Semester-2	Code	Course Name	L	T	P	Credits
	BSC-121	Engineering Mathematics – II	3	1	0	4
	BSC-122	Chemistry	3	1	2	5
	HSMC-121	Professional Communication	3	0	2	4
	ESC-121	Basic Electrical & Electronics Engineering	3	1	2	5
	ESC-122	Workshop Practices	0	0	4	2
	MC-121	Constitution of India	3	0	0	0
						20

Engineering Mathematics II

BSC-121	Engineering Mathematics – II	3	1	0	4

Basic Sciences (BS); 4 Credits (3-1-0)

Objective: To provide knowledge of basic understanding of differential calculus and vector calculus. The aim is to cover the fundamental concepts such as Green's theorem, Gauss theorem, and Stokes theorem. On the other hand Students will have exposer of numerical analysis in which they will learn numerical methods of solving of transcendental and polynomial equations.

Course outline

Unit	Contents	Contact Hrs.
I	Limits and continuity, Indeterminate form (L'hopitals rule etc.), convergence and divergence of Sequences and series.	8
II	Differentiability, successive differentiation, Leibnitz formula, Taylor series and McLauren series. Mean Value Theorem (MVT), Rolle's theorem, Cauchy theorem and their applications,maxima-minima.	9
III	Iterative integration, beta and gamma function, and Improper Integral, multiple integration, change of order, polar coordinate system, cylindrical coordinate system, spherical coordinate system, solid of revolution, surface area, arc length, volume etc.	11
IV	Curl and divergence of a vector field, gradient of a scalar field.Laplacian operator, Gauss divergence theorem, Green's Theorem, Stoke's Theorem	8
V	Zeros of transcendental and polynomial equations using bisection method, regula-falsi method, Newton –Raphson method, rate of convergence of these methods, Solution of system of linear equations, Guass-Seidal method, crout method, numerical differentiation, numerical integration, Trapezoidal rule, Simpson's one third and three-eight rule, solution of ordinary differential equations by Euler's, Picard's and forth-order Runge-kutta method	12
	Total	**48**

Texts Books:

1. Advanced Engineering Mathematic By D. G. Zill and W. S. Wright.
2. Mathematical Analysis.By S.C. Malik and SavitaArora.

Reference Books:

1. Higher Engineering mathematics By B.S. Grewal.
2. Advanced Engineering mathematics by Erwin. Kreyszig.
3. Calculus and Analytic Geometry By George B. Thomas, Jr. Ross L. Finney

Applied Chemistry

BSC-122	Chemistry	3	1	2	5

Basic Sciences (BS); 4 Credits (3-0-2)

Objective: The Subject will provide information on structure of atoms, chemical bonds, basic organic chemistry, chemical thermodynamics, chemical kinetics, polymer and electrochemistry

S. No.	Topic	Contact Hrs.
Unit 1	Atomic orbitals, hybridization, orbital representation of methane, ethane, ethene, ethyne and benzene; polarity of bonds – inductive, resonance and steric effects and their influence on acidity and basicity of organic compounds. Heterolytic and homolytic cleavage, nucleophiles, electrophiles and free-radicals; substitution, addition and elimination reactions; mechanism of chlorination of methane, SN1 and SN2 mechanisms. E1 and E2 mechanisms, Elimination versus substitution reactions, Addition reactions (electrophilic and free radical), Hydration. Hydrocarbons.	10
Unit 2	Idea of de Broglie matter waves. Heisenberg uncertainty principle. Quantum numbers. Aufbau and Paulis exclusion principles. Hund's multiplicity rule. Atomic orbitals and hybridizations, Electronic configuration of elements, Schrödinger wave equation, significance of wave functions.	8
Unit 3	Types of ionic solids, radius ratio effect and coordination number, limitations of radius ratio, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions such as NH_3, H_3O^+, SF_4, ClF_3 ICl_2^-, and H_2O by valence shell electron pair repulsion (VSEPR) theory, linear combination of atomic orbitals (LCAO), bonding, nonbonding and antibonding molecular orbitals. Molecular orbital (MO) theory of covalent bond.	8
Unit 4	Thermodynamics of chemical reactions, Introduction, Definitions and assumption, 1st law of thermodynamics, Heat capacities, Energy changes during a chemical reaction, Entropy and the 2nd	12

	law of thermodynamics, Gibbs free energy, Ideal Mixtures, Chemical potential, Equilibrium constants. Order and molecularity of a chemical reaction, basic kinetic laws of first and second order reactions, Determination of order of reactions, effect of temperature on reaction rates (Arrheninus equation), collision theory of rates of bimolecular reactions.Parallel and consecutive reactions.	
Unit 5	Sols (reversible and irreversible), gel, suspension, colloids, true solution, phases of colloidal solution, surfactants and their classification, emulsions and emulsifiers, association colloids (micelles), parameters governing the formation of surfactant aggregates. Properties of colloidal solution. Introduction and classification of polymers, Types of Plastics - thermoplastic & thermosetting resins, Types of polymerization: addition or chain polymerization, condensation polymerization, coordination polymerization, ionic polymerization, step polymerization and their mechanism. Application of engineering polymers in daily life. Electrochemical series, Nernst's equation for electrode potential and cell EMFF, varieties of cell-concentration and chemical cells, liquid junction potential, thermodynamic functions from cell EMF measurements Acid-base titrations, redox titrations, redox indicators, over voltage	**10**
	Total	**48**

Text Books:
1. "A New Concise Inorganic Chemistry", J. D. Lee, 5th Edition (1996), Chapman & Hall, London.
2. "Principles of Physical Chemistry", B. R. Puri, L. R. Sharma, and M. S. Pathania, 37th Edition (1998), ShobanLalNagin Chand & Co., Jalandhar.
3. "Organic Chemistry", R. T. Morrison and R. N. Boyd, 6th Edition (1992), Prentice-Hall of India (P) Ltd., New Delhi.

Applied Chemistry Lab
List of Experiments

1. Determination of alkalinity in the given water sample.

2. Determination of temporary and permanent hardness in water sample usind EDTA as standard solution.

3. Determination of available chlorine in bleaching powder.

4. Determination of chloride content in water sample.

5. Determination of iron content in the given water sample by Mohr's method.

6. pH- metric titration.

7. Viscosity of an addition polymer like polyester by viscometer.

8. Determination of iron concentration in sample of water by calorimetric method. The method involves the use of KCN as a colour developing agent and the measurements are carried out at λmax 480nm.

9. Element detection and functional group identification in organic compounds.

10. Preparation of Bakelite and Urea formaldehyde resin.

HSMC-121	Professional Communication	3	0	2	4

Professional Communication I
Humanities and Social Sciences (HU); 4 Credits (2-1-2)

Objective:
To train students to acquire language skills this will enable them;
1. To acquire effective and appropriate communication skills
2. To understand and acquire the interdependent skills of reading and communication; and
3. To appreciate literature and develop an understanding of how it may contribute to personal growth and advancement

Course outline

S. No.	Topic	Contact Hrs.
Unit 1	**What is Language?** Definition - Components of Language - The Sounds of Language - Units of Meaning - Word Order and Sentence Structure - Meaning in Language – Learning English and Second Language Acquisition (SLA)	**06**
Unit 2	**Lend me your Ear*** Why to listen? – How to listen? – What to listen? - Importance of Active Listening – Constraints on listening in SLA	**08**
Unit 3	**The Talking Ape*** Importance of imitation – Internal monologue to global communication – Power-point presentation skills - Quantity versus quality	**08**
Unit 4	**Step-by-step to Grammar** The sentence – Tenses – Punctuation - Reported speech – Voices	**08**
Unit 5	**Read & write your way up** Reading for Comprehension – Dictionary work – Difference between speech and writing – structure your thoughts- Opening and the end game	**10**
Unit 6	**Belles Lettres (Part one)** Literature and language relationship – Social function of literature – Role of good literature in enriching one's language	**08**
	Total	**48**

ESC-121	Basic Electrical & Electronics Engineering	3	1	2	5

Basic Electronics & Electrical Engineering

Basic Engineering and Sciences (BES); 3 Credits (2-1-0)

Objective: Basic idea of the Subject will be to introduce the basic concepts required to understand the electronic devices, circuits and measuring instruments

S. No.	Topic	Contact Hrs.
Unit 1	**Semiconductor Diode** Introduction, Transport phenomena in semiconductor, Formation of P-N Junction, Forward bias and reverse bias in P-N junction diode, V-I characteristics and its temperature effect, Ideal diode, diode equation, diode resistance, and its capacitance.	08
Unit 2	**Rectifier and Filters** Rectifying circuits and DC power Supplies: Load line analysis of diode circuit, Half wave rectifier, Full wave rectifier, Voltage regulation, Ripple factor, ratio of rectification, bridge rectifier. Filter circuits for power supply: Induction filter, capacitance filter, LC filter, multiple LC filter, CLC or π Filter. zener diode: Break down mechanism, voltage regulation circuit using zener diode..	08
Unit 3	**BJT & MOSFETs** Transistor: Introduction, construction, types npn and pnp, current components, Transistor as an amplifier, Transistor Characteristics, Transistor Circuit Configuration: Common Base(CB) configuration, Common Emitter (CE), Common Collector Configuration, Early Effect, Ebers-Moll Model, Maximum Voltage Ratings. Field Effect Transistor-Introduction, Construction, Operation, V-I characteristics,	08
Unit 4	**D. C. Networks:** Kirchoof's laws, Node voltage and Mesh current methods, Delta – Star and Star Delta conversion; classification of Network Elements, Superposition principle, Thevenin's and Norton's theorems. Only independent source. **Magnetic Circuits:** B-H curve, solution of magnetic circuits; Hysteresis and Eddy current losses. Difference between elect/magnetic circuits.	10
Unit 5	**Transformers:** Construction, EMF equation, rating, phasor diagram on no load and full load, equivalent circuit, regulation, Losses, efficiency. All day	10

	efficiency calculation, open and short circuit tests. **DC Machines:** Construction, EMF and torque equations, classification and application and characteristics of DC motors.	
	Total	**44**

Text Book:
1. Electronic Devices and Circuit Theory, Boylestad&Nashelsky. 8th Ed. PHI.
2. Integrated Electronics: Analog& Digital Circuit Systems, Jacob Millman&Halkias, TMH.
3. Basic Electrical Engineering by V.N. Mittle, TMH Edition

Reference Books:
1. Electronics Devices and Circuits, Devid A. Bell, 5th Edition, OXFORD University Press 2008
2. Electronics Devices and Circuits, Jacob Millman/ Christos C. Halkias/ SatyabrataJit, 3rd Edition, TMH 2008
3. Basic Electrical Engineering by I. J. Nagrath, (T.M.H.)
4. Electrical Technology by Edward Hughes, ELBS 10th Edition, 2010

Engineering Workshop

ESC-122	**Workshop Practices**	**0**	**0**	**4**	**2**

Basic Engineering and Sciences (BES); 1 Credits (0-0-2)

Objective: To provide basic practical knowledge of different shops of engineering workshop.

S. No.	Topic	Practical Hrs.
Unit 1	**Carpentry Shop:** 1. Study of tools & operations and carpentry joints 2. Simple exercise using jack plane 3. To prepare half-lap corner joint, mortise &tennon joints	**04**
Unit 2	**Fitting (Bench Working) Shop:** 1. Study of tools & operations 2. Simple exercises involving fitting work 3. Make perfect male-female joint 4. Simple exercises involving drilling/tapping/dieing	**04**
Unit 3	**Black Smithy Shop:** 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering& swaging	**04**
Unit 4	**Welding Shop:** **1.** Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints 3. Oxy-acetylene flame cutting	**04**

Unit 5	**Sheet-metal Shop:** 1. Study of tools & operations 2. Making Funnel complete with 'soldering' 3. Fabrication of tool-box, tray, electric panel box etc.	**04**
Unit 6	**Machine Shop:** 1. Study of Single point cutting tool, machine tools and operations 2. Plane turning 3. Step turning 4. Taper turning 5. Threading	**04**
Unit 7	**Foundry Shop:** 1. Study of tools & operations 2. Pattern making 3. Mould making with the use of a core 4. Casting	**04**
	Total	**28**

MC-121	Constitution of India	3	0	0	0