

# As Per NEP 2020

## University of Mumbai



### Bachelor of Engineering

**First Year Engineering (Semester I & II), Revised Course**  
**(NEP-2020 Scheme) from Academic Year 2024-25**  
**(Common for All Branches of Engineering)**

- A- U.G. Certificate in **Major Discipline of Engineering/Technology**
- B- U.G. Diploma in **Major Discipline of Engineering/Technology**
- C- B.Voc/B.S.c. in **Major Discipline of Engineering/Technology**
- D- B.E. in **Major Discipline of Engineering/Technology**
- E- B.E. ( Hons.) in **Major Discipline of Engineering/Technology**
- F- B.E. (Hons. With Research) in **Major Discipline of Engineering/Technology**

Under

### **FACULTY OF SCIENCE & TECHNOLOGY**

**Ref: GR dated 20<sup>th</sup> April, 2023 for Credit Structure of UG**

**(As per AICTE & NEP 2020 Guidelines with effect  
from the Academic Year 2024-25 Progressively)**

# Preamble

To meet the challenge of ensuring excellence and NEP 2020 policy in engineering education, the issue of quality needs to be addressed, debated, and taken forward systematically. Accreditation is the principal means of quality assurance in higher education. The major emphasis of the accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Science and Technology (in particular Engineering) of the University of Mumbai has taken the lead in incorporating the philosophy of NEP 2020 education in the process of curriculum development.

The First Year Engineering course is a broad foundation training program to impart scientific and logical thinking Training to learners in general with a choice of course selection in the Basic sciences and Engineering Sciences. Simultaneously NEP- 2020 objectives demand nurturing the basic skills required for familiarizing within the respective chosen Branch of Engineering by the learner. Keeping this in view, a pool of courses is offered in Basic sciences covering fundamentals required to understand modern engineering practices and emerging trends in technology. Considering the change in pedagogy and the convenience of the stress-free learning process, in the course work under heads of Engineering Sciences, a choice-based subject pool is offered in the second semester. Essentially to give a glimpse of trends in the industry under vocational skill practices, the pool is offered to nurture and develop creative skills in contemporary industrial practices. Criteria met in the structure is the opportunity for learners to choose the course of their interest in all disciplines.

Basic sciences cover Applied Physics and Elective Physics, Applied Chemistry and Elective Chemistry, and Applied Mathematics where a pool of subjects are given for selection, the rationale for the same is that generalized basic science courses are not feasible from learners' point of view. Considering the present scenario, diverse choices need to be made available to fulfill the expectation of a learner to aspire for a career in the field of current trends of Technology and interdisciplinary research. Ability enhancement can be achieved in Undergraduate training by giving an objective viewpoint to the learning process and transitioning a learner from a rote learner to a creative professional, for the purpose Design Thinking is introduced in the First Semester to orient a journey learner to become a skilled professional. Considering the NEP-2020 structure of award of Certificate & Diploma at multiple exit-point pools of Vocational skills is arranged for giving exposure to the current Industry practices.

Faculty resolved that course objectives and course outcomes are to be clearly defined for every course so that all faculty members in affiliated higher education institutes understand the depth and approach of the course to be taught, which will enhance the learner's learning process. NEP 2020 grading system enables a much-required shift in focus from teacher-centric to continuous-based learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. Credit assignment for courses is based on a 15-week teaching-learning process for NEP 2020, however, the content of courses is to be taught in 12-13 weeks and the remaining 2-3 weeks are to be utilized for revision, tutorial, guest lectures, coverage of content beyond the syllabus, etc.

There was a concern that in the present system, the first-year syllabus must not be heavily loaded to the learner and it is of utmost importance that the learner entering into the first year of an engineering course should feel at ease by lowering the burden of syllabus and credits. This is necessary for a learner to get accustomed to the new environment of a college and to create a bond between the teacher and the learner. The present curriculum will be implemented for the First Year of Engineering from the academic year 2024-25. Subsequently, this system will be carried forward for Second Year Engineering in the academic year 2025-26, and for Third Year and Final Year Engineering in the academic years 2026-27, and 2027-28, respectively.

**Dr. Deven Shah**  
Associate Dean  
Faculty of Science & Technology

**Prof. Shivram S. Garje**  
Dean  
Faculty of Science & Technology

## Program Structure for First Year Engineering

### UNIVERSITY OF MUMBAI (NEP 2020 With Effect from Academic Year 2024-2025)

#### Semester I

Course Code	Course Description	Teaching Scheme (Contact Hours)			Credit Assigned			
		Theory	Practical	Tutorial	Theory	Tutorial	Practical	Total Credits
BSC101	Applied Mathematics -I	2	--	1	2	1	--	3
BSC102	Applied Physics	2	--	-	2	-	--	2
BSC103	Applied Chemistry	2	-	-	2	-	-	2
ESC101	Engineering Mechanics	2	-	-	2	-	-	2
ESC102	Basic Electrical & Electronics Engineering	3	--	-	3	-	--	3
BSL101	Applied Physics Lab	-	1	-	-	-	0.5	0.5
BSL102	Applied Chemistry Lab	-	1	-	-	-	0.5	0.5
ESL101	Engineering Mechanics Lab	-	2	-	-	-	1	1
ESL102	Basic Electrical & Electronics Engineering Lab	--	2	-	--	-	1	1
AEC101	Professional and Communication Ethics	2	--	-	2	-	--	2
AEL101	Professional and Communication Ethics	--	2		--	--	1	1
VSEC101	Engineering Workshop-I	-	2	-	-	-	1	1
VSEC102	C Programming	-	2*+2	-	-	-	2	2
CC101	Induction cum Universal Human Values	2#	-	-	2	-	--	2
<b>Total</b>		<b>15</b>	<b>14</b>	<b>1</b>	<b>15</b>	<b>01</b>	<b>07</b>	<b>23</b>

\* Two hours of practical class to be conducted for full class as demo/discussion.

# Course evaluation is activity-based which may be an individual or group of four students.

Theory / Tutorial 1 credit for 1 hour and Practical 1 credit for 2 hours

### Semester I

Course Code	Course Description	Examination scheme							
		Internal Assessment Test (IAT)			End Sem. Exam Marks	End Sem. Exam Duration (Hrs)	Term Work (Tw)	Oral & Pract.	Total
		IAT-I	IAT-II	Total (IAT-I) + IAT-II)					
BSC101	Applied Mathematics -I	20	20	40	60	02	25	--	125
BSC102	Applied Physics	15	15	30	45	1.5	--	--	75
BSC103	Applied Chemistry	15	15	30	45	1.5	--	--	75
ESC101	Engineering Mechanics	20	20	40	60	02	--	--	100
ESC102	Basic Electrical & Electronics Engineering	20	20	40	60	02	--	--	100
BSL101	Applied Physics Lab	--	--	--	--	--	25	--	25
BSL102	Applied Chemistry Lab	--	--	--	--	--	25	--	25
ESL101	Engineering Mechanics Lab	--	--	--	--	--	25	25	50
ESL102	Basic Electrical & Electronics Engineering Lab	--	--	--	--	--	25	25	50
AEC101	Professional and Communication Ethics	15	15	30	45	1.5	--	--	75
AEL101	Professional and Communication Ethics	--	--	--	--	--	25	--	25
VSEC101	Engineering Workshop-I	--	--	--	--	--	25	--	25
VSEC102	C Programming	--	--	--	--	--	25	25	50
CC101	Induction cum Universal Human Values	--	--	--	--	--	-	--	-
<b>Total</b>		<b>105</b>	<b>105</b>	<b>210</b>	<b>315</b>	<b>10.5</b>	<b>200</b>	<b>75</b>	<b>800</b>

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract	Tut.	Theory	TW/Pract	Tut.	Total
BSC101	Applied Mathematics-I	02	--	01	02	--	01	03

Course Code	Course Name	Examination Scheme									
		Theory					Exam Duration (in Hrs)	Term Work	Pract	Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam						
		IAT-I	IAT-II	IAT-I + IAT-II (Total)							
BSC101	Applied Mathematics-I	20	20	40	60	02	25	--	--	125	

**Course Objectives:** The course is aimed

1. To develop the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.
2. To provide hands-on experience using SCILAB software to handle applications to real-life problems.

**Course Outcomes:** Students will be able to

1. Apply the basic concepts of Complex Numbers and will be able to use them to analyze for engineering problems.
2. Apply hyperbolic functions and logarithms in subjects like electrical circuits and electromagnetic wave theory for cutting-edge tools and technology.
3. Apply the basic concepts of partial differentiation of function of several variables and will be able to use in subjects like Electromagnetic Theory, Heat and Mass Transfer, etc.
4. Apply the concept of Maxima, Minima, and Successive differentiation and will be able to use it for optimization and tuning the systems in emerging and computing areas.
5. Apply the concept of Matrices and be able to use it for solving the KVL and KCL in electrical networks in emerging and telecommunications areas.
6. Apply the concept of Numerical Methods for solving engineering problems with help of SCILAB software.

Module	Detailed Contents	Hrs.	CO Mapping
01	<p><b>Complex Numbers</b>  <b>Pre-requisite:</b> Review of Complex Numbers-Algebra of Complex Numbers, Cartesian, polar and exponential form of complex number, Statement of D'Moivre's Theorem.</p> <p>1.1. Expansion of <math>\sin^n\theta</math>, <math>\cos^n\theta</math> in terms of sines and cosines of multiples of <math>\theta</math> and Expansion of <math>\sin n\theta</math>, <math>\cos n\theta</math> in powers of <math>\sin\theta</math>, <math>\cos\theta</math>.</p> <p>1.2. Powers and Roots of a complex number.</p> <p># <b>Self-learning topic:</b> Basic of Complex Number.</p>	2 2	CO1
02	<p><b>Hyperbolic Functions &amp; Logarithms of Complex Numbers</b></p> <p>2.1. Circular functions of complex number and Hyperbolic functions. Inverse  Circular and Inverse Hyperbolic Functions. Separation of real and imaginary parts of all types of Functions. (Simple Examples)</p> <p>2.2. Logarithm of Complex Number (Simple Examples)</p> <p># <b>Self-learning topic:</b> Applications of complex numbers in Electrical circuits.</p>	3 1	CO2
03	<p><b>Partial Differentiation</b></p> <p>3.1. Partial Differentiation: Function of two and three variables, Partial derivatives of first and higher order. Differentiation of composite function.</p> <p>3.2. Euler's Theorem on Homogeneous functions with two independent variables (with proof). Deductions from Euler's Theorem. (without proof).</p> <p># <b>Self-learning topics:</b> Total differentials, implicit functions, Euler's Theorem on Homogeneous functions with three independent variables.</p>	3 2	CO3
04	<p><b>Applications of Partial Differentiation and Successive Differentiation.</b></p> <p>4.1. Maxima and Minima of a function of two independent variables,</p> <p>4.2. Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem (without proof) and simple examples.</p> <p># <b>Self-learning topics:</b> Jacobian's of two and three independent variables (simple problems) Lagrange's Multiplier method.</p>	1 3	CO4
05	<p><b>Matrices</b>  <b>Pre-requisite:</b> Inverse of a matrix, addition, multiplication, and transpose of a matrix, symmetric, skew-symmetric Matrix (Only</p>	3	

	Definition). 5.1.Types of Matrices (Hermitian, Skew Hermitian, Unitary, Orthogonal Matrices and properties of Matrices (without proof)). The rank of a Matrix using Echelon form, reduction to normal form, and PAQ form (Only 3X3 Matrix) 5.2.System of homogeneous and non –non-homogeneous equations, their consistency, and solutions. <b># Self-learning topics:</b> Application of inverse of a matrix to coding theory. Reduction to normal form and PAQ form.( $m \times n$ Matrix)	2	CO5
06	<b>Numerical Solutions of Transcendental Equations and System of Linear Equations and Expansion of Function.</b> 6.1.Solution of Transcendental Equations: Solution by Newton Raphson method and Regula –Falsi method. 6.2.Solution of a system of linear algebraic equations, by (1) Gauss Jacobi Iteration Method, (2) Gauss Seidel Iteration Method. <b># Self-learning topics:</b> Indeterminate forms, L- Hospital Rule, Gauss Elimination Method, Gauss Jordan Method.	2  2	CO6

#### References:

1. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9<sup>th</sup>Ed.
3. Engineering Mathematics by Srimanta Pal and Subodh, C.Bhunia, Oxford University Press
4. Matrices, Shanti Narayan, S. Chand publication.
5. Applied Numerical Methods with Matlab for Engineers and Scientists by Steven Chapra, McGraw Hill
6. Elementary Linear Algebra with Application by Howard Anton and Christ Rorres. 6th edition.  
John Wiley & Sons, INC.
7. A textbook of Engineering Mathematics by N.P. Bali & Manish Goyal. Laxmi Publication.
8. A textbook of Applied Mathematics Vol-I & Vol-II by P. N. Wartikar & J.N. Wartikar.

#### Term Work:

##### General Instructions:

1. Batch-wise tutorials are to be conducted. The number of students per batch should be as per University pattern for practicals.
2. Students must be encouraged to write SCILAB Programs in tutorial class only. Each Student has to write at least 2 SCILAB tutorials (including print out) and at least 6 class tutorials on entire syllabus.
3. SCILAB Tutorials will be based on (i) Gauss Jacobi Iteration Method (ii) Gauss Seidel Iteration method (iii) Newton Raphson Method (iv)Regula –Falsi method.

**The distribution of Term Work marks will be as follows –**

1.	Attendance (Theory and Tutorial)	05 marks
2.	Class Tutorials on entire syllabus	10 marks
3.	SCILAB Tutorials	10 marks

**Assessment:**

**Internal Assessment Test (IAT) for 20 marks each:**

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

**End Semester Theory Examination:**

➤ **Question paper format**

- Question Paper will comprise a total of **six questions each carrying 15 marks** Q.1 will be **compulsory** and should **cover the maximum contents of the syllabus**
- **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
- A total of **four questions** need to be answered



Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
BSC102	Applied Physics	2	--	-	2	--	-	2

Course Code	Course Name	Theory				Term work	Pract / Oral	Total	
		Internal Assessment Test (IAT)			End Sem Exam				Exam Duration (in Hrs)
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
BSC102	Applied Physics	15	15	30	45	02	--	75	

#### Rationale:

Most of the engineering branches are being off-spring of basic sciences where physics is playing a pivotal role in concept and understanding of foundation of core engineering branches. This syllabus is developed by keeping in mind, needs of all branches that we offer in University of Mumbai. In the distribution of modules, core physics and its applied form are given priority. Further, it is ensured that these modules will cover prerequisites needed for engineering courses to be introduced in higher semesters as core subjects or as interdisciplinary subjects in respective branches.

#### Course Objectives:

1. To provide students with a basic understanding of laser operation.
2. To explain the basic working principle of Optical fiber and its use in communication technology.
3. To demonstrate principles of interference in thin film.
4. To describe Maxwell's equations and their significance.
5. To build a foundation of quantum mechanics needed for modern technology.
6. To give exposure to the concept of Fermi level in semiconductors.

#### Course Outcomes:

1. Learners will be able to ILLUSTRATE the use of laser in LiDAR and Barcode reading.
2. Learners will be able to APPLY the foundation of fiber optics in the development of modern communication technology
3. Learners will be able to determine the wavelength of light and refractive index of liquid using the interference phenomenon.

4. Learners will be able to **ARTICULATE** the significance of Maxwell's equations.
5. Learners will be able to **RELATE** the foundations of quantum mechanics with the development of modern technology.
6. Learner will be able to **CLASSIFY** semiconductors and **EXPLAIN** variation of Fermi level with temperature and doping concentration.

**DETAILED SYLLABUS:**

	<b>Name of Module</b>	<b>Detailed Content</b>	<b>Hours</b>	<b>CO Mapping</b>
	<b>Prerequisite</b>	Basic knowledge of optics and atomic structure, Wavefront and Huygens principle, reflection and refraction, Interference by division of wavefront, Refractive index of a material, Snell's law, Basics of vector algebra, partial differentiation concepts, Dual nature of radiation, Photoelectric effect, Matter waves, Davisson-Germer experiment. Intrinsic and extrinsic semiconductors, electrical resistivity and conductivity concepts	--	--
I	<b>Lasers</b>	Lasers: Spontaneous and stimulated emission, population inversion, pumping, active medium & active center, resonant cavity, coherence length and coherence time, Characteristics of lasers, He-Ne laser: construction and working. Fiber laser Construction and working Application : (i)Elementary knowledge of LiDAR(ii) Barcode reader (iii) Application of laser in metal work	<b>04</b>	<b>CO1</b>
II	<b>Fibre Optics</b>	Optical fibers: Critical angle, acceptance angle, acceptance cone, numerical aperture, total internal reflection and propagation of light, Types of optical fibers: Single mode & multimode, step index & graded index, attenuation,attenuation coefficient, factors affecting attenuation, Fibre Optic Communication System, Advantages of optical fiber	<b>04</b>	<b>CO2</b>

		communication, numerical		
III	<b>Interference In Thin Films</b>	Interference in thin film of uniform thickness, conditions of maxima and minima for reflected system, Conditions for maxima and minima for wedge shaped film (qualitative), engineering applications – (i) Newton’s rings for determination of unknown monochromatic wavelength and refractive Index of transparent liquid (ii) AntiReflecting Coating	<b>04</b>	<b>CO3</b>
IV	<b>Electrodynamics</b>	Vector Calculus : Gradient, Divergence, Curl. Gauss’s law, Amperes’ circuital Law, Faraday’s law, Divergence theorem , Stokes theorem Maxwell’s equations in point form, Integral form and their significance(Cartesian coordinate only)	<b>04</b>	<b>CO4</b>
V	<b>Quantum Physics</b>	de Broglie hypothesis of matter waves, de Broglie wavelength for electron, Properties of matter waves, Wave function and probability density, mathematical conditions for wave function, problems on de Broglie wavelength, Need and significance of Schrödinger’s equations, Schrödinger’s time independent and time dependent equations, Energy of a particle enclosed in a rigidbox and related numerical problems, Quantum mechanical tunneling, Principles of quantum computing: concept of Qubit.	<b>06</b>	<b>CO5</b>
VI	<b>Basics Of Semiconductor Physics</b>	Direct and Indirect Band Gap Semiconductors, Electrical Conductivity of Semiconductors, Drift Velocity, Mobility and Conductivity in Conductors Fermi- Dirac distribution function, Position of Fermi Level in Intrinsic and Extrinsic Semiconductors.	<b>04</b>	<b>CO6</b>

**Text Books:**

1. A Text book of Engineering Physics -Dr. M. N. Avadhanulu, Dr. P. G. Kshirsagar, S. Chand, Revised Edition 2014
2. Modern Engineering Physics - A. S. Vasudeva, S. Chand, Revised Edition 2013
3. Engineering Physics D. K Bhattacharya, Poonam Tandon, Oxford Higher Education, 1st Edition 2015

4. Engineering Physics -R. K. Gaur,S. L. Gupta, Dhanpat Rai Publications, 2012
5. Engineering Physics -V. Rajendran, McGraw Hill Educations, 2017
6. A Textbook of Nanoscience and Nanotechnology, T. Pradeep Tata McGraw Hill Education Pvt. Ltd., 2012

**References:**

1. Concepts of Modern Physics - Arther Beiser, Shobhit Mahajan, S. Choudhury, McGraw Hill, 7<sup>th</sup> Edition 2017
2. Fundamentals of optics - Francis A. Jenkins, Harvey E. White, McGraw Hill Publication, India, 4th Edition
3. Fundamentals of Physics, Halliday and Resnick, Wiley publication
4. Introduction to Electrodynamics, D. J. Griffiths, Pearson Publication Online

**References:**

Sr. No.	Website Name
1.	<a href="https://archive.nptel.ac.in/courses/115/102/115102124/">https://archive.nptel.ac.in/courses/115/102/115102124/</a>
2.	<a href="https://archive.nptel.ac.in/courses/115/102/115102025/">https://archive.nptel.ac.in/courses/115/102/115102025/</a>
3.	<a href="https://archive.nptel.ac.in/courses/115/105/115105132/">https://archive.nptel.ac.in/courses/115/105/115105132/</a>

**Assessment:**

**Internal Assessment Test (IAT) for 15 marks each:**

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

**End Semester Theory Examination:**

**Question paper format**

- Question Paper will comprise a total of **five questions each carrying 15 marks Q.1** will be **compulsory** and should **cover the maximum contents of the syllabus**
- **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
- A total of **three questions** need to be answered

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
BSL101	Applied Physics Lab	--	1	-	--	0.5	-	0.5

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
BSL101	Applied Physics Lab	--	--	--	--	--	25	--	25

### Lab Objectives:

1. To develop scientific understanding of the physics concepts.
2. To develop the ability to explain the processes and applications related to science subjects.
3. To apply skills and knowledge in real life situations.
4. To improve the knowledge about the theory concepts of Physics learned in the class.
5. To improve ability to analyse experimental result and write laboratory report.
6. To develop understanding about inferring and predicting.

### Lab Outcomes: Learners will be able to..

1. Determine wavelength / divergence of laser beam.
2. Determine parameters like numerical aperture / power attenuation of an optical fibre.
3. Perform experiments based on interference in thin film and determine radius of curvature of lens / diameter of wire / thickness of paper.
4. Calculate basic parameters / constants using semiconductors.
5. Determine energygap / resistivity of a semiconductor.
6. Learner to understand the concept for virtual lab as per syllabus.

### List of Experiments. (Minimum five experiments required)

Sr No	List of Experiments	Hrs	LO Mapping
01	Determination of wavelength using Diffraction grating. (Laser source)	01	LO1
02	Study of divergence of laser beam	01	LO1
03	Determination of Numerical Aperture of an optical fibre.	01	LO2
04	Measuring optical power attenuation in your plastic optical fiber	01	LO2
05	Determination of radius of curvature of a lens using Newton's ring set up.	01	LO3
06	Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.	01	LO3
07	Determination of 'h' ..photo cell	01	LO4
08	Determination of 'h' using LED	01	LO4
09	Determination of energy band gap of semiconductor.	01	LO5

10	Determination of resistivity by four probe method.	01	LO5
11	Any other experiment based on syllabus may be included, which would help the learner to understand concept. Virtual lab may be developed and used for performing the experiments, after defining a suitable LO	01	LO6

**Term Work Marks:** 25 Marks (Total marks) = 10 Marks (Experiment) + 10 Marks Project + 5 Marks (Attendance)

**Project work** will be extended to semester-2 as well. In semester 1, a group of four students will be formed; a domain may be provided by faculty, the group will frame a problem statement in consultation with faculty. A PPT presentation with problem statement, preliminary literature survey, execution plan and a probable outcome is to be considered for awarding marks. Proper rubrics must be framed by faculty member

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
BSC103	Applied Chemistry	2	--	-	2	--	-	2

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
BSC103	Applied Chemistry	15	15	30	45	02	--	--	75

**Rationale:**

Chemical science has contributed in many ways to most of the Engineering branches where “Environmental Chemistry” is the modern approach to learn impact of Technology on habitat and can be common to all Core Groups, “Engineering Materials” can be prerequisites to many subjects of all core groups and Impact of corrosion on metals as engineering materials is the important area of concern. “Conventional and Non Conventional Energy Study” is the matter of general approach to all Core groups as Energy issue is the most recent concern even for designing computational engines (Include hardware & software energy efficient).

**Course Objectives:**

- 1) To study Coal as a conventional source of energy.
- 2) To study the effect of corrosion by different mechanisms on metals and methods of corrosion control.

- 3) To recognise importance of alloys and can apply the phase rule on it to study the effect of temperature and composition.
- 4) To introduce important properties of polymers as Engineering material.
- 5) To recognise the composition, properties and functions of various composite materials.
- 6) To study importance of Green Chemistry by comparative study of conventional and Green routes of syntheses, solvents and fuels.

**Course Outcomes:** Student will be able to -

- 1) Determine the quality of coal and quantify the oxygen required for combustion of coal.
- 2) Apply different methods to minimize corrosion in industries.
- 3) Interpret various phase transformations of alloy using thermodynamics.
- 4) Use the polymers for specific engineering applications on the basis of the properties.
- 5) Identify different types of composite materials for engineering applications.
- 6) Apply the principles of Green chemistry and study environmental impact for sustainable development

**Prerequisite:**

- 1) Knowledge about basic difference in Conventional and non-conventional energy sources.
- 2) Knowledge about concepts of Electrochemistry.
- 3) Knowledge of basic properties of metals and nonmetals.
- 4) Knowledge of 12 principles of Green Chemistry

**DETAILED SYLLABUS:**

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
I	Fuels and Combustion	A) cFuel: - Definition, Characteristics of good fuel. B) Calorific value (Definition, Types, Determination, Dulong's formula, Numerical) C) Coal: - Analysis of coal – Proximate analysis, Ultimate analysis, Numerical) D) Combustion of coal – Numerical	04	CO1
II	Corrosion	A) Introduction: - Definition, Types of Corrosion – i) Dry or Atmospheric Corrosion, ii) Wet or Electrochemical corrosion (In Acidic medium, In Neutral medium) B) Factors affecting rate of corrosion:- i) Position of metal in galvanic series, ii) Purity of Metal, iii) Nature of Corrosion product, iv) Temperature, v) pH of medium, vi) concentration of medium, vii) moisture, viii) Relative Cathodic and Anodic area, ix) overvoltage C) Methods to control corrosion: - i) Selection of metal, ii) Proper Designing, iii) Cathodic protection, iv) Use of Corrosion Inhibitors, v) Metallic Coating D) Corrosion in Electronic devices	04	CO2
III	Alloys	A) Purpose of making alloys. B) i) Gibbs Phase rule – Statement, Terms involved	04	CO3

		with examples. ii) Reduced phase rule, Two-component system (Pb-Ag) & Numerical. iii) Merits and Limitations of Phase rule.		
<b>IV</b>	<b>Introduction to Polymers</b>	A) Macro-molecular science, basic concept of polymers, Chemical bonding in polymers, Classification of Polymers. B) Properties of Polymers:- i) Molecular weight - Number average molecular weight, Weight average molecular weight, Numerical, ii) Crystallinity - Crystalline and amorphous polymers – Glass transition temperature, iii) Mechanical Properties: Hardness, tensile strength, creep, fatigue, impact resistance (introduction), iv) Electrical properties: dielectric strength, insulation resistance, surface resistivity (Introduction), v) Optical properties: refractive index, transmittance, photoelectric property, colour	<b>05</b>	<b>CO4</b>
<b>V</b>	<b>Introduction to Composites</b>	A) Definition, Characteristics of Composites, B) Constituents of Composites – Matrix Phase and Dispersed Phase (Definition and Functions) C) Classification of Composites	<b>04</b>	<b>CO5</b>
<b>VI</b>	<b>Green Chemistry for sustainable development</b>	A) Comparative study of synthesis of following industrially important molecules by conventional and green route:- i) Indigo dye, ii) Adipic acid, iii) Carbaryl B) Green Solvents: - characteristics and applications of Supercritical solvents and ionic liquids C) Green Fuels:- Synthesis and Advantages of i) Biodiesel, ii) Ethanol	<b>05</b>	<b>CO6</b>

**Recommended Books:**

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication
2. A textbook of Engineering Chemistry, S. S. Dara, S. Chand and Company
3. Polymer science: Vasant Gowariker, Wiley Estern Ltd, new Delhi
4. Green Chemistry: V. K. Ahluwalia

**Online References:**

Sr. No.	Website Name
1.	<a href="https://archive.nptel.ac.in/courses/103/106/105106205/">https://archive.nptel.ac.in/courses/103/106/105106205/</a>
2.	<a href="https://courses.nptel.ac.in/noc20_ch41/preview">https://courses.nptel.ac.in/noc20_ch41/preview</a>

**Assessment:**

**Internal Assessment Test (IAT) for 15 marks each:**



- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

### End Semester Theory Examination:

#### Question paper format

- Question Paper will comprise a total of **five questions each carrying 15 marks** Q.1 will be **compulsory** and should **cover the maximum contents of the syllabus**
- Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
- A total of **three questions** need to be answered.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
BSL102	Applied Chemistry Lab	--	1	-	--	0.5	-	0.5

Course Code	Course Name	Theory				Term work	Pract / Oral	Total	
		Internal Assessment Test (IAT)			End Sem Exam				Exam Duration (in Hrs)
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
BSL102	Applied Chemistry Lab	--	--	--	--	--	25	--	25

#### Lab Objectives:

- To apply knowledge acquired during the theory class in carrying out the experiments for qualitative and quantitative determination.
- To analyse experimental results and write laboratory report.

**Lab Outcomes:** After completion of experiment, the learners will be able to:

- Understand the significance of proximate analysis of coal and determine quality of coal sample.
- Learn various quantitative analytical techniques to determine % of elements from alloy samples.
- Synthesize biodiesel at laboratory level and calculate % atom economy from Green chemistry point of view.

- Learn the effect of various factors on the rate of corrosion.
- Synthesize bioplastic at laboratory level using from Green chemistry.
- Quantitative determination of N<sub>2</sub> / Flue gas.

**Prerequisite:**

- Knowledge of basic safety practices in the Chemistry Laboratory
- Knowledge of Proximate analysis of coal
- Knowledge of volumetric analysis

**List of Experiments.**

Sr No	List of Experiments	Hrs	LO Mapping
01	Determination of moisture content of coal	01	LO1
02	Determination of ash content of coal	01	LO1
03	Determination of Zn in Brass	01	LO2
04	Synthesis of Biodiesel from vegetable oil	02	LO3
05	Determination of Cu in Brass	01	LO2
06	Flue gas analysis by Orsats Apparatus	02	LO6
07	Synthesis of biodegradable plastics	02	LO5
08	Determination of nitrogen by Kjeldahl's method	02	LO6
09	To compare rate of corrosion of various metals in acidic medium	01	LO4

Sr No	List of Assignments / Tutorials	LO Mapping
01	Numerical based on calorific value determination, proximate and ultimate analysis of coal	LO1
02	Phase Diagram on Electrochemical corrosion in different medium	LO4
03	Diagrams and numerical based on two component system	LO2
04	Numerical based on average molecular weight of polymers	LO5
05	Synthesis of at least two Industrially important molecules	LO3, LO5

**Assessment :**

**Term Work:** Term Work shall consist of at least 5 to 6 practicals based on the above list. Also, Term work Journal must include at least 4 assignments.

**Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ESC101	Engineering Mechanics	02	-	-	02	-	-	02

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
ESC101	Engineering Mechanics	20	20	40	60	02	--	--	100

#### Rationale:

Engineering mechanics is a branch of science that deals with the behavior of solid bodies when subjected to external forces or loads and the effects of these forces on the bodies. It is a fundamental discipline within engineering and provides the basis for understanding and analyzing various types of structures and mechanisms.

#### Course Objectives:

1. To acquaint with basic principles of centroid and its application
2. To familiarize with the concepts of force, moment, Resultant and Equilibrium of system of coplanar force.
3. To acquaint with the basic concept of friction and its application in real-life problems.
4. To understand the parameters required to quantify the Kinematics of Particle and Rigid body.
5. To understand the parameters required to quantify the Kinetics of rigid body.
6. To acquaint with the basics of Robot kinematics

#### Course Outcomes:

1. Determine the equivalent force-couple system for a given system of forces.(L3)
2. Demonstrate the understanding of Centroid and its significance and locate the same. (L3)
3. Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two- and three-dimensional systems with the help of FBD. (L3)
4. Calculate position, velocity and acceleration etc. of particle/rigid body using principles of kinematics (L3)
5. Analyze particles in motion using force and acceleration, work-energy and impulse-momentum principles (L4)

6. Establish the relation between robot joints and parameters (L2)

**DETAILED SYLLABUS:**

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Resolution of a force. Use of trigonometry functions. Parallelogram law of forces. Law of triangle. Polygon law of forces, Lami's theorem. Concepts of Vector Algebra. Uniformly accelerated motion along a straight line, motion under gravity, projectile motion, Time of flight, Horizontal range, Maximum height of a projectile. Law of conservation of Energy, Law of conservation of Momentum, and Collision of Elastic Bodies. Work-Energy Principle (Note: There will be no questions from the prerequisite in the theory examination)	01	CO1
I	System of Forces	Classification of force systems, Principle of transmissibility, composition and resolution of forces. Resultant of coplanar force system (Concurrent forces, parallel forces and general system of forces). Moment of force about a point, Couples, Varignon's Theorem. Resultant of Non-Coplanar (Space Force): Concurrent force system	04	CO1
II	Centroid	Centroids of plane laminas: Plane lamina consisting of primitive geometrical shapes.	03	CO2
III	Equilibrium of Force system and Friction	<b>3.1 Equilibrium:</b> Conditions of equilibrium for concurrent forces, parallel forces and general forces, Couples. Equilibrium of rigid bodies, free body diagrams. <b>3.2 Equilibrium of Beams:</b> Types of beams, simple and compound beams, type of supports and reaction: Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges) <b>3.3 Friction:</b> Laws of friction. Cone of friction. angle of repose, angle of friction, equilibrium of bodies on a horizontal and inclined plane.	06	CO3
IV	Kinematics of particle and rigid bodies	<b>4.1</b> Motion of particle with variable acceleration. Motion along plane curved path. velocity and acceleration in terms of rectangular components, tangential and normal component of acceleration. <b>4.2</b> Introduction to general plane motion, problem based on Instantaneous center (ICR) method for general plane motion (up to 2 linkage mechanism and no relative velocity method)	05	CO4

V	<b>Kinetics of particle</b>	<b>5.1</b> Force and Acceleration: -Introduction to basic concepts, D'Alembert's Principle, concept of Inertia force, Equations of dynamic equilibrium. <b>5.2</b> Principle of linear impulse and momentum. Impact and collision: Law of conservation of momentum, Coefficient of Restitution. Direct Central Impact and Oblique Central Impact. Loss of Kinetic Energy in collision of inelastic bodies.	<b>05</b>	<b>CO5</b>
VI	<b>Introduction to Robot Kinematics</b>	Fundamental of Robot Mechanics, Degree of Freedom, D-H Parameters, robot kinematics (Forward), Homogeneous transformation (limited to 2 DOF Serial robot)	<b>02</b>	<b>CO6</b>

#### Text Books:

1. Engineering Mechanics by A K Tayal, Umesh Publication.
2. Engineering Mechanics by Kumar, Tata McGraw Hill
3. Engineering Mechanics by Beer & Johnston, Tata McGraw Hill

#### References:

1. Engineering Mechanics by R. C. Hibbeler.
2. Engineering Mechanics by F. L. Singer, Harper & Row Publication
3. Engineering Mechanics by Macklin & Nelson, Tata McGraw Hill
4. Engineering Mechanics by Shaum Series
5. Engineering Mechanics (Statics) by Meriam and Kraige, Wiley Books
6. Engineering Mechanics (Dynamics) by Meriam and Kraige, Wiley Books
7. Introduction to Industrial Robotics by Ramchandran Nagrajan, Pearson publication

#### Online References:

Sr. No.	Website Name
3.	<a href="https://archive.nptel.ac.in/courses/112/106/112106286/">https://archive.nptel.ac.in/courses/112/106/112106286/</a>
4.	<a href="https://onlinecourses.nptel.ac.in/noc21_me70/preview">https://onlinecourses.nptel.ac.in/noc21_me70/preview</a>
3.	<a href="https://archive.nptel.ac.in/courses/112/106/112106180/">https://archive.nptel.ac.in/courses/112/106/112106180/</a>

#### Assessment:

##### Internal Assessment Test (IAT) for 20 marks each:

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

#### End Semester Theory Examination:

##### ➤ Question paper format

- Question Paper will comprise a total of **six questions each carrying 15 marks** Q.1 will be **compulsory** and should **cover the maximum contents of the syllabus**
- **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from

Module 3 then part (b) must be from any other Module randomly selected from all the modules).

- A total of **four questions** needs to be answered

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ESL101	Engineering Mechanics Lab	--	02	-	--	01	-	01

Course Code	Course Name	Theory				End Sem Exam	Exam Duration (in Hrs)	Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			IAT-I + IAT-II (Total)					
		IAT-I	IAT-II							
ESL101	Engineering Mechanics Lab	--	--	--	--	--	25	25	50	

#### Lab Objectives:

1. To acquaint with basic principles of centroid and its application
2. To familiarize with the concepts of force, moment, Resultant and Equilibrium of system of coplanar force.
3. To acquaint with the basic concept of friction and its application in real-life problems.
4. To understand the parameters required to quantify the Kinematics of Particle and Rigid body.
5. To understand the parameters required to quantify the Kinetics of rigid body.
6. To acquaint with the basics of Robot kinematics

#### Lab Outcomes:

1. Determine the equivalent force-couple system for a given system of forces (L3)
2. Demonstrate the understanding of Centroid and its significance and locate the same. (L3)
3. Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two- and three-dimensional systems with the help of FBD. (L3)
4. Calculate position, velocity and acceleration etc of particle and rigid body using principles of kinematics. (L3)
5. Analyze particles in motion using force and acceleration, work-energy and impulse-momentum principles (L4)
6. Establish the relation between robot joints and parameters (L2)

#### List of Experiments:

Minimum six experiments from the following list of which a minimum one should be from dynamics.

Sr No	List of Experiments	Hrs	CO mapping
01	Verification of Polygon law of coplanar forces	01	LO1
02	Verification of the Principle of Moments (Bell crank lever)	01	LO3
03	Determination of support reactions of a Simply Supported Beam.	01	LO3
04	Determination of coefficient of friction) using inclined plane	01	LO3
05	Verification of the equations of equilibrium for non-concurrent non-parallel (General)force system.	02	LO3
06	Collision of elastic bodies (Law of conservation of momentum).	02	LO5
07	Kinematics of particles. (Uniform motion of a particle, Projectile motion, motion undergravity)	02	LO4
08	Kinetics of particles. (collision of bodies)	02	LO5

Sr No	List of Assignments / Tutorials	Hrs	CO mapping
01	Resultant of Coplanar force system	02	LO1
02	Resultant of non-coplanar force system: Concurrent force system	01	LO1
03	Centroid of Composite plane Laminas	01	LO2
04	Equilibrium of System of Coplanar Forces including support reaction of beams	02	LO3
05	Equilibrium of bodies on inclined plane and problems involving ladder.	02	LO3
06	Kinematics of particles (Variable acceleration)	02	LO4
07	Kinetics of particles (D'Alembert's Principle, Impulse momentum Principle, Impact and Collisions.)	02	LO5
08	Homogeneous transformation, Direct Kinematics of robot	02	LO6

**Term Work:** Term Work shall consist of at least 6 practical's and 8 assignments based on the above list

**Term Work Marks:** 25 Marks (Total marks) = 10 Marks (Experiment) + 10 Marks (Assignments) + 5 Marks (Attendance)

**Oral Exam:** An Oral exam will be held based on entire syllabus.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ESC102	Basic Electrical and Electronics Engineering	3	--	-	3	--	-	3

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
ESC102	Basic Electrical and Electronics Engineering	20	20	40	60	2	-	-	100

### Course Objectives:

1. To provide knowledge on fundamentals of DC circuits
2. To provide knowledge of single phase and three phase AC circuits.
3. To inculcate fundamental knowledge of 1- $\Phi$  transformer.
4. To provide basic knowledge on fundamentals of DC and AC machines.
5. To provide knowledge of special purpose Diodes.
6. To provide knowledge of Transistor.

### Course Outcomes:

- 1) Apply various network theorems to determine the circuit response / behavior.
- 2) Evaluate and analyze 1- $\Phi$  and 3- $\Phi$  AC circuits.
- 3) Understand the construction, operation and applications of 1- $\Phi$  transformers.
- 4) Illustrate the working principle of 3- $\Phi$ , 1- $\Phi$  Induction motors and DC Motors.
- 5) Study the construction, operation and applications of some special purpose Diodes.
- 6) Study construction, operation and applications of some Transistors.

### DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Resistance, inductance, capacitance, series and parallel connections of resistance, concepts of voltage, current, power and energy and its units. Magnetic circuits, MMF, Magnetic field strength, reluctance.		
I	01	DC Circuits: (Only independent sources) Kirchhoff's Laws, Ideal and Practical Voltage and Current Sources, Source Transformation, Mesh and Nodal Analysis (no super node and super mesh) Star-Delta / Delta-Star Transformations, Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.	10	CO1
II	02	AC Circuits: Generation of alternating voltage, basic definitions, average and RMS values, phasor and phase difference, sums on phasors, Single-phase ac series	12	CO2



		and parallel circuits consisting of R, L, C, RL, RC, RLC combinations, definitions - real, reactive and apparent power, admittance (Y), Series and parallel resonance (only theory). Generation of Three-Phase Voltages, voltage & current relationships in Star and Delta Connections.		
III	03	Single Phase Transformer: (Numerical are not expected) Working principle of single-phase transformer, types of single-phase transformer, transformation ratio, actual (practical) and ideal transformer, Transformer losses, efficiency, applications of transformer.	04	CO3
IV	04	Electrical Machines: (Numerical are not expected) principle of operation, constructional details, classification and applications of DC Motor, three-phase induction motor, Single-Phase induction motors and BLDC motor	05	CO4
V	05	Special Purpose Diodes: (Numerical are not expected) Characteristics and operation of Zener Diode and application as a voltage regulator. Basic and structure of LED. Application of LED in indicative and lighting displays.	04	CO5
VI	06	Introduction to Transistors: (Numerical are not expected) structure and operation of BJT. BJT configurations (only common emitter). FET structure and operation. Application of BJT and FET in amplification, switching and oscillators.	04	CO6

**Text Books:**

1. V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)
2. Vincent Del Toro "Electrical Engineering Fundamentals", PHI Second edition, 2011
3. Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition)
4. D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.
5. M. Naidu, S. Kamakshiah "Introduction to Electrical Engineering" McGraw-Hill Education, 2004.
6. B.R Patil "Basic Electrical Engineering" Oxford Higher Education,
7. Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky

**References:**

1. B.L. Theraja "Electrical Engineering " Vol-I and II
2. S.N. Singh, "Basic Electrical Engineering" PHI , 2011Book

**Assessment:**

**Internal Assessment Test (IAT) for 20 marks each:**

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

**End Semester Theory Examination:**

➤ **Question paper format**

- Question Paper will comprise a total of **six questions each carrying 15 marks** Q.1 will be **compulsory** and should **cover the maximum contents of the syllabus**
- **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
- A total of **four questions** need to be answered

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
ESL102	Basic Electrical and Electronics Engineering Lab	--	2	-	--	1	-	1

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
ESL102	Basic Electrical and Electronics Engineering Lab	--	--	--	--	--	25	25	50

**Lab Objectives:**

1. To impart the basic concept of network analysis and its application.
2. To provide the basic concept of AC circuit analysis and its application.
3. To illustrate the operation of the transformer.
4. To illustrate the operation of machines.
5. To explain the Zener diode voltage regulation characteristic.
6. To explain the BJT and FET as switches and amplifiers.

**Lab Outcomes:**

- 1) Interpret and analyze the behavior of DC circuits using network theorems.
- 2) Perform and infer experiments on single-phase and three-phase AC circuits
- 3) Illustrate the performance of a single-phase transformer
- 4) Illustrate the performance of A.C. machine and DC Motor
- 5) Perform an experiment on voltage regulation characteristics of Special diode
- 6) Perform an experiment on the VI characteristic Transistor.

**List of Experiments.**

Sr No	List of Experiments	Hrs	LO Mapping
01	Basic safety precautions. Introduction and use of measuring instruments - voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors, and inductors	01	LO1
02	To measure output voltage across load resistor/current through load resistor and verify the result using Mesh and Nodal analysis	01	LO1
03	Verification of Superposition Theorem.	02	LO1
04	Verification Thevenin's and Norton's theorem	02	LO1
05	Verification Maximum Power Transfer Theorem.	02	LO1
06	To find the resistance and inductance of a coil connected in series with a pure resistance using the voltmeter method	02	LO2
07	To measure the relationship between phase and line, currents and voltages in three-phase system (star & delta)	02	LO2
08	To demonstrate cut-out sections of the single-phase transformer.	02	LO3
09	To demonstrate cut-out sections of the DC machine	02	LO4
10	To plot Zener diode voltage regulation characteristics	02	LO5
11	To demonstrate the application of LED in indicative and lighting display	02	LO5
12	To demonstrate the application of BJT as a switch	02	LO5
13	To demonstrate BJT/FET as an amplifier	02	LO6

Sr No	List of Assignments / Tutorials	Hrs	LO Mapping
01	Assignment on Basic electrical safety practices	02	LO1
02	Numerical assignment on Mesh analysis and nodal analysis		LO1
03	Numerical assignment on Thevenin, Norton, and maximum power transfer theorem		LO1
04	Numerical assignment on series and parallel circuits		LO2
05	Assignment on single-phase transformer		LO2
06	Assignment on DC and AC machine		LO4
07	Assignment on special purpose diodes		LO5
08	Assignment on BJT and FET		LO6

**Online Resources:**

Sr. No.	Website Name
5.	All About Circuits ( <a href="https://www.allaboutcircuits.com">https://www.allaboutcircuits.com</a> )

6.	Circuit Lab ( <a href="https://www.circuitlab.com">https://www.circuitlab.com</a> )
3.	Tinkercad ( <a href="https://www.tinkercad.com">https://www.tinkercad.com</a> )

**Assessment:**

**Term Work:** Term Work shall consist of at least 08 to 10 practicals based on the above list. Also, Term work Journal must include at least 6 assignments.

**Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Practical & Oral Exam:** An Oral & Practical exam will be held based on the above syllabus.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
AEC101	Professional Communication and Ethics	02	-	-	02	-	-	02

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
AEC101	Professional Communication and Ethics	15	15	30	45	1.5	--	--	75

**Rationale**

This course has been designed to hone the communicative abilities of First Year Engineering students by providing them skill-based training on LSRW (Listening-Speaking-Reading-Writing) to prepare

them for a career in the industry and for competitive exams pertaining to higher studies.

**Course Objectives** - The learners should be able to:

1. Effectively evaluate the dynamics of communication and navigate professional arenas
2. Competently acquire active listening skills by comprehending various types of Speech Acts
3. Critically analyse communication barriers, audience and purpose to speak proficiently
4. Minutely comprehend extensive texts, technical and non-technical, to execute relevant tasks
5. Efficiently organize and create purposeful technical writing for professional transaction
6. Successfully manage teams, by applying ethical standards to deliver synergistic solutions

**Course Outcomes** - The learners will be able to:

1. Evaluate the dynamics of communication and effectively navigate professional arenas
2. Acquire active listening skills by comprehending various types of Speech Acts
3. Analyse different communication barriers, audience and purpose, and speak proficiently
4. Comprehend extensive texts, technical and non-technical, to execute relevant tasks
5. Organize and create purposeful technical writing for professional transactions
6. Manage teams successfully, by applying ethical standards to deliver synergistic solutions

**DETAILED SYLLABUS:**

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
01	Module 1- Fundamentals of Communication	<p><b>1.1. Basic Concepts of Communication</b></p> <ul style="list-style-type: none"> <li>• Definition, Objectives, Postulates</li> </ul> <p><b>1.2. Process of Communication</b></p> <ul style="list-style-type: none"> <li>• Stimulus, Sender, Encoding, Message, Medium, Channel, Receiver, Decoding, Feedback</li> </ul> <p><b>1.3. Methods of Communication</b></p> <ul style="list-style-type: none"> <li>• Verbal (<i>Written &amp; Spoken</i>).</li> <li>• Non-verbal cues perceived through the five senses (<i>Visual, Auditory, Tactile, Olfactory, Gustatory</i>)</li> <li>• Non-verbal cues transmitted cues through (<i>The body, Voice, Space, Time, Silence</i>)</li> </ul> <p><b>1.4. Barriers to Communication</b></p> <ul style="list-style-type: none"> <li>• Mechanical, Physical, Semantic &amp; Linguistic, Psychological, Socio-cultural</li> </ul> <p><b>1.5. Organisational Communication</b></p> <ul style="list-style-type: none"> <li>• Formal (<i>Upward, Downward, Horizontal</i>).</li> <li>• Informal (<i>Grapevine</i>)</li> </ul>	08	CO1

02	<b>Module 2 - Developing Basic Listening Skills</b>	<b>2.1. Concepts of Active Listening</b> <ul style="list-style-type: none"> <li>• Listening for Details</li> <li>• Listening for Gist</li> <li>• Listening for Inference</li> </ul> <i>(For details please refer to Lab. Syllabus)</i> <b>2.2. Enhancing Listening Proficiency Using Language Labs or on Open Source Platforms</b>	02	CO2
03	<b>Module 3 - Developing Basic Speaking Skills</b>	<b>3.1. Conversational Activities - Monologues</b> <ul style="list-style-type: none"> <li>• Introducing yourself, Introducing others, One-minute impromptu speeches, Scaffolded story telling</li> </ul> <b>3.2. Conversational Activities - Dialogues</b> <ul style="list-style-type: none"> <li>• Role plays on everyday interactions, Interviews (Find out if...), Information Gap Activities, Picture descriptions and feedback, Situational conversations.</li> </ul> <b>3.3. Conversational Activities - Pronunciation, Stress &amp; Rhythm, Intonation</b> <ul style="list-style-type: none"> <li>• Neutralisation of accent, Word stress, Rhythm &amp; Pauses, Tonal variations/inflections</li> </ul> <i>(For details please refer to Lab. Syllabus)</i>	02	CO3

04	Module 4 - Developing Basic Reading Skills	<p><b>4.1. Verbal Aptitude</b></p> <ul style="list-style-type: none"> <li>• Root Words, Meanings, Word Forms, Synonyms, Antonyms, Collocations, Prefixes, Suffixes at a similar difficulty level of entrance tests like <b>CAT/GRE/GMAT &amp; proficiency tests like TOEFL/IELTS</b></li> </ul> <p><b>4.2. Grammar</b></p> <ul style="list-style-type: none"> <li>• Identifying Common Errors (<i>Subject-verb agreement, Articles. Prepositions, Misplaced modifiers and Punctuations</i>) Redundancies, Idioms, Cliches at a similar difficulty level of entrance tests like <b>CAT/GRE/GMAT &amp; proficiency tests like TOEFL/IELTS</b></li> </ul> <p><b>4.3. Techniques to Improve Reading Fluency and Comprehension</b></p> <ul style="list-style-type: none"> <li>• Intensive Reading</li> <li>• Extensive Reading</li> <li>• Skimming</li> <li>• Scanning</li> <li>• SQ5R Method (<i>Survey, Question, Reading, Recording, Recall, Review and Revise</i>)</li> </ul> <p><b>4.4. Reading &amp; Summarisation Skills</b></p> <ul style="list-style-type: none"> <li>• Summarising text to Graphic Organisers (GO) and visa-versa. Venn diagrams, Radial Diagrams (<i>Mindmaps</i>), Tree Diagrams, Cyclic Diagrams, Flow Charts, Timelines, Matrix (<i>Tables</i>), Pyramids</li> <li>• Summarising text in point form</li> <li>• Summarising text in one-sentence central idea</li> </ul>	02	CO4
05	Module 5 - Developing Basic Writing Skills	<p><b>5.1. Coherence &amp; Cohesion in Writing</b></p> <ul style="list-style-type: none"> <li>• Basic Units of Writing (<i>Words, Sentences, Paragraphs</i>)</li> <li>• Coherence (<i>Structure of written pieces, CSI Order of Organisation</i>)</li> <li>• Cohesive Devices (<i>Referencing, Repetition, Substitution, Ellipsis, Transition Signals</i>).</li> <li>• Structure of a Paragraph (<i>Topic Sentence, Supporting Ideas, Concluding Sentence</i>).</li> </ul> <p><b>5.2. Seven Cs of Business Writing</b></p> <ul style="list-style-type: none"> <li>• Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness.</li> </ul>	09	CO5

### 5.3. Format & Types of Formal Letters

- Parts of a Formal Letter in **Complete Block Style**
- Request/Permission Letter
- Claim and Adjustment Letter
- Sales Letter
- E-mails

### 5.4. Writing User Instructions

- Styles of Instruction Presentation (*Impersonal, Indirect, Direct, Imperative*)
- Describing general function/purpose of an object/process,
- Drawing labelled diagrams
- Describing labelled parts
- Writing User Instructions
- Writing Special Notices (*Note, Caution, Warning, Danger*)

### 5.5. Content Creation for Social Media and e-Commerce Platforms

- Blogs
- Poetry
- Keynote speeches
- Podcast titles
- Landing pages
- Social media posts
- YouTube video description
- Screenwriting/Script Writing

*(Ensure minimum 3 of these categories are covered in the form of competitions)*

06	<b>Module 6 - Ethical and Managerial Skills for Engineers</b>	<b>6.1.Team building</b> <ul style="list-style-type: none"><li>• Five stages of Team, (Forming, Storming, Norming, Performing and Adjourning)</li></ul> <b>6.2.Goal setting</b> <ul style="list-style-type: none"><li>• SMART goals – short term and long-term goals</li></ul> <b>6.3.Ethical Considerations for Professional Integrity</b> <ul style="list-style-type: none"><li>• Fairness and Honesty</li><li>• Difference between Values and Ethics</li><li>• Ethical principles</li><li>• Ethical use of AI Tools</li><li>• Plagiarism and copyright infringement</li></ul>	03	CO6
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- |  |                                                                                |  |  |
|--|--------------------------------------------------------------------------------|--|--|
|  | <ul style="list-style-type: none"> <li>Ethical-dilemma case studies</li> </ul> |  |  |
|--|--------------------------------------------------------------------------------|--|--|

**References:**

1. Communication Skills by Sanjay Kumar & Pushp Lata
2. Business Communication with Writing Improvement Exercises. Hemphill, McCormick and Hemphill
3. Business Communication: Building Critical Skills by Locker, Kitty O. Kaczmarek, Stephen Kyo
4. Effective Business Communication by Herta Murphy
5. Technical Communication: Principles and Practice by Raman and Sharma
6. Effective Technical Communication: A Guide for Scientists and Engineers by Rizvi
7. Oxford Guide to Effective Writing & Speaking by John Seely
8. English Grammar by Raymond Murphy
9. Word Power Made Easy by Norman Lewis

**Online References:**

1.	<a href="https://bbclearningenglish.org">https://bbclearningenglish.org</a>
2.	<a href="https://www.bbc.co.uk/learningenglish">https://www.bbc.co.uk/learningenglish</a>

**Assessment:**

**Internal Assessment Test (IAT) for 15 marks each:**

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

**End Semester Theory Examination:**

**Question paper format**

- Question Paper will comprise a total of **five questions each carrying 15 marks Q.1** will be **compulsory** and should **cover the maximum contents of the syllabus**
- **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
- A total of **three questions** need to be answered.

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
AEL101	<b>Professional Communication and Ethics</b>	-	2	-	-	1	-	1

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
AEL101	Professional Communication and Ethics	--	--	--	--	--	25	--	25

**Lab Objectives:** The learners should be able to:

1. Effectively evaluate the dynamics of communication and navigate professional arenas
2. Competently acquire active listening skills by comprehending various types of Speech Acts
3. Critically analyse communication barriers, audience and purpose to speak proficiently
4. Minutely comprehend extensive texts, technical and non-technical, to execute relevant tasks
5. Efficiently organize and create purposeful technical writing for professional transactions
6. Successfully manage teams, by applying ethical standards to deliver synergistic solutions

**Lab Outcomes:** The learners will be able to:

1. Apply the understanding of communication dynamics and navigate professional arenas
2. Appreciate other's point of view and apply effective listening strategies
3. Analyse different communication barriers, audience and purpose to speak proficiently
4. Comprehend extensive technical and non-technical texts to execute specific tasks
5. Plan and create purposeful technical writing for professional transactions
6. Employ ethical standards and managerial skills in various professional situation

#### DETAILED SYLLABUS:

Sr. No.	Module No.	Practical/ Tutorial	Detailed Content	Hours	LO Mapping
1	Fundamentals of Communication	1	1.1. Situational Application of Fundamentals of Communication  1.2. Case Studies on Fundamentals of Communication	02	LO1

2	Developing Basic Listening Skills	2	<p>2.1. Listening for Details</p> <ul style="list-style-type: none"> <li>Listen to a song and fill in the blanks, Listen to a telephonic conversation and fill in the blanks, Listen to a story/lecture/podcast and fill in the blanks, Listen to a monologue and complete the sentences</li> </ul> <p>2.2. Listening for Gist</p> <ul style="list-style-type: none"> <li>Listen to an audio recording and identify the gist/main idea/theme in the form of MCQs or True/False statements</li> </ul> <p>2.3. Listening for Inference</p> <ul style="list-style-type: none"> <li>Listen to short passages and draw inferences in the form of MCQs or True/False statements</li> </ul> <p>2.4. Listening Comprehension Exercises in the Language Lab or on Open Source Platforms</p> <ul style="list-style-type: none"> <li>Listening to a telephonic conversation, Listen to a Podcast</li> </ul> <p>Examples of the Activities That Can Be Done under the Above 4 Heads:</p> <p>Listen to a Formal Speech</p> <ul style="list-style-type: none"> <li>Martin Luther King Jr.,</li> <li>Swami Vivekananda</li> <li>Dr.A.P.J.Abdul Kalam</li> <li>John F. Kennedy</li> <li>Mr.Ratan Tata</li> <li>Steve Jobs</li> </ul> <p>Note-taking &amp; Designing Quizzes</p> <ul style="list-style-type: none"> <li>Listen to a lecture, take notes and prepare a quiz for others</li> </ul> <p>Dictations</p> <ul style="list-style-type: none"> <li>Take old-fashioned dictation with special focus on punctuations and spellings</li> </ul>	04	LO2
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			<p>Draw a Story</p> <ul style="list-style-type: none"> <li>Listen to a descriptive passage read out by the teacher on a scenery/item and draw a picture based on what you hear</li> </ul> <p>Labelling a Map, Plan, Diagram, Table &amp; Flow Charts</p> <ul style="list-style-type: none"> <li>Listen to your teacher and write labels on a plan (<i>e.g. of a building</i>), map (<i>e.g. of part of a town</i>) diagram (<i>e.g. of a piece of equipment</i>), table (<i>e.g. place/time/price</i>), flow chart (<i>e.g. a process which has clear stages</i>).</li> </ul>		
3	Developing Basic Speaking Skills	3	<p>3.1. Conversational Activities - Monologues</p> <ul style="list-style-type: none"> <li>Introducing yourself, Introducing others, One-minute impromptu speeches, Scaffolded story telling</li> </ul> <p>3.2. Conversational Activities - Dialogues</p> <ul style="list-style-type: none"> <li>Role plays on everyday interactions, Interviews (Find out if...), Information Gap Activities, Picture descriptions and feedback, Situational conversations.</li> </ul> <p>3.3. Conversational Activities - Pronunciation, Stress and Rhythm, Intonation</p> <ul style="list-style-type: none"> <li>Neutralisation of accent, Word stress, Rhythm &amp; Pauses, Tonal variations/inflections</li> </ul> <p>Suggested Examples of Functional Communication Activities That Can Be Done under the Above 3 Heads:</p> <ul style="list-style-type: none"> <li>Asking for and giving information</li> <li>Taking initiative</li> <li>Seeking and giving favour/offers</li> <li>Requesting and responding to requests</li> <li>Apologizing and forgiving</li> <li>Seeking and giving permission</li> </ul>	04	LO3

			<ul style="list-style-type: none"> <li>• Congratulating people on their success</li> <li>• Expressing opinions, likes and dislikes, agreements and disagreements</li> <li>• Expressing condolences</li> <li>• Asking questions and responding politely</li> <li>• Giving instructions</li> <li>• Agreeing and disagreeing</li> <li>• Asking for and giving advice and suggestions</li> <li>• Expressing sympathy</li> <li>• Using mobile phone</li> <li>• Live commentary on videos on mute</li> <li>• Debates</li> </ul>		
4	Developing Basic Reading Skills	4	<p>4.1. Verbal Aptitude Reading Fluency &amp; Comprehension Monitoring</p> <ul style="list-style-type: none"> <li>• Reading short/long passages to answer MCQs based on factual, general and inferential comprehension skills</li> <li>• Reading short/long passages to answer MCQs based on factual, general and inferential comprehension skills</li> </ul> <p><i>(Passages should be of a technical nature and minimum length of passages should be 350-400 words)</i></p> <p>4.2. Vocabulary Building Activities</p> <p>Examples of Word Games:</p> <ul style="list-style-type: none"> <li>• Crosswords</li> <li>• Bingo</li> <li>• Word Ladders</li> <li>• Hangman</li> <li>• Word Association</li> </ul>	<b>04</b>	<b>LO4</b>
			<p>4.3. Reading &amp; Summarisation Skills</p> <ul style="list-style-type: none"> <li>• Summarising text to Graphic Organisers and visa-versa <ul style="list-style-type: none"> <li>○ Venn diagrams</li> <li>○ Radial Diagrams (<i>Mindmaps</i>)</li> <li>○ Tree Diagrams</li> <li>○ Cyclic Diagrams</li> <li>○ Flow Charts</li> <li>○ Timelines</li> </ul> </li> </ul>		

			<ul style="list-style-type: none"> <li>○ Matrix (<i>Tables</i>)</li> <li>○ Pyramids</li> <li>• Summarising text in bullet points</li> <li>• Summarising text in one-sentence central idea</li> </ul>		
5	Developing Basic Writing Skills	5	<p>5.1. Mechanics of Writing - Paragraph Writing</p> <ul style="list-style-type: none"> <li>• Building paragraphs developing coherence (<i>Structure of written pieces, CSI Order of Organisation</i>)</li> <li>• Coherence (<i>Structure of written pieces, CSI Order of Organisation</i>)</li> <li>• Cohesive Devices (<i>Referencing, Repetition, Substitution, Ellipsis, Transition Signals</i>).</li> <li>• Structure of a Paragraph (<i>Topic Sentence, Supporting Ideas, Concluding Sentence</i>).</li> </ul> <p>5.2. Write Letters and eMails</p> <ul style="list-style-type: none"> <li>• Request/Permission Letter</li> <li>• Claim &amp; Adjustment Letter</li> <li>• Sales Letter</li> </ul> <p>(<i>Complete Block format applying the seven Cs</i>)</p> <ul style="list-style-type: none"> <li>• eMails</li> </ul> <p>USE ONLY COMPLETE BLOCK FORMAT</p> <p>5.3 Writing User Instructions on: Examples:</p> <ul style="list-style-type: none"> <li>• Installing a software</li> <li>• Ordering food on delivery apps (<i>Zomato, Swiggy</i>)</li> <li>• Using payment system (<i>Google Pay, PhonePe, Paytm</i>)</li> <li>• Using AI Tools (<i>ChatGPT, Gemini, ZeroGPT and GPTZero</i>)</li> <li>• Electronic Devices/ Gadget (<i>Gaming Console, Smartwatch</i>)</li> <li>• Home Appliances (<i>Mixer-Grinder, Microwave Oven, Air Fryer</i>)</li> <li>• Tools (<i>Chisel, Screw-driver</i>)</li> </ul> <p>5.4 Content Creation for Social Media and e-Commerce Platforms</p> <p>Examples</p>	04	LO5

			<ul style="list-style-type: none"> <li>• Blogs</li> <li>• Poetry</li> <li>• Keynote speeches</li> <li>• Podcast Titles</li> <li>• Landing Pages</li> <li>• Social media posts</li> <li>• YouTube Video Description</li> <li>• Screenwriting/Script Writing</li> </ul> <p><i>(Ensure minimum 3 of these categories are covered in the form of competitions)</i></p>		
6	Ethical and Managerial Skills for Engineers	6	6.1. Ethics <ul style="list-style-type: none"> <li>• Case Studies on Ethical dilemma</li> </ul> 6.2. Team building  Examples <ul style="list-style-type: none"> <li>• Newspaper Bridges/ Towers/ Dress Building</li> <li>• Best out of waste</li> <li>• Obstacle Race</li> </ul>	<b>02</b>	<b>LO6</b>

Nos.	List of Assignments	Details	Hrs.
<b>01</b>	Application-based Assignment on Communication Theory	Must include Methods and Barriers from Module 1	<b>01</b>
<b>02</b>	Consolidated Listening Skills Activity Sheet with Students' Answers	At least 4 type of listening activities must be taken from Module 2	<b>01</b>
<b>03</b>	Performance-based Oral Activities <i>(Refer below for further details)</i>	Should be based on Continuous Evaluation of minimum 5 activities from entire lab syllabus. Follow the Common European Framework of Reference (CEFR) Rubrics for assessment.	<b>01</b>
<b>04</b>	<b>A. MCQ on Reading Comprehension and Summarisation with GO</b>  <b>B. Objective Test on Verbal Aptitude &amp; Grammar</b>	<b>A. Must cover sub-topics under Module 4</b>  <b>B. Must be based on Module 4 at the same difficulty level of entrance tests like CAT/GRE/GMAT &amp; proficiency tests like TOEFL/IELTS</b>	<b>01</b>
<b>05</b>	Assignment on Writing Skills	Must include 3 types of letters from Module 5	<b>01</b>
<b>06</b>	Application-based Assignment on Ethics	Case studies on ethical dilemma from Module 6	<b>01</b>

### References:

1. Communication Skills by Sanjay Kumar & Pushp Lata
2. Business Communication with Writing Improvement Exercises. Hemphill, McCormick and Hemphill
3. Business Communication: Building Critical Skills by Locker, Kitty O. Kaczmarek, Stephen Kyo
4. Effective Business Communication by Herta Murphy
5. Technical Communication: Principles and Practice by Raman and Sharma
6. Effective Technical Communication: A Guide for Scientists and Engineers by Rizvi
7. Oxford Guide to Effective Writing & Speaking by John Seely
8. English Grammar by Raymond Murphy
9. Word Power Made Easy by Norman Lewis

### Online References:

Sr. No.	Website Name
1.	<a href="https://bbclearningenglish.org">https://bbclearningenglish.org</a>
2.	<a href="https://www.bbc.co.uk/learningenglish">https://www.bbc.co.uk/learningenglish</a>

**Term Work:** Term Work shall consist of at least 6 practicals' based on the above list. Also, Term work Journal must include at least 9 assignments.

**Term Work Marks:** 25 Marks (Total marks) = 10 Marks (Experiment) + 10 Marks (Assignments) + 5 Marks (Attendance)



Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
VSEC101	Engineering Workshop-I	-	2	-	-	-	-	1

Course Code	Course Name	Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
VSEC101	Engineering Workshop-I	--	--	--	--	--	25	--	25

### Lab Objectives

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and hard labor.
3. To get exposure to the interdisciplinary engineering domain.

### Lab Outcomes: Learners will be able to...

1. Develop the necessary skill required to handle/use different fitting tools.
2. Develop skill required for hardware maintenance.
3. Able to install an operating system and system drives.
4. Able to identify the network components and perform basic networking and crimping.
5. Able to prepare the edges of jobs and do simple arc welding.
6. Develop the necessary skill required to handle/use different plumbing tools and simple job.

Sr. No.	Detailed Content	Hrs.	LO Mapping
	<p><b>Note:</b></p> <p>Trade 1 and 2 are compulsory. Select any ONE trade topics out of the topic at trade 3 to 5. Demonstrations and hands on experience to be provided during the periods allotted for the same. Report on the demonstration including suitable sketches is also to be included in the termwork</p> <p>CO-1 is related to Trade-1</p> <p>CO-2 to CO-4 is related to Trade-2CO-5 is related to Trade-3</p> <p>CO-6 is related to Trade-4CO-7 is related to Trade-5</p>		

	CO evaluation is to be done according to the opted Trades in addition to <b>Compulsory Trades</b> .		
<b>Trade-1</b>	<p><b>Fitting (Compulsory):</b></p> <ul style="list-style-type: none"> <li>• Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping.</li> <li>• Term work to include one job involving following operations : filing to size, one simple male- female joint, drilling and tapping</li> </ul>	<b>04</b>	<b>LO1</b>
<b>Trade-2</b>	<p><b>Hardware and Networking: (Compulsory)</b></p> <ul style="list-style-type: none"> <li>• Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc. □ Assembling of PC, Installation of Operating System (Any one) and Device drivers, Boot-up sequence. Installation of application software (at least one) □ Basic troubleshooting and maintenance □ Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables) Basic networking and crimping. NOTE: Hands on experience to be given in a group of not more than four students</li> </ul>	<b>06</b>	<b>LO2, LO3, LO4</b>
<b>Trade-3</b>	<p><b>Welding:</b></p> <ul style="list-style-type: none"> <li>• Edge preparation for welding jobs. Arc welding for different job like, Lap welding of two plates, butt welding of plates with simple cover, arc welding to join plates at right angles.</li> </ul>	<b>06</b>	<b>LO5</b>
<b>Trade 4</b>	<p><b>Plumbing:</b></p> <ul style="list-style-type: none"> <li>• Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic line involving fixing of a water tap and use of coupling, elbow, tee, and union etc.</li> </ul>	<b>04</b>	<b>LO6</b>
<b>Trade-5</b>	<p><b>Machine Shop:</b></p> <ul style="list-style-type: none"> <li>• At least one turning job is to be demonstrated and simple job to be made for Term Work in a group of 4 students.</li> </ul>	<b>06</b>	<b>LO6</b>

**Term Work:** Term Work shall consist of at least 3 Trade based on the above list. Also, Term work.

**Term Work Marks:** 25 Marks (Total marks) = 20 Marks (Workshop Experiment) + 5 Marks (Attendance)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract	Tut	Total
VSEC102	C Programming	--	2*+2	-		2	-	2

Course Code	Course Name	Examination Scheme							
		Theory					Term work	Pract / Oral	Total
		Internal Assessment Test (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
VSEC102	C Programming	-	-	-	-	-	25	25	50

**Lab Objectives:** This subject aims to provide students with an understanding of the role computation can play in solving problems. The Course will be taught using C-Programming Language.

1. Understand and use basic terminology in computer programming.
2. Use various data types in C programs effectively.
3. Design and implement programs involving decision structures, loops, and functions.
4. Design Implement Arrays , String, and Structure
5. Describe and utilize memory dynamics through the use of pointers.
6. Use different data structures and create/update basic data files in C.

**Lab Outcomes:** Learners will be able to

1. Illustrate the basic terminology used in computer programming.
2. Use different data types in a computer program.
3. Design programs involving decision structures, loops and functions.
4. Implement Arrays , String, and Structure
5. Describe the dynamics of memory by the use of pointers.
6. Use different data structures and create/update basic data files.

#### DETAILED SYLLABUS

Sr. No	Module	Detailed Content	Hours	LO mapping
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1	<b>Fundamentals of C-Programming</b>	<p>1.1 Character Set, Identifiers and keywords, Data types, Constants, Variables.</p> <p>1.2 <b>Operators</b>-Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, other operators. Expression, statements, Library Functions, Preprocessor.</p> <p>1.3 <b>Data Input and Output</b> – getchar( ), putchar( ), scanf( ), printf( ), gets( ), puts( ), Structure of C program .</p>	06	LO1, LO2
2	<b>Control Structures</b>	<p>2.1 <b>Branching</b> - If statement, If-else Statement, Multiway decision.</p> <p>2.2 <b>Looping</b> – while, do-while, for</p> <p>2.3 <b>Nested control structure</b>- Switch statement, Continue statement Break statement, Goto statement.</p>	05	LO3
3	<b>Functions and Parameter</b>	<p>3.1 Function -Introduction of Function, Function Main, defining a Function, accessing a Function, Function Prototype, Passing Arguments to a Function, Recursion.</p> <p>3.2 Storage Classes –Auto , Extern , Static, Register</p>	05	LO3
4	<b>Arrays , String Structure</b>	<p>4.1 <b>Array</b>-Concepts, Declaration, Definition, Accessing array element, One-dimensional and Multidimensional array.</p> <p>4.2 <b>String</b>- Basic of String, Array of String, Functions in String.h</p> <p>4.3 <b>Structure</b>- Declaration, Initialization, structure within structure, Operation on structures, Array of Structure.</p>	05	LO4
5	<b>Pointer</b>	<p>5.1 <b>Pointer:</b> Introduction, Definition and uses of Pointers, Address Operator, Pointer Variables, Dereferencing Pointer, Void Pointer, Pointer Arithmetic, Pointers to Pointers, Pointers and Array.</p>	03	LO5
6	<b>Files</b>	<p>6.1 <b>Files:</b> File operation- Opening, Closing, Creating, Reading, Processing File.</p>	02	LO6

#### Text Books

1. “Basics of Computer Science”, by BehrouzForouzan , Cengage Learning .

2. "Programming Techniques through C", by M. G. Venkateshmurthy, Pearson Publication.
3. "Programming in ANSI C", by E. Balaguruswamy, Tata McGraw-Hill Education.
4. "Programming in C", by Pradeep Day and Manas Gosh, Oxford University Press.
5. "Let Us C", by Yashwant Kanetkar, BPB Publication.

### Reference Books

1. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie, Publisher: Prentice Hall  
Publication Date: February 22, 1988 ,ISBN-13: 978-0131103627 ,
2. "C Programming: A Modern Approach" by K. N. King, Publisher: W. W. Norton & Company  
Publication Date: April 26, 2008 (2nd Edition), ISBN-13: 978-0393979503
3. "C Primer Plus" by Stephen Prata, Publisher: Addison-Wesley Professional Publication Date: December 27, 2013 (6th Edition) ISBN-13: 978-0321928429
4. "Programming in C" by Stephen G. Kochan Publisher: Addison-Wesley Professional  
Publication Date: August 18, 2014 (4th Edition) ISBN-13: 978-0321776419

### Online Resources:

Sr. No.	Website Name
1.	Learn C - This website offers a free, interactive tutorial to learn C programming, covering both basic and advanced topics.
2.	Codecademy - Codecademy provides a comprehensive, interactive course for learning C, complete with real-world projects and skill paths.
3.	Coursera - Coursera, in collaboration with Duke University, offers a specialization in C programming, including hands-on projects and a certificate upon completion.
4.	edX - This course, offered by edX, covers C programming with a focus on Linux, including professional certification.

Sr No	Suggested List of Experiments	Hrs
01	a) Program to demonstrate Operators Data Input and Output – getchar( ), putchar( ), scanf( ), printf( ), gets( ), puts( ) b) Program to demonstrate Operators-Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, other operators.	02
02	a) Program to demonstrate Branching - If statement, If-else Statement, Multiway decision. b) Program to demonstrate Looping – while, do-while	02
03	a) Program to demonstrate Nested control structure- Switch statement, Continue statement, Break statement, Goto statement	02
04	a) Program to demonstrate Function, Passing Arguments to a Function (call by value and call by reference	02

05	a) Implement an iterative function for factorial/ Fibonacci etc. b) Implement a recursive function for factorial/ Fibonacci etc.	02
06	a) Program to demonstrate Storage Classes –Auto, Extern, Static, Register	02
07	c) Program to demonstrate Array 1D, d) Program to demonstrate Array 2D	02
08	e) Program to demonstrate String f) Program to demonstrate String arrays of string	02
09	Program to demonstrate Structure Write a program to store and display information of a student/employee etc. using structures. a) Define a structure. b) Read and store details. c) Display the stored information.	02
10	Program to demonstrate pointers a) Define a node structure. b) Implement functions to insert, delete, and display nodes.	02
11	Program to demonstrate files Write a program to maintain a simple student/employee etc. database using file handling. a) Open a file to store student records. b) Implement functions to add, update, and display records. c) Ensure data persistence by saving changes to the file.	02
12	Implement one small application using Function, Files, Structure and Pointers concepts you have learnt in C (eg. : Simple Library Management System 1.Functions: Add, display, and search books. 2. Files: Store and retrieve book data. 3. Structures: Represent a book. 4. Pointers: Manage the list of books dynamically	02

Sr No	List of Assignments / Tutorials	Hrs
01	Flowcharts for programs	02
02	Functions and Parameter	
03	Control Structures	
04	Functions and Parameter	
05	Arrays, String Structure and Union	
06	Pointer and Files	

**Assessment :**

**Term Work:** Term Work shall consist of at least 10 to 12 practicals' based on the above list. Also, Term work Journal must include at least 2 assignments.

**Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Practical & Oral Exam:** An Oral & Practical exam will be held based on the above syllabus.

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Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CC101	Induction cum Universal Human Values	2#	-	-	-	-	-	2

Course Code	Course Name	Theory				Term work	Pract / Oral	Total	
		Internal Assessment Test (IAT)			End Sem Exam				Exam Duration (in Hrs)
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
CC101	Induction cum Universal Human Values	--	--	--	--	--	--	--	

#### Rationale:

“The purpose of the education system is to develop good human beings capable of rational thought and action, possessing compassion and empathy..., with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution. Education must develop not only cognitive capacities... but also social, ethical, and emotional capacities and dispositions.... Education is fundamental for achieving full human potential, developing an equitable and just society, and promoting national development... A holistic and multidisciplinary education would aim to develop all capacities of human beings – intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner” [NEP 2020, p 4].

UHV courses are intended to help students to develop a holistic, humane world vision. A self-reflective, explorational methodology is adopted. All content discussed is universal, rational, and verifiable, and leads to harmony.

#### Holistic education inculcates the following three aspects in the student:

1. **Holistic, Humane Vision of Life** – harmonious individual to cosmos
2. **Human Values**– human feelings, participation based on holistic vision
3. **Skills**– required to live with these values in mutual relationship at all levels of human existence

#### Course Objectives:

The objective of the course is :

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.



5. Prepare learner for achieving full human potential who can be contribute for developing an equitable and just society, and promoting national development
6. developing clarity of these fundamental universal human values to help the learner in understanding and living by the various specific expressions. E.g., National values enshrined in the Constitution, aspirations articulated in NEP 2020, UN MDGs and SDGs...

**Course Outcomes:** After completion of the course learner will be able to

1. Identify basic human aspirations and programme for its fulfilment.
2. Express existing reality of Human being
3. Explain the values in human-human relationship and program for its fulfilment to ensure mutual happiness.
4. Describe harmony in surroundings family and society.
5. Explain harmony nature, existence as coexistence and become more responsible in life, in handling problems with sustainable solutions.
6. Apply what they have learnt to their own self in day-to-day life and utilize the professional competence for augmenting universal human order, develop holistic technologies, management models and production systems.

**Prerequisite:** There is no prerequisite for this course.

#### DETAILED SYLLABUS:

Sr. No.	Name of Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	No prerequisite		
I	<b>Introduction - Need, Basic Guidelines, Content and Process for Value Education</b>	Purpose and motivation for the course, Self-Exploration, Continuous Happiness and Prosperity- the basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations.	<b>05</b>	<b>CO1</b>
II	<b>Understanding Harmony in the Human Being</b>	Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. the Body as an instrument of 'I', characteristics and activities of 'I' and harmony in 'I', harmony of I with the Body: Self-regulation and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Self-regulation and Health.	<b>04</b>	<b>CO2</b>
III	<b>Understanding Harmony in the Family</b>	Understanding values in human-human relationship and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, the other salient values in relationship	<b>07</b>	<b>CO3</b>

IV	<b>Understanding Harmony in the Society</b>	Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order-from family to world family.	<b>03</b>	<b>CO4</b>
V	<b>Understanding Harmony in the Nature and Existence - Whole existence as Coexistence</b>	Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature, cyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence.	<b>04</b>	<b>CO5</b>
VI	<b>Implications of the Holistic Understanding of Harmony on Professional Ethics</b>	Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic. Universal Order, Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order and identify the scope and characteristics of people friendly and eco-friendly production systems. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order. Sum up.	<b>03</b>	<b>CO6</b>

(In every module one lecture can be used for students sharing and discussion)

**Text Books:**

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 3<sup>rd</sup> Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher's Manual Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3. A Foundation Course in Holistic Human Health – Its Philosophy and Practice, Sharmila Asthana, Akhilesh Shukla, T Sundara Raj Perumall, 1st Edition, October 2023, Published by UHV Publications, , Kanpur, UP.7

**A References:**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya
2. Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. Small is Beautiful - E. F Schumacher.

7. Slow is Beautiful - Cecile Andrews
8. Economy of Permanence - J C Kumarappa
9. Bharat Mein Angreji Raj – Pandit Sunderlal
10. Rediscovering India - by Dharampal
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

**Online References:**

Sr. No.	Website Name
7.	<a href="https://uhv.org.in">https://uhv.org.in</a>

**Note:**

1. This is an **audit course**.
2. This course is to be taught by faculty from every teaching department
3. Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
4. In the discussions, the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration
5. One or two periods from each module may be used for tutorials. These are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life.
6. Depending on the nature of topics, worksheets, home assignment and/or activity can be included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.