course Outcomes: Upon completing this course, the student will be able to:

a) Understand the fundamentals of C programming.
b) Choose the loops and decision-making statements to solve the problem.
c) Use functions to solve the given problem.
d) Implement different Operations on arrays.
e) Understand strings and structures.
f) Understand the usage of pointers.

Computer Lab

Theory: 04Hrs./ Week **Credits: 2.0**

Course description: This course provides students with a comprehensive study of the C programming language. Introduction to program design and problem solving using the C programming language. Programming topics include control structures, functions, arrays, pointers, and file I/O.

Course Objectives: To impart knowledge so that the student will:

1. Learn the fundamentals, structure and syntax of C Language.
2. Write simple programs in C Language.

Course Content:

1. Write a C program to find area of circle, triangle, rectangle, square using switch statement.
2. Write a C program to find the sum of a series (looping).
3. Write a C program to accept a string and reverse it without using library functions. Display the original and reversed string. (String handling).
4. Write a C program that uses functions to perform the following string operations using function and pointers:
    i) To insert a sub-string in to given main string from a given position.
    ii) To delete n Characters from a given position in each string.
5. Write a C program to read 'N' elements into an array and compute the sum of all the elements stored in an array using pointer. (Arrays and pointers).
6. Write a C program to read a matrix of order (M *N) and (P * Q) and compute the addition and multiplication of two matrices. (Passing matrix to functions).
7. Write a C program to read 'N' students information and display the information with appropriate headings, where each student information consists of roll number, Name, total marks scored etc. (Structure handling).
8. Write a C program to find Factorial using Recursion.
9. Write a C program for Root Finding using Numerical Methods.
10. Write a C program to solve Linear Equations.

Text /Reference Books:

1. "Programming in ANSIC C" by E Balagurusamy, Tata McGraw Hill, 4/E, 2007
2. "Mastering C" by K. R. Venugopal and S. R. Prasad, Tata McGraw Hill, 2011
3. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie, PHI
4. "C How to Program" by Paul Deitel and Harvey Deitel, 8th Edition, Pearson
5. "Let Us C" by Yashavant Kanetkar, 14th Edition, BPB Publication.
6. "Test Your C Skills" By Yashavant Kanetkar, 5th Edition, BPB Publication.

Course Outcomes: Upon completing this course, the student will be able to:

a) Understand the fundamentals of C programming.
b) Choose the loops and decision-making statements to solve the problem.
c) Use functions to solve the given problem.
d) Implement different Operations on arrays.
e) Understand strings and structures.
f) Understand the usage of pointers.

Course Title: Material Science &Technology

Course Code: ESL-104

Theory: 03Hrs./ Week **Credits: 3.0**

Course Prerequisite:

The goals of the course are to understand the basic principles of Material science and their applications in different areas. The background expected includes a prior knowledge of physics and Chemistry from H.S.C. (Science) and familiarity with various laws, principles and theories.

Course Objectives:

The objective of this course will provide the students basic introduction to different concepts of Materials, different classes of materials relevant to Chemical Engineering. The intent of the course will be to relate the underlying molecular structure of the materials to their physical and chemical properties, and their processing and performance characteristics.

UNIT – I

Classification of solids (Amorphous, crystalline, polycrystalline), Space lattice, Bravais Lattices. Miller Indices, inter planar distances, Co-ordination number, Packing fractions. Imperfections in solids: point defects (stoichiometric defects and no stoichiometric defects), line imerfections, surface imperfections, volume imperfection. (08)

UNIT – II

Introduction to materials, bonding between atoms: metallic bonding, ionic bonding, covalent bonding, vander waals bond, hydrogen bond. Mechanical properties of solids such as plastic deformation, Mechanism of plastic deformation-slip, twinning, modulus of elasticity, tensile strength, ductility, toughness, elongation, plastic deformation, Schmid's law. Creep, requirement for creep resistance material, fracture, fatigue. (08)

UNIT – III

Classification of engineering materials (Metals, Polymers, Ceramics, Composites, Nanomaterials and Biomaterials). Polymers: classification of polymers, mechanism of polymerization, crystallization of polymers. Ceramics and glasses- properties of ceramics, Types of ceramics, electrical properties of ceramics, glasses, cermets. Nanomaterials-Introduction to nonmaterials, properties. Fabrication process-top down and bottom up approach.

Composite materials-dispersion reinforced composites, laminated composites, fiber reinforced composites, loading under isostrain and isostress condition. Biomaterials. (08)

UNIT – IV

Corrosion: Electrochemical principles, mechanisms, Formation and Growth of film, Growth Laws, polarization. Types of corrosion, prevention and control. Protective coatings, Application of inhibitors. Role of materials selection in design, structure-property–processing-performance relationships. (08)

UNIT – V

Material characterization techniques, X-Ray Diffraction, Braggs X-ray spectrometer, Debye Scherrer Camera. Principles of Raman Spectroscopy. Particle size analyzers. (08)

Text/Reference Books:

1. Material Science and Engineering Metallurgy: V. D. Kodgire.
2. Material Science: G.B.S. Narang.
3. Material Science: O P Khanna.
4. Engineering Metallurgy and Material Science: S.P. Nayak.
5. Material Science: Raghavan.
6. Material Science: Hazra Chaudhari.
7. Principles of Material Science and Engineering: William F. Smith
8. Material Science-Tata MC-Graw Hill Publication, V. Rajendran, R. A. Maricani.
9. Material Science and Engineering an Introduction, William D. Callister, David G. Rethwisch. WILEY Publications.
10. Instrumental Methods of Chemical Analysis, Gurdeep R. Chatwal, Sham K Anand.
11. Nanotechnology: Principles and Practices: S. K. Kulkarni.

Course Outcomes: After successful completion of this course the student will be able to:

a) To acquaint students with the basic concepts and properties of Materials and their use in Engineering applications.

b) To develop futuristic insight into Materials and introduction to some characterization techniques.