J.C. Bose University of Science & Technology YMCA, Faridabad
(A Haryana State Government University)
(Established by Haryana State Legislative Act No. 21 of 2009 & Recognized by UGC Act 1956 u/s 22 to Confer Degrees)
Accredited 'A' Grade by NAAC

Scheme & Syllabus

for

BACHELOR OF TECHNOLOGY PROGRAMME
in

ELECTRICAL ENGINEERING

(w.e.f. Session 2020-2021)

DEPARTMENT OF ELECTRICAL ENGINEERING

J.C. Bose University of Science & Technology, YMCA, Faridabad
(A Haryana State Government University)
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Ref. No. —

Dated: 28/12/2022

CERTIFICATE

This is to certify that the scheme & syllabi of Electrical Engg (course name & scheme) is duly approved by the competent body/authority and to the best of my knowledge the contents of the same, are correct in all respect.

This Scheme & Syllabus has been approved in 19 (meeting no.) of BOS (ME) held on dated 08/02/2022.

Date: 28/12/2022

28/12/2022

Signature & Stamp of Chairperson

Chairperson
Department of Electrical Engineering
J.C. Bose University of Science & Technology, YMCA, Faridabad

Name: ANJU GUPTA

Deptt. Name Electrical.

J. C. BOSE UNIVERSITY OF SCIENCE & TECHNOLOGY
YMCA, FARIDABAD
NEW SCHEME OF STUDIES AND EXAMINATION
B-TECH 1st YEAR (ELECTRICAL ENGG.) SEMESTER-I

Course Notation	Course Code	Course Title	L	T	P	Cr.	Internal Marks	End Sem	Total	Category Code
B	BSC101C	Physics (Waves and Optics)	3	1	-	4	25	75	100	BSC
C	BSC103C	Mathematics-I (Calculus and Differential Equations)	3	1	-	4	25	75	100	BSC
B	ESC102A /21*	Engineering Graphics & Design	-	-	4	2	30	70	100	ESC
B	ESC103	Programming for Problem Solving	3	-	-	3	25	75	100	ESC
C	ESC104A /21*	Workshop- I	-	-	4	2	30	70	100	ESC
B	BSC104C	Physics lab	-	-	3	1.5	15	35	50	BSC
B	ESC105	Programming for Problem solving Lab	-	-	4	2	15	35	50	ESC

Total Credit- 18.5

Note: Exams duration will be as under

a. Theory exams will be of 03 hours duration.
b. Practical exams will be of 02 hours duration
c. Workshop exam will be of 03 hours duration

* modified in 2021

28/12/22
Chairperson
Department of Electrical Engineering
J.C. Bose University of Science & Technology, YMCA, Faridabad

J. C. BOSE UNIVERSITY OF SCIENCE & TECHNOLOGY
YMCA, FARIDABAD
NEW SCHEME OF STUDIES AND EXAMINATION
B-TECH 1st YEAR (ELECTRICAL ENGG.) SEMESTER-II

Course Notation	Course Code	Course Title	L	T	P	Cr	Internal Marks	End Sem	Total	Category Code
C	BSC106C	Mathematics-II (Linear Algebra , Transform Calculus and Numerical methods)	3	1	-	4	25	75	100	BSC
B	ESC101-A	Basic Electrical Technoogy	3	1	-	4	25	75	100	AECC
B	BSC 102	Chemistry	3	1	-	4	25	75	100	BEC
C	ESC106A/ 21*	Workshop- II	-	-	4	2	30	70	100	BEC
B	HSMC101	English	2	-	-	2	25	75	100	HSMC
B	ESC107-A	Basic Electrical Technology Lab	-	-	2	1	15	35	50	BSC
B	BSC 105	Chemistry Lab	-	-	3	1.5	15	35	50	BEC
B	HSMC102	English Lab	-	-	2	1	15	35	50	HSMC

Total Credit- 19.5

Note: Exams duration will be as under

a. Theory exams will be of 03 hours duration.
b. Practical exams will be of 02 hours duration
c. Workshop exam will be of 03 hours duration

* Modified in 2021

22/12/21
Chairperson
Department of Electrical Engineering
J.C. Bose University of Science & Technology, YMCA, Faridabad

BSC101C: Physics (Waves and Optics)

(Electrical, ECE, EIC, Electrical and Electronics Engineering)

Prerequisites:

(i) Mathematics course on Differential equations

(ii) Introduction to Electromagnetic theory

Unit 1: Simple harmonic motion, damped and forced simple harmonic oscillator (7)

Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator

Unit 2: Non-dispersive transverse and longitudinal waves in one dimension and introduction to dispersion (7)

Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves and speed of sound, standing sound waves. Waves with dispersion, water waves, superposition of waves and Fourier method, wave groups and group velocity.

Unit 3: The propagation of light and geometric optics (10)

Fermat's principle of stationary time and its applications e.g. in explaining mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them, transfer formula and the matrix method

Unit 4: Wave optics (6)

Huygens' principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power

Unit 5: Lasers (8)

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers(ruby,Neodymium), dye lasers; Properties of laser beams: monochromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

Reference books:

(i) Ian G. Main, Oscillations and waves in physics

(ii) H.J. Pain, The physics of vibrations and waves (iii) E. Hecht, Optics (iv) A. Ghatak, Optics (v) O. Svelto, Principles of Lasers

BSC103C: Mathematics-I (Calculus and Differential Equations)

(Electrical Engineering)

Contents

Module 1: Calculus (8 hours)

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 2: Sequences and Series (7 hours)

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 3: Multivariable Calculus: Differentiation (6 hours)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Module 4: Multivariable Calculus: Integration (7 hours)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

Module 5: First Order Ordinary Differential Equations (3 hours)

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.

Module 6: Ordinary Differential Equations of Higher Order (6 hours)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 7: Partial Differential Equations: First Order (3 hours)

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Text / References:

1. G.B. Thomas and R.L. Finney, " Calculus and Analytic geometry" , Pearson, 2002.
2. T. Veerarajan, " Engineering Mathematics" , McGraw-Hill, New Delhi, 2008.
3. B. V. Ramana, " Higher Engineering Mathematics", McGraw Hill, New Delhi, 2010.
4. N.P. Bali and M. Goyal, " A text book of Engineering Mathematics" , Laxmi Publications, 2010.
5. B.S. Grewal, " Higher Engineering Mathematics" , Khanna Publishers, 2000.
6. E. Kreyszig, " Advanced Engineering Mathematics", John Wiley & Sons, 2006.
7. W. E. Boyce and R. C. DiPrima, " Elementary Differential Equations and Boundary Value Problems" , Wiley India, 2009.
8. S. L. Ross, " Differential Equations" , Wiley India, 1984.
9. E. A. Coddington, " An Introduction to Ordinary Differential Equations" , Prentice Hall India, 1995.
10. E. L. Ince, " Ordinary Differential Equations" , Dover Publications, 1958.
11. G.F. Simmons and S.G. Krantz, " Differential Equations" , McGraw Hill, 2007

Course code	**ESC103(Th)/ESC105(Lab)**				
Category	**Engineering Science Course**				
Course title	**Programming for Problem Solving (Theory & Lab.)**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester – I/II
	3	0	4	5	
Pre-requisites (if any)	-				

(i)Programming for Problem Solving ([L : 3; T:0; P : 0 (3 credits)] [contact hrs : 40]

Detailed contents

Unit 1Introduction to Programming **(4 lectures)**
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture).**
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**

Unit 2:Arithmetic expressions and precedence **(2 lectures)**
Conditional Branching and Loops **(6 lectures)**
Writing and evaluation of conditionals and consequent branching **(3 lectures)**
Iteration and loops **(3 lectures)**

Unit 3Arrays **(6 lectures)**
Arrays (1-D, 2-D), Character arrays and Strings

Unit 4 Basic Algorithms **(6 lectures)**
Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 5 Function **(5 lectures)**
Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Unit 6Recursion **(4 -5 lectures)**
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 7Structure **(4 lectures)**
Structures, Defining structures and Array of Structures

Unit 8Pointers **(2 lectures)**
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit 9File handling (only if time is available, otherwise should be done as part of the lab)

Suggested Text Books

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Suggested Reference Books

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Outcomes

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

(ii) Laboratory - Programming for Problem Solving[L : 0; T:0 ; P : 4 (2credits)]

[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]

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
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: Programming for solving 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

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.

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BSC106C: MATHEMATICS II (Linear Algebra, Transform Calculus and Numerical Methods)

(Electrical Engineering)

Module 1: Matrices (10 hours)

Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Module 2: Numerical Methods-I (10 hours)

Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae. Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Module 3: Numerical Methods-II (10 hours)

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poisson equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Transform Calculus (10 hours)

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. Fourier transforms.

Text / References:

1. Poole, " Linear Algebra: A Modern Introduction", Brooks/Cole, 2005.
2. N.P. Bali and M. Goyal, " A text book of Engineering Mathematics" , Laxmi Publications, 2008.
3. B.S. Grewal, " Higher Engineering Mathematics" , Khanna Publishers, 2010.

V. Krishnamurthy, V. P. Mainra and J. L. Arora, " An introduction to Linear Algebra" , Affiliated East-West press, 2005

Course code	ESC 101 A (Th)/ESC107A (Lab)				
Category	Engineering Science Course				
Course title	Basic Electrical Technology (Theory & Lab.)				
Scheme and Credits	L	T	P	Credits	Semester –I/II
	3	1	2	5	
Pre-requisites (if any)	-				

[ESC101-A] Basic Electrical Technology (Theory) [L : 3; T : 1; P:0, (4 credit)]

Course Outcomes:

- To analyze and solve D. C. networks by different analysis methods and theorems.
- To formulate and solve complex AC single phase and three circuits
- To identify the type of electrical machines and their applications
- To introduce the components of low voltage electrical installations

Module 1: DC Circuits (8 hours)

Basic definitions, Electrical circuit elements (R, L and C), voltage and current sources, Ohm's law and its limitations, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation by mesh analysis and node analysis, Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems.

Module 2: AC Circuits (8 hours)

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.

Module3: Poly Phase Systems (5 hours)

Advantages of 3-phase systems, generation of 3-phase voltages, three phase connections (star and delta), voltage and current relations in star and delta connections, three phase powers, analysis of 3-phase balanced circuits, measurement of 3-phase power- 2 wattmeter method.

Module 4: Transformers (6 hours)

Magnetic Circuits, construction and working of single phase transformer, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, Auto-transformer

Module 5: Electrical Machines (8 hours)

Induction motor: Construction, principle and working of a three-phase induction motor, Single-phase induction motor: Construction, principle and working, Applications

DC machine: Construction, principle and working of dc motor and generator. Applications

Synchronous machine: Construction, principle and working of synchronous motor and generators. Applications

Module 6: Electrical Installations (6 hours)

Components of LT Switchgear: Fuses, MCB, ELCB, MCCB, Types of Wires, Earthing, Power factor improvement.

Suggested Text / Reference Books

(i) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.

(ii) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

(iii) L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.

(iv) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

(v) V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Online Recourses:

1. **NPTL Web Course, Basic Electrical Technology,** Prof. G. D. Roy, Prof. N. K. De, Prof. T.K. Bhattacharya, IIT Kharagpur (https://nptel.ac.in/courses/108/105/108105053/)
2. **NPTL Web Course, Electrical Machines-I,** Prof. P. Sasidhara Rao, Prof. G. Sridhara Rao, Dr. Krishna Vasudevan, IIT Madras (https://nptel.ac.in/courses/108/106/108106071/)
3. **NPTL Web Course, Electrical Machines-II,** Prof. P. Sasidhara Rao, Prof. G. Sridhara Rao, Dr. Krishna Vasudevan, IIT Madras https://nptel.ac.in/courses/108/106/108106072/

[ESC107-A] Basic Electrical Technology Laboratory [L : 0; T:0 ; P : 2 (1 credit)]

List of experiments/demonstrations:

- Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
- Verification of network theorem in DC circuits, Thevenin's Theorem, Norton's, Theorem, Superposition Theorem etc.
- Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
- Poly phase systems, three phase connections (star and delta), measurement of three phase power
- Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
- Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous

machine (field winging - slip ring arrangement) and single-phase induction machine.

- Torque Speed Characteristic of separately excited dc motor.
- Components of LT switchgear.

Laboratory Outcomes

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.

Course code	**BSC102(Th)/BSC105(Lab)**				
Category	Basic Science Course				
Course title	**Chemistry (Theory & Lab.)** **Contents** (i) Chemistry-I (Concepts in chemistry for engineering) (ii) Chemistry Laboratory				
Scheme and Credits	**L**	**T**	**P**	**Credits**	Semester –I/II
	3	1	3	5.5	
Pre-requisites (if any)	-				

(i)Chemistry (Concepts in chemistry for engineering) [L : 3; T:1; P : 0 (4 credits)]

Detailed contents

(i) Atomic and molecular structure (12 lectures)

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

(ii) Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

(iii) Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

(iv) Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.
Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

(vi) Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

(vii) Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Text Books

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and 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, 5th Edition

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

(ii) Chemistry Laboratory[L : 0; T:0 ; P : 3 (1.5 credits)]

Choice of 10-12 experiments from the following:

- Determination of surface tension and viscosity
- Thin layer chromatography
- Ion exchange column for removal of hardness of water
- Determination of chloride content of water
- Colligative properties using freezing point depression
- Determination of the rate constant of a reaction
- Determination of cell constant and conductance of solutions
- Potentiometry - determination of redox potentials and emfs
- Synthesis of a polymer/drug
- Saponification/acid value of an oil
- Chemical analysis of a salt
- Lattice structures and packing of spheres
- Models of potential energy surfaces
- Chemical oscillations- Iodine clock reaction
- Determination of the partition coefficient of a substance between two immiscible liquids
- Adsorption of acetic acid by charcoal
- Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg .

Laboratory Outcomes

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry

relevant to the study of science and engineering. The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function of time
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

Course code	HSMC 101(Th)/HSMC102(Lab)				
Category	Humanities and Social Sciences including Management courses				
Course title	English (Theory & Lab.)				
Scheme and Credits	L	T	P	Credits	Semester – I/II
	2	0	2	3	
Pre-requisites (if any)	-				

English

Detailed contents

1. Vocabulary Building

The concept of Word Formation
Root words from foreign languages and their use in English
Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
Synonyms, antonyms, and standard abbreviations.

2. Basic Writing Skills

Sentence Structures
Use of phrases and clauses in sentences
Importance of proper punctuation
Creating coherence
Organizing principles of paragraphs in documents
Techniques for writing precisely

3. Identifying Common Errors in Writing

Subject-verb agreement
Noun-pronoun agreement
Misplaced modifiers
Articles
Prepositions
Redundancies
Clichés

4. Nature and Style of sensible Writing

Describing
Defining
Classifying
Providing examples or evidence

5. Writing introduction and conclusion

6. Writing Practices

Comprehension
Précis Writing
Essay Writing

7. Oral Communication

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension

- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Suggested Readings:

(i) *Practical English Usage*. Michael Swan. OUP. 1995.
(ii) *Remedial English Grammar*. F.T. Wood. acmillan.2007
(iii) *On Writing Well*. William Zinsser. Harper Resource Book. 2001
(iv) *Study Writing*. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
(v) *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(vi) *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Course code*	ESC 102A/21* (Modified in 2021)				
Category	Engineering Science Courses				
Course title	Engineering Graphics & Design (Theory & Lab.)				
Scheme and Credits	L	T	P	Credits	Semester - I
	-	0	4	2	
Pre-requisites (if any)	NIL				

Course Objectives:

The objective of studying this course is to understand the basic principles of engineering drawing and graphics and to apply the same to daw different types of projections.

Course Outcomes: At the end of the course, the student shall be able to:

CO 1- Understand the basic principles of projections of points and lines.

CO 2- Know the different orientations and projections of planes and solids.

CO 3- Learn about the projections of sectioning of solids in different orientations and development of surfaces.

CO 4- Draw orthographic and isometric view of an object.

CO 5- Learn about the basics of AUTOCAD

Course Contents:

Unit 1:

Introduction: Importance, Significance and scope of Engineering Drawing, Usage of drawing Instruments, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic projections of simple engineering objects, B.I.S Specifications. **(12)**

Unit 2:

Projection of Points & Lines: Introduction of plane of projection, reference & auxiliary planes, projection of points and line in different quadrants, traces, inclinations & true lengthsof the lines, projections on auxiliary plane, shortest distance intersecting and non intersecting lines. **(8)**

Unit 3:

Projection of Planes and Solids: Parallel to one reference plane, inclined to one plane but perpendicular to the other, inclined to both reference planes. Projection of Polyhedra, solids of revolution-in simple positions with axis perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other. **(8)**

...sectioning of Solids and Development of Surfaces: Projections of sections of prisms,pyramids, ...ylinders and cones. Development of simple object with and without sectioning. **(4)**

...nit 5:
...ometric Projections: Introduction, isometric scale, Isometric view of plane figures, prisms, ...ramids and cylinders. **(4)**

...nit 6:
...verview of Computer Graphics: Introduction to AUTOCAD and practice of simpleexercises ...lated to the above units on CAD Software. **(8)**

...ecommended/ Reference Books:

...Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.

...A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria & Sons.

A Text Book of Engineering Drawing and Machine Drawing by M. L. Aggarwal and Sandhya Dixit: Dhanpat Rai & Co.

Textbook on Engineering Drawing , K. L. Narayana and P. Kannaiah, Scitech Publichers

Web Links:

S.N	Address of web source	Content
1	https://youtu.be/2C8H2rIwhrA	Engineering Drawing
2	https://youtu.be/xzi_R8lims0	Drawing Layouts

*-Modified in 2021

Course code	ESC 104A/21 & ESC 106A/21* (Modified in 2021)				
Category	Engineering Science Courses				
Course title	Workshop-I & Workshop-II				
Scheme andCredits	L	T	P	Credits	Semester-I/II
	-	0	4	2	
Pre-requisites (ifany)	-				

(Group-1)

MECHANICAL ENGINEERING WORKSHOP

Course Outcomes (COs): After studying this course the students will be able to:

CO 1- Acquire skills on basic engineering materials and safety aspects.

CO 2- Understand the fundamental concept of various basic engineering practices namely fitting, sheet metal, carpentry, pattern making and welding etc.

CO 3- Learn and use different marking & measuring instruments used in machine shop, fitting shop, sheet metal shop, carpentry & pattern making shop etc.

CO 4- Practice real time job preparation using various operations related to fitting, sheet metal, carpentry, welding & foundry etc.

List of Exercises:

Machine shop, fitting shop, sheet metal shop, carpentry & pattern making shop, weldingshop, foundry shop, forging (smith) shop and injection moulding shop.

Section (A): Machine Shop

1. To understand the layout, safety measures and fundamental concept of different engineering materials used in the workshop.
2. To study and demonstrate the various parts, specifications & operations on lathe,milling and shaping machine.
3. To study different types of measuring tools used in metrology and determine theleast count of vernier calipers, vernier height gauges and micrometers.

Section (B): Fitting & Sheet Metal Shop

4. To study different types of tools, equipments, devices and machines used in fittingshop.
5. To prepare a job involving filing, drilling, tapping and hacksaw cutting operations onmild steel plate.
6. To study various types of sheet metal tools and prepare a simple sheet metal joint.

Section (C): Carpentry and Pattern Making Shop

7. To study various types of carpentry and pattern making tools and equipments.
8. To prepare a simple wooden joint (cross lap / Tee-lap/dovetail joint) using kail woodin carpentry shop.
9. To prepare single piece pattern / split pattern using kail wood in pattern makingshop.

Section (D): Welding Shop

10. To practice striking an arc and prepare straight short bead on given M.S plate in flatpositionby arc welding.
11. To prepare straight continuous bead and re start of electrode in flat position by arcwelding on given M.S. plate as per size.

12. To practice tack weld &close butt joint in flat position by arc welding on given M.S.plate as per size.

Section (E): Foundry, Forging (Smithy) & Injection Moulding shop

13. To study various types of foundry tools and prepare a mould cavity using single/splitpattern in moulding sand.
14. To study various types of forging / black smithy tools and prepare a ring or hook byhand forging operation.
15. To study the working of injection molding machine and prepare a simple componentby injection moulding.

NOTE: - Total twelve exercises should be performed from the above list. At least two from each section and remaining two may either be performed from above list or designed by the concerned institution as per the scope of the syllabus and facilities available in institute.

(Group-II)

PART-A

Computer Engineering Workshop

Course Outcomes (COs): After the completion of the course the student will be able to:

CO1- Acquire skills in basic engineering practice.

CO2- Have working knowledge of various equipments used in workshop.

CO3- Have hands on experience about various machines and their components.

CO4- Obtain practical skills of basic operation and working of tools used in the workshop.

List of Exercises:

1. To study and demonstrate Block diagram of Digital Computer System and explanation of each unit.
2. To study and demonstrate internal parts of a Computer System (Card level) and other peripheral devices and explanation of POST & BIOS.
3. To study and demonstrate primary memory and secondary memory.
4. To demonstrate Mother Board/ Main Board and its parts, Chipset, Connectors, Add On Card.
5. To study various processor (Pentium-I, II, III, DUAL Core, i-3, i-5, i-7 etc).
6. To study various types of monitors: LCD /LED/TFT/PLASMA DISPLAY& New Technologies
7. To study different printer types and their working.
8. Assembly / Installation and Maintenance of Personnel Computer Systems: Practical exercise on assembly of Personnel Computer System, Installation of Operating System: Windows & Linux etc, Installation of other Application Softwares and Utility Softwares, Fault finding in Personnel Computers: Software or Hardware wise, Virus: Introduction, its Types & Removal techniques, Data Backup and Restore, Data Recovery Concepts, Typical causes of Data loss
9. Introduction to computer networking concepts: Introduction of Connecting devices: Hub, Switch & Router etc, Networking Cable preparation: Normal & Cross Cables, Data Transferring Techniques from one Computer System to another Computer System, Configuration of Switch/ Routers etc.
10. Introduction to system security and network security.

PART-B

Electrical Workshop

List of Exercises:

1. Introduction of Electrical Safety precautions, Electrical Symbols, Electrical Materials, abbreviations commonly used in Electrical Engg. and familiarization with tools used in Electrical Works.
2. To make a Straight Joint & Tee joint on 7/22 PVC wire and Britannia Joint on GI wire.
3. To study fluorescent Tube Light, Sodium Lamp and High Pressure Mercury Vapour Lamp.
4. To study different types of earthing and protection devices e.g. MCBs, ELCBs and fuses.
5. To study different types of domestic and industrial wiring and wire up a circuit used for Stair case and Godown wiring.
6. To make the connection of fan regulator with lamp to study the effect of increasing and decreasing resistance in steps on the lamp.
7. To fabricate half wave and full wave rectifiers with filters on PCB.
8. Maintenance and Repair of Electrical equipment i,e Electric Iron , Electric Toaster ,Water heater, Air coolers and Electric Fans etc.
9. To study soldering process with simple soldering exercises.
10. To make the connection of a three core cable to three pin power plug and connect the other cable end by secured eyes connection using 23/0.0076"or 40/0.0076" cable.

PART- C

Electronics Workshop

1. To study and demonstrate basic electronic components, Diode, Transistor, Resistance, Inductor and capacitor.
2. To study and demonstrate resistance color coding, measurement using color code and multimeter and error calculation considering tolerance of resistance.
3. To study and demonstrate Multimeter and CRO- front panel controls, description of block diagram of CRT and block diagram of CRO.
4. To study and demonstrate Vp(peak voltage),Vpp(peak to peak voltage), Time, frequency and phase using CRO.
5. Introduction to function generator. Functions of front panel controls and measurement of different functions on CRO.
6. To study and demonstrate variable DC regulated power supply, function of controls and DC measurement using multimeter and CRO.
7. Soldering practice on wire mesh or a resistance decade board includes fabrication, soldering, lacing, harnessing forming and observation.
8. Testing of components using multimeter and CRO like diode, transistor, resistance capacitor, Zener diode and LED.
9. To study and demonstrate rectification, half wave, Full wave and bridge rectifier. Fabrication,assembly and waveform observation.
10. To design and fabricate a printed circuit board of a Zener regulated/ series regulated power supply and various measurements, testing of power supply.

Note: At least 8 exercises are to be performed from each part by the students.

J.C. Bose University of Science & Technology YMCA, Faridabad

(NAAC Accredited "A" Grade University of State Govt. established by Haryana State Legislative Act No.21 of 2009)

Minutes of Meetings

of

19th Meeting of Board of Studies (UG)

Mechanical Engg. Department

held ON LINE

8.2.22 at 11 AM

MINUTES OF MEETING Of 19 th BOARD OF STUDIES (UG)

ON LINE

Present:

1	Dr. Rajkumar	Chairman
2	Dr. Sandeep Grover	Member
3	Dr. Tilak Raj,	Dean (Institution)
4	Dr. Z. A. Khan (Jamia)	Member
5	Dr. Rakesh Mugdil ; VC TMU,	Member
6	Dr. Praveen Sharma (ACEM)	Member
7	Sh Vivek Mehta; Sai Extrusion	Member(Industry)
7	Dr. Om Prakash Mishra	Member
8	Dr. Shafali Trivedi	Member Coordinator,
9.	Dr. Sandhya Dixit	Invited Member(Departmental Syllabus coordinator)
10.	Dr. Rajesh Attri	Invited Member

Following members could not attend the meeting:

1	Dr. P. C. Tewari (NIT kurukshetra)	Member
2	Dr. Noor Md. Deshmukh; Satyug Darshan	Member
3.	Sh Parvesh Kumar ;Victoria tools	Member (Industry)
4	Sh. Rakesh Bhatia ; M V Elctronics	Member (Industry)

At the outset, Dr. Rajkumar, Chairman of Board of Studies of Department warmly welcomed all the members of the Board. The Chairman also appreciated the presence of the external members to attend this meeting.

Minutes of Meeting of 19th BOS held on 8.2.2022.

ITEM NO. BOS/19/01	**To Confirm the Minutes of 18th Meeting of Board of Studies held on 06.08.2021 at 3.30 PM. Annexure--A** *The Minutes of 18th Meeting of the Board of Studies held on 6. 8..2021, in online mode were confirmed by the Board.*
ITEM NO. BOS/19/02	**To apprise the members about the Action Taken Report (ATR) on the Minutes of BOS meeting held on 06.08.2021 at 3.30 PM.** **Annexure--B** *Action Taken Report (ATR) on the Minutes of BOS Meeting held on 6.8. 2021 in online mode were confirmed by the Board.*
ITEM NO. BOS/19/03	**3.1 To consider and approve the scheme and syllabi of B.Tech I year of Mechanical Engineering (Hindi Medium) for session 2021-22.** **Annexure-C(i)** **3.2. To consider and approve an amendment in the codes of Courses (i) Engineering Mechanics, (ii) Engineering Graphics and Drawing, (iii) Workshop I and (iv) Workshop II, in the Scheme and Syllabus of B.Tech Mechanical Engg 2021-22. . Annexure-C (ii)**

Sr. No.	Old Course Nomenclature (2018-19)	New Course Nomenclature (2021-22)
1	ESC-203 Engineering Mechanics (III Sem)	ESC-203 A/21 Engineering Mechanics (III Sem)
2	ESC-102 Engineering Graphics and Design (1st Year all branches)	ESC-102 A/21 Engineering Graphics and Drawing (1st Year all branches)
3	ESC-104 Workshop- I (1st Year all branches)	ESC-104A/21 Workshop- I (1st Year all branches)

4	ESC-106 Workshop-II (1st Year all branches)	ESC-106A/21 Workshop-II (1st Year all branches)

3.3. To consider and approve an amendment in the codes of Courses (i) Engineering Graphics and Drawing, (ii) Workshop I and (iii) Workshop II, in the Scheme and Syllabi of B.Tech Robotics and Artificial Intelligance 2021-22.

Sr. No.	Old Course Nomenclature (2018-19)	New Course Nomenclature (2021-22)
2	ESC-102 Engineering Graphics and Design (1st Year all branches)	ESC-102 A/21 Engineering Graphics and Drawing (1st Year all branches)
3	ESC-104 Workshop- I (1st Year all branches)	ESC-104A/21 Workshop- I (1st Year all branches)
4	ESC-106 Workshop-II (1st Year all branches)	ESC-106A/21 Workshop-II (1st Year all branches)

The item is placed for its consideration and approval please.

The related documents containing details of scheme & syllabi, list of courses added etc. are attached as Annexure C.

The members authorised the Chairman BOS, to do minor modification/correction before issue.

The scheme and syllabi of B.Tech 1st year of Mechanical Engineering (Hindi Medium) for session 2021-22, is approved by the board.

Item No.BOS/19/04	**To apprise the members regarding various activities conducted by** 1. Department conducted various values added courses to impart quality training to different participants in online mode 2. STC and FDP 3. Workshop