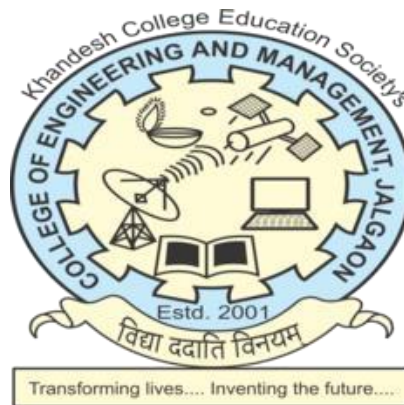


Khandesh College Education Society's  
**College of Engineering & Management**  
NH-6, Behind DIC Office, Jalgaon 425001  
(An Autonomous Institute Approved by AICTE and Affiliated to DBATU, Lonere)



**Course Structure and Detailed  
Syllabus**  
of  
**First Year**  
**Engineering for**  
**B. Tech Programme**  
**in**  
**Electrical Engineering**  
**&**  
**Mechanical Engineering**

**In line with National Education Policy 2020**

**Effective from Academic year 2025-26**

**Khandesh College Education Society's**  
**College of Engineering and Management, Jalgaon**  
**Group B**  
**Electrical Engineering, Mechanical Engineering**  
**Semester-I**

Sr. No.	Course Category	Course Code	Course Title	Exam Head	Teaching Scheme			Evaluation Scheme				Total	Credit
					L	T	P	Continuous Assessment			ESE		
								MSE	CA-1	CA-2			
1	BSC	BSC101	Engineering Mathematics- I	TH	3	1		20	10	10	60	100	4
2	ESC	ESC102	C Programming	TH	2			20	10	10	60	100	2
3	ESC	ESC102L	C Programming Lab	PR			2		30	30	40	100	1
4	BSC	BSC103	Engineering Chemistry	TH	2			20	10	10	60	100	2
5	BSC	BSC103L	Engineering Chemistry Lab	PR			2		30	30	40	100	1
6	ESC	ESC104	Engineering Graphics	TH	2			20	10	10	60	100	2
7	ESC	ESC104L	Engineering Graphics Lab	OR			2		30	30	40	100	1
8	AEC	HSSM105	Personality Development and Communication Skill	TH	2			20	10	10	60	100	2
9	AEC	HSSM105L	Personality Development and Communication Skill Lab	TW			2			50		50	1
10	VSEC	EEVSEC106L	Electrical Wiring & Installation Lab (EE)	PR			2		30	30	40	100	1
		MEVSEC106L	Advance CNC Technology Lab (ME)										
11	VSEC	VSEC107L	Workshop Practices	TW			2			50		50	1
12	IKS	IKS108	#IKS Bucket	TW	2					50		50	2
					13	1	12	100	170	320	460	1050	20

\*As per the Rules and Regulations of Autonomy, it is mandatory for students to earn audit points through participation/performance in co-curricular and extra-curricular activities.

**Group B**  
**Semester-II**

Sr. No.	Course Category	Course Code	Course Title	Exam Head	Teaching Scheme			Evaluation Scheme				Total	Credit
					L	T	P	Continuous Assessment			ESE		
								MSE	CA-1	CA-2			
1	BSC	BSC201	Engineering Mathematics- II	TH	3	1		20	10	10	60	100	4
2	ESC	ESC202	Python Programming	TW	1					50		50	1
3	ESC	ESC202L	Python Programming Lab	PR			2		30	30	40	100	1
4	BSC	BSC203	Engineering Physics	TH	2			20	10	10	60	100	2
5	BSC	BSC203L	Engineering Physics Lab	PR			2		30	30	40	100	1
6	PCC	EEPCC204	Electrical Technology (EE)	TW	1					50		50	1
7		MEPCC204	Elements of Mechanical Engineering (ME)										
8	VSEC	EEVSEC204L	Electrical Technology Lab (EE)	PR			4	30	30	40	100	2	
9		MEVSEC204L	Elements of Mechanical Engineering Lab (ME)										
10	ESC	ESC205	Engineering Mechanics	TH	3	1		20	10	10	60	100	4
11	ESC	ESC205L	Engineering Mechanics Lab	TW			2			50		50	1
12	ESC	ESC206	Basic Electrical and Electronics Engineering	TH	3			20	10	10	60	100	3
13	ESC	ESC206L	Basic Electrical and Electronics Engineering Lab	PR			2		30	30	40	100	1
14	CCA	CCA207	Health and Wellness/ Yoga	TW			2			50		50	1
					13	2	14	80	160	360	400	1000	22

<b>Sr. No.</b>	<b>Abbreviation of</b>	<b>Stands For</b>
1	BSC	Basic Science Course,
2	ESC	Engineering Science Course,
3	PCC	Programming Core Course
4	PEC	Programming Elective Course
5	Multidisciplinary (OE)	Open Elective Other than particular program
6	VSEC	Vocational and Skill Enhancement Course
7	HSSM	Humanities Social Science and Management
8	IKS	Indian Knowledge System
9	HSSM	VEC: Value Education Course
10	CCA	Co- curricular & Extracurricular Activities
11	L	Lecture Hours
12	T	Tutorials Hours
13	P	Practical Hours
14	MSE	Mid Semester Examination
15	CA1	Continuous Assessment Marks of Assignments
16	CA2	Continuous Assessment Marks of Class Test
17	ESE	End Semester Examination
18	TW	Term work Assessment
19	TH	Theory Examination
20	OR	Oral Examination
21	PR	Practical Examination

**First Year (Semester - I)**  
**Engineering Mathematics -I**

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
BSC101	Lecture: 3 hrs./week Tutorial : 1hr./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)	4	BSC

**Course Objectives:**

- 1) To understand and apply linear algebra techniques, including matrix inversion, rank, eigen values/eigenvectors, and Cayley –Hamilton theorem, for solving systems of linear equations in engineering contexts.
- 2) To learn partial differentiation methods and their use in analyzing multivariable functions—including total derivatives, Euler’s theorem for homogeneous functions, and changing variables.
- 3) To apply partial differentiation techniques, including use of Jacobians, Taylor and Maclaurin expansions, finding maxima/minima, and solving with Lagrange multipliers for optimizing engineering problems.
- 4) To develop skills in reduction formulas and curve tracing, enabling graphical analysis and integrative reduction in mathematical modeling.
- 5) To handle multiple integrals—double and triple integrals in Cartesian and polar form—and apply them to compute areas, volumes, surface areas, centroids, and moments of inertia in engineering problems.

**Course Outcomes:**

- CO 1. Equip students with the fundamental knowledge to apply matrix techniques (linear equations) for solving various engineering problems.
- CO 2. Analyze how changes with respect to one variable while holding the other constant function of multiple variables.
- CO 3. Compute Jacobian of function of several variables and maxima/minima, series of expansion of multi valued functions.
- CO 4. Identify and sketch of curves in various coordinate system.
- CO 5. Compute multiple integrals and their applications to find area and volume.

**Course Content:**

**Unit 1: Matrices**

**[9 Hours]**

Inverse of a matrix by Gauss-Jordan method; Rank of a matrix; Normal form of a matrix; Consistency of non- homogeneous and homogeneous system of linear equations; Eigen values and Eigen vectors; Properties of Eigen values and Eigen vectors (without proofs); Cayley-Hamilton’s theorem (without proof) and its applications.

## **Unit 2: Partial Differentiation**

[9 Hours]

Partial derivatives of first and higher orders; Homogeneous functions–Euler’s Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

## **Unit 3: Applications of Partial Differentiation**

[8 Hours]

Jacobians - properties; Taylor’s and McLaurin’s theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange’s method of undetermined multipliers.

## **Unit 4: Tracing of Curve and Reduction Formulae**

[8 Hours]

Reduction formulae for  $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$ ,  $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$ ,  $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x \, dx$ ; Tracing of the curves given in Cartesian, parametric & polar forms.

## **Unit 5: Double and Triple Integration**

[8 Hours]

Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral; Applications of multiple integrals to find area as double integral, volume as triple integral and surface area.

## **Basics of MATLAB or SCILAB**

[16 Hours]

Overview of MATLAB or Scilab, Basic Syntax, Introducing Variables, Relational and Logical, Operators Vectors Matrix. Practice examples on Unit 1 to Unit 5 on MATLAB or Scilab.

## **Text Books**

- 1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
- 2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
- 3) A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
- 4) A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- 5) Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

## **Reference Books**

- 1) Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
- 2) A Text Book of Engineering Mathematics by Peter O’ Neil, Thomson Asia Pvt. Ltd., Singapore.
- 3) Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw – Hill Publishing Company Ltd., New Delhi.
- 4) Master in MATLAB 7 (Edition 8) by Duane Hanselman, Bruce Littlefield, Pearson Prentice Hall, 2005.

## First Year (Semester - I)

### C Programming

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC102	Lecture: 2 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)	2	ESC

#### Course Objectives:

1. To develop logical skills and programming skills to solve basic and advanced computing problems.
2. To learn the c-programming language concepts for problem solving.

#### Course Outcomes:

After completion of this course, students will be able to:

**CO1.** Gain a broad perspective about the uses of computers in engineering industry and C Programming.

**CO2.** Understand the use of Types, operators and expressions in programming.

**CO3.** Apply the knowledge of flow statements and functions for control based computational algorithms.

**CO4.** Understand the concepts of arrays and pointers in C.

**CO5.** Apply the knowledge of structure in OS file management

#### Course Contents:

#### **UNIT- 1: Fundamental of the Computer and Computing Concepts [6 Hours]**

Generation of computers, Classification of computers, Basic Anatomy of Computer System, Input Devices, Processor, Output Devices, Memory Management, Types of Computer Software, Overview of Operating system, Concept of Networking. Process of programming: Editing, Compiling, Error Checking, executing, testing and debugging of programs. IDE commands. Eclipse for C Program development, basic of Flowcharts and Algorithms.

#### **UNIT- 2: Types, Operators and Expressions [6 Hours]**

C Tokens, Data types, sizes, initialization and declarations, arithmetic operators, relational and logical operators, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation, type conversions.

#### **UNIT- 3: Control Flow [6 Hours]**

Statements and Blocks: If-else, if-else ladder, nested if-else, switch-case, Loops: while, for, do-while, break, continue, go to and Labels. Functions and Program Structure: Basic of functions, In build functions, user defined functions, function returning various data types, external variables scope rules.

**UNIT- 4: Arrays and Pointers in C****[6 Hours]**

Initializing arrays, initializing character arrays, multidimensional arrays. Pointer: Definition and uses of pointers, Pointers to integers, characters, floats, arrays.

**UNIT- 5: Structures in C and File Management:****[6 Hours]**

Basics of structures, structures and functions arrays of structures, Pointers in structures. Introduction to File Management: Defining and Opening File, Closing File, Input/output Operations on File.

**Text Books**

- 1) R. S. Bichkar, Programming with C, Orient Blackswan, 1st Edition, 2012.
- 2) Herbert Schildt, C the Complete Reference, McGraw-Hill Publication, 2000.
- 3) Balguru wamy, Programming in C, PHI.
- 4) Yashwant Kanitkar, Let Us C, PHI.

**Reference Books**

- 1) Brian W. Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India.
- 2) R. G. Dromey, —How to solve it by Computer, 1st Edition, Pearson Education, 2006.
- 3) Rajaraman V, the Fundamentals of Computer, 6th Edition, Prentice-Hall of India, 2014.
- 4) Steve Oualline, Practical C Programming, 3 Edition, O'Reilly Press, 2006.
- 5) Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 7th Edition, Pearson Education, 2012.
- 6) Balagurusamy E, Programming in ANSI C, 8th Edition, Tata McGraw-Hill, 2019.
- 7) Gottfried, Programming with C, 3 Edition, Tata McGraw-Hill, 2018.

## First Year (Semester - I)

### C-Programming Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC102L	Practical- 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	2	ESC

#### Course Objectives:

1. To understand the basic structure of C programs, data types, variables, and operators.
2. To develop problem-solving skills using conditional statements, loops, and functions in C programming.
3. To learn the implementation of arrays, pointers, structures, and recursion for efficient programming solutions.
4. To understand file handling concepts and perform data processing operations using C programs.
5. To develop logical thinking and programming ability for solving real-world computational problems.

#### Course Outcomes:

After successful completion of this course, students will be able to:

**CO1.** Write and execute C programs using variables, data types, operators, and expressions.

**CO2.** Apply decision-making and looping statements to solve programming problems effectively.

**CO3.** Develop modular programs using functions, recursion, arrays, and pointers.

**CO4.** Implement structures and arrays of structures for managing and processing data records.

**CO5.** Perform file handling operations such as reading, writing, copying, and processing data files in C.

#### LIST OF PRACTICALS

**Minimum 10 Practical's are to be performed based on contents from syllabus Sample List:**

Practical No.	Title
1	Write a C program to declare and initialize variables of different data types and display their sizes.
2	Implement arithmetic, relational, and logical operations in C programs and display the results.
3	Write a program to demonstrate the use of conditional expressions and explain the order of evaluation.
4	Create a C program to perform bit wise operations on integer variables and print the results.
5	Develop a C program to demonstrate the use of assignment operators and evaluate expressions involving them.

6	Write a C program to implement various control flow statements such as if-else, switch- case, and loops, to solve a given problem.
7	Create a function in C to calculate the factorial of a given number and display the result.
8	Write a program to find the sum of digits of a number using recursion.
9	Implement a menu-driven programming C using switch-case statements to perform arithmetic operations.
10	Develop a C program to print the Fibonacci series using a loop.
11	Write a C program to initialize and display elements of a one-dimensional array.
12	Implement a program to find the largest and smallest elements in an array
13	Create a C program to transpose a matrix using a two-dimensional array.
14	Write a program to demonstrate the use of pointers to access elements of an array.
15	Develop a C program to swap two numbers using pointers.
16	Define a structure to represent a student record with attributes like name, roll number, and marks, and write a program to display the student details.
17	Create an array of structures to store details of multiple students and perform operations like searching and sorting based on roll number.
18	Write a program to read data from a text file, perform some operations (e.g., calculation), and write the results to another file.
19	Implement file handling operations in C to copy the contents of one file to another.

## First Year (Semester - I)

### Engineering Chemistry

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
BSC203	Lecture: 2 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)	2	BSC

#### Course Objectives:

- 1) To understanding water quality parameters, treatment processes, and relevant regulations.
- 2) To providing students with a comprehensive understanding of the properties, behavior, and applications of various engineering materials
- 3) To identifying metals & corrosion types, understanding their causes, and applying appropriate control method.
- 4) To understanding the properties and applications of fuels and lubricants, particularly in the context of engines and machinery.
- 5) To understanding of this field, enabling them to analyze and apply electrochemical principles to various applications.

#### Course Outcomes:

**CO1.** Evaluate water quality, select appropriate treatment technologies, and understand operational and maintenance procedure.

**CO2.** Select appropriate materials for specific engineering applications based on their properties and performance requirements.

**CO3.** Assess corrosion risks, select suitable materials, and implement effective corrosion management strategies

**CO4.** Ability to classify fuels and lubricants, understand their properties, and evaluate their performance in engines

**CO5.** Apply their understanding of electrochemistry to various applications, such as batteries, fuel cells.

## **Course Content-**

### **Unit 1: Water Treatment**

**[6 Hours]**

Introduction, Hard and Soft water, Disadvantages of hard water –In Domestic use, In Industrial use, softening of water – Zeolite process, Ion exchange process, Hot Lime –Soda process, water characteristics- Hardness and its determination by EDTA method, Dissolved oxygen (DO) and its determination by Winkler's method.

### **Unit 2: Engineering Materials**

**[6 Hours]**

Cement: Introduction, Portland cement, Chemical Composition of Cement Gypsum: Plaster of Paris, Properties and Uses High polymers: Introduction. Types of Polymerization, Thermoplastic and Thermosetting resin, Constituent of Plastic, Synthesis of Urea formaldehyde and its Properties and Uses, Brief discussion on Natural Rubber, Synthesis of Styrene - butadiene rubber and its Properties and uses.

### **Unit 3: Metals and Corrosion**

**[5 Hours]**

Introduction, Occurrence of metals in free & combined state, Physical & chemical properties of metals, Fundamental reason of corrosion, Electrochemical Corrosion (Wet corrosion), Direct Chemical Corrosion (Dry corrosion), Factors affecting the rate of corrosion, Types of corrosion, Methods to minimize the rate of corrosion- Proper designing, Cathodic and Anodic protection method.

### **Unit 4: Fuels and Lubricants**

**[7 Hours]**

Fuels: Introduction, Classification of fuel, Calorific value of a fuel, Characteristics of a good fuel, solid fuel- Coal and Various types of Coal, Analysis of coal- Proximate and Ultimate analysis, Liquid fuel- Refining of Petroleum. Lubricants: Introduction, classification of lubricants - Solid, Semi –solid and Liquid Lubricants, Properties of lubricants: Physical properties – Viscosity, Viscosity index, surface tension, Flash point and Fire point. Chemical properties – Acidity, Saponification.

### **Unit 5: Electrochemistry**

**[6 Hours]**

Introduction – Definition and units of Ohm's Law, Specific Resistance, Specific Conductance, Equivalent and Molecular Conductance, Cell constant, Conductometric titrations, Nernst equation and its application for the calculation of half-cell potential, Glass electrode, Fuel cell (H<sub>2</sub>O<sub>2</sub>), Advantages of fuel cell, Ostwald's theory of acid- base indicator.

**Text Books:**

- 1) Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1992.
- 2) Bhal & Tuli, Text book of Physical Chemistry, S. Chand & Company, New Delhi.
- 3) Shikha Agarwal, Engineering Chemistry- Fundamentals and applications, Cambridge Publishers - 2015.
- 4) Gurudeep Chatwal and Sham Anand, Instrumental methods of Chemical Analysis, Himalaya Publishing House, New Delhi, 2013
- 5) V. R. Gowarikar, Polymer Science, New Age International Publication, 2015

**Reference Books:**

- 1) Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi, 2013
- 2) O. G. Palanna, Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi., 2015
- 3) WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
- 4) S. S. Dara, Engineering Chemistry, McGraw Hill Publication, New Delhi., 2013
- 5) Willard, Hobart H.; Merritt, Lynne L., Jr.; Dean, John A. Instrumental Methods of Analysis, American Chemical Society, 2013

## First Year (Semester - I)

### Engineering Chemistry Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
BSC203L	Practical-2 hrs. /week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	BSC

#### Course Outcomes:

Students will be able to:

**CO1.** Analyze water quality by determining key parameters such as hardness, alkalinity, pH, and chloride content using standard titrimetric and instrumental methods.

**CO2.** Determine the properties of fuels and lubricants and assess their suitability for industrial and engineering applications.

**CO3.** Demonstrate effective use of laboratory techniques, instruments, and safety procedures while working in a chemistry lab.

#### LIST OF PRACTICALS

Minimum 10 practical's are to be performed based on contents from syllabus Sample List of Practical's:

Practical No.	Title
1	Determination of Hardness of water sample by EDTA method.
2	Determination of Chloride content in water sample by precipitation titration method.
3	Determination of Dissolve Oxygen in water by Iodometric method.
4	To determine Alkalinity water sample.
5	Determination of concentration of strong Acid by titrating it conductometrically by strong base.
6	Determination of Percent purity of Bleaching Powder.
7	To determine Calorific value of a fuel.
8	Determination of Acid value of an oil sample.
9	Determination of Saponification value of an oil sample.
10	To determine Surface tension of the given liquid at room temperature by Stalagmometer.
11	To determine the coefficient of Viscosity of a given liquid using Ostwald's Viscometer
12	To determine the strength of given HCL using a Standard solution of NaOH by pH-metric Titration (Acid Base titration).

**Reference Books:**

1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, New Delhi.
2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.
3. Practical in Engineering Chemistry, S. S. Dara

## First Year (Semester - I)

### Engineering Graphics

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC104	Lecture: 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	2	ESC

#### Course Objectives:

1. To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. To prepare you to communicate effectively.
3. To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

#### Course Outcome:

- CO1.** Understand the basics of engineering graphics and its applications.
- CO2.** Describe the common terms used in design and drawing.
- CO3.** Construct the positions of line for given conditions.
- CO4.** Visualize the 2D and 3D views of the object.
- CO5.** Ability to apply orthographic, sectional, auxiliary and isometric view in engineering drawing.
- CO6.** Understand the geometries of development of engineering projects.

#### Course Content-

##### **Unit 1: Introduction to Engineering Graphics** **[6 Hours]**

Principles of Engineering Graphics and their significance, usage of Drawing Instruments and Supporting Material, Letters and Numbers as per BIS: SP46-2003, Scale (Plane, Diagonal & Vernier scale) dimensioning techniques, geometrical construction, Curves and Conic Section draw ellipse by directrix and arc of circle method. Draw parabola by directrix and rectangle method. Draw hyperbola by rectangle and directrix method. Cycloid, Epicycloid, Hypocycloid and Involute.

##### **Unit 2: Projections of Points, Lines and Planes** **[6 Hours]**

Projections of points, point is situated in different quadrants, types of projection methods, Projections of straight lines, Principle of Orthographic Projections, Projection of Line, Lines inclined to both the

Planes, traces of line, projections of planes, types of planes, Projection of different simple shapes e.g. Circle, Triangle, Rectangle, Pentagon and Hexagon on principle plane (Inclined to one plane and to both planes)

**Unit 3: Projection of Solids and Section of Solids**

**[6 Hours]**

Projection of solids, types of solids, Projection of Prism, Pyramid, Cone, Cylinder and Cube with their axis inclined to one reference plane and parallel to other, axis inclined to both reference plane. Sections of solids, Section planes perpendicular to one plane and parallel or inclined to other plane.

**Unit 4: Orthographic Projections**

**[6 Hours]**

Orthographic projections of different machine parts problem on first angle & Third Angle, Types of sections and Conversion of pictorial view into sectional orthographic views.

**Unit 5: Isometric Projections**

**[6 Hours]**

Introduction, Isometric axes, lines, angles and planes, true scale and isometric scale. Isometric projection and Isometric view Conversion of given orthographic view into isometric projection.

**Reference/Text Books:**

- 1) N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 46th Edition, 2003.
- 2) K. V. Natarajan, A text book of Engineering Graphic, Dhanalakshmi Publishers, Chennai, 2006.
- 3) K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd, 2008.
- 4) 4. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to AutoCAD, Mc-GrawHill Education, 2017.

**First Year (Semester - I)**  
**Engineering Graphics Lab**

<b>Course Code</b>	<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit</b>	<b>Course Category</b>
ESC104L	Practical: 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	ESE

### **Course Objectives**

1. To understand the principles of engineering drawing and graphical representation.
2. To develop visualization and drafting skills for engineering objects.
3. To learn orthographic and isometric projection techniques.
4. To prepare engineering drawings as per BIS standards.

### **Course Outcomes**

1. Draw and interpret engineering drawings using standard conventions.
2. Prepare projections of points, lines, planes and solids.
3. Convert orthographic views into isometric views and vice versa.
4. Apply graphical visualization skills in engineering applications.

### **LIST OF PRACTICALS**

**Minimum 8 practicals' are to be performed based on contents from syllabus sample list:**

<b>Sr. No.</b>	<b>Name of Experiments</b>
1	To Draw Lines, Lettering and Dimensioning as per BIS Standards.
2	To Perform Geometrical Constructions and Draw Engineering Curves.
3	To Draw Projections of Points and Straight Lines.
4	To Draw Projections of Planes.
5	To Draw Projections of Solids.
6	To Draw Sections and Sectional Views of Solids.
7	To Draw Orthographic Projections of Objects.
8	To Draw Isometric Projections of Solids and Objects.
9	To Draw Orthographic Projections of Different Machine Parts Using First Angle Projection Method.
10	To Convert Given Orthographic Views into Isometric Views.

## First Year (Semester - I)

### Personality Development and Communication Skills

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
AEC105	Lecture: 2 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)	2	AEC

#### Course Objectives:

1. To know and apply speaking and writing skills in professional as well as social situations
2. To Overcome Mother Tongue Influence and demonstrate neutral accent while exercising English
3. To know and apply communication skills for Presentations, Group Discussion and interpersonal interactions.
4. To know and apply grammar correctly during Speaking and Writing situations especially in context with Presentations, Public Speaking, Report writing and Business Correspondence.

#### Course Outcome:

**CO 1.** Inculcating the soft skills in theoretical and practical ways and also to develop the effective communication skills among students.

**CO 2.** Developing the effective communication skills among students.

**CO 3.** Learning about the essential factors for personality development and bringing them into practice.

#### Course Content:

##### Unit 1: Communication and Communication Processes

[6 Hour]

Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcoming them, Verbal and Non-verbal Communication Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Fast Reading, Strategies for Reading, Comprehension. Listening: Importance of Listening, Types of Listening and Barriers to Listening.

##### Unit 2: Verbal & Non-Verbal Communication

[6 Hour]

Use of Language in Spoken Communication, Principles and Practice of Group Discussion, Public Speaking (Addressing Small Groups and Making Presentation), Interview Techniques, Appropriate Use of Non-verbal Communication, Presentation Skills, Extempore, Elocution.

**Unit 3: Study of Sounds in English****[3 Hour]**

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English

**Unit 4: English Grammar****[5 Hour]**

Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Synonyms and Antonyms, Common Errors.

**Unit 5: Writing Skills, Reading Skills & Listening Skills****[5 Hour]**

Features of Good Language, Difference between Technical Style and Literary Style, Writing Emails, Formal and Informal English, Technical Reports: Report Writing: Format, Structure and Types Letter Writing: Types, Parts, Layouts, Letters and Applications, Use of Different Expressions and Style, Writing Job Application Letter and Resume

**Unit 6: Personality Development****[5 Hour]**

**Module 1:** Personality- The Introduction, Personality meaning, determinants- physical, intellectual, emotional, cultural, Traits of personality, importance of personality development.

**Module 2:** Personality Development, Grooming, dress code, do's and don'ts, Social etiquettes, self-confidence.

**Module 3:** Self Analysis, SWOT analysis, Creative thinking, Goal setting, time management

**Reference Books**

- 1) Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2019.
- 2) Bovee, Thill & Schatzman, Business Communication Today, Pearson Education, 2016.
- 3) Raymond V. Lesikar, Marie E. Flatley, Kathryn Rentz, Basic Business Communication: Skills for Empowering the Internet Generation, McGraw Hill, 2017.
- 4) John Seely, Oxford Guide to Effective Writing and Speaking, Oxford University Press, 2013.
- 5) T. Balasubramanian, A Textbook of English Phonetics for Indian Students, Macmillan Publishers, 2012.
- 6) Wren & Martin, High School English Grammar and Composition, S. Chand Publishing, 2017.
- 7) Shiv Khera, You Can Win: A Step-by-Step Tool for Top Achievers, Bloomsbury India, 2018.
- 8) Stephen R. Covey, The 7 Habits of Highly Effective People, Simon & Schuster, 2020.
- 9) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2016.

## First Year (Semester - I)

### Personality Development and Communication Skill Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
AEC105L	Practical-2 hrs. /week	Continuous Assessment: 50 Marks	1	AEC

#### Course Outcome:

**CO1.** Inculcating the soft skills in theoretical and practical ways and also to develop the effective communication skills among students.

**CO2.** Developing the effective communication skills among students.

**CO3.** Learning about the essential factors for personality development and bringing them into practice.

### LIST OF PRACTICAL

Minimum 10 practical's are to be performed based on contents from syllabus Sample List of Practical's:

Practical No.	Title
1	How to introduce oneself?
2	Introduction to Phonemic symbols.
3	Articulation of sounds in English with proper manner
4	Practice and exercises on articulation of sounds
5	Read Pronunciations/transcriptions from the dictionary
6	Practice and exercises on pronunciations of words
7	Introduction to stress and intonation
8	Rapid reading sessions
9	Know your friend
10	How to introduce yourself
11	Extempore
12	Group discussion
13	Participating in a debate
14	Presentation techniques
15	Interview techniques

## First Year (Semester - I)

### Electrical Wiring & Installation Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
EEVSEC106L	Practical: 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	VSEC

#### Course Objectives:

- To provide hands-on experience in basic wiring and installation techniques.
- To introduce safety measures and tools used in electrical installations.
- To familiarize students with standard wiring systems and household/commercial applications.

#### Course Outcomes:

On successful completion, students will be able to:

**CO1.** Identify and use electrical tools and accessories.

**CO2.** Perform various types of wiring techniques.

**CO3.** Understand single-phase supply distribution in homes.

**CO4.** Interpret wiring diagrams and install circuits accordingly.

**CO5.** Follow safety norms and earthing practices in installation work.

#### LIST OF PRACTICAL

Minimum 10 practical's are to be performed based on contents from syllabus Sample List of Practical's:

Practical No.	Name of Practical
1	Use of different electrical safety accessories and follow safe practices.
2	Study and identification of electrical tools, wires, cables, and protective devices (MCB, ELCB, Fuse)
3	Preparation of electrical wire joints (simple twist, married, Tee and western union joints britannia straight, Britannia tee and rattail joints).
4	Lug crimping for cable leads, Testing of rewirable fuse and Selection of fuses in different lighting circuits.
5	Preparation of series lamp test board with 2m wire extension.
6	Testing of single pole one way, two ways switches and MCB using relevant tools and instruments.

7	Wiring layout of a small home /office using symbols and design plan.
8	Stair case wiring (1-way and 2-way control) and Go down wiring (control of multiple lamps in sequence)
9	Series and parallel connections of lamps.
10	Sub-circuit wiring (Power + Lighting) from distribution board (1 BHK wiring system).
11	Tracing of electrical schematic drawings of a panel of any electrical machine in your Laboratory.
12	Testing of domestic wiring using Megger and test lamp.

### **Recommended Books and References**

- 1) “Electrical Wiring, Estimating and Costing” – S.L. Uppal & G. C. Garg
- 2) “Basic Electrical Engineering Laboratory Manual” – D. P. Kothari
- 3) “Electrical Installation Work” – Brian Scaddan (Newnes)
- 4) “Electrical Workshop: Safety, Installation & Testing” – R.P. Singh
- 5) “A Textbook of Electrical Technology, Vol 1” – B. L. Theraja & A. K. Theraja (Basic concepts and wiring)
- 6) IS Codes: IS 732 (Code of Practice for Electrical Wiring Installations)

## First Year (Semester - I)

### Advance CNC Technology Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
MEVSEC106L	Practical: 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	VSEC

#### LIST OF PRACTICAL

Practical No.	Title
1	To study various CNC Milling codes and addresses
2	CNC Programming and Simulation.
3	Setting up of work piece zero position and machining in Modular Vertical 3 Axis CNC Milling machine.
4	Write a manual part program for Rectangular Pocketing operation for the component
5	To write a manual part program for machining the component through canned cycle for the component
6	To study various CNC Turning codes and addresses
7	Setting up of work piece zero position and machining in Modular CNC Turning machine.
8	To write a manual part program for step turning operation with G90 cycle for components
9	To write a manual part program for taper turning operation for component
10	To write a manual part program for multiple turning operation for component.
11	Preparation of job on CNC Milling machine
12	Preparation of job on CNC turning machine

## First Year (Semester - I)

### Workshops Practices

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
VSEC107	Practical : 2 hr./week	Continuous Assessment: 50 Marks	1	VSEC

#### Course Objectives:

- 1) To impart knowledge and skills to use tools, machines, equipment and measuring instruments
- 2) To develop general machining skills
- 3) To educate about safe handling of machines and tools
- 4) To develop a skill in dignity of labour, precision, safety at workplace, team working and development of right attitude.

#### Course Outcome:

- CO1.** Prepare simple wooden joints and parts using wood working tools and machines
- CO2.** Apply the fitting and plumbing skills and produce a job with specified dimensions
- CO3.** Practice sheet metal tools and machine to develop the sheet metal articles
- CO4.** Practice edge preparation for simple Lap Built T Joint using Arc/GAS/Resistance welding equipment
- CO5.** Demonstrate machining process including turning, facing, step turning, drilling and parting

#### Course Contents:

**A) Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tendon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.

**B) Welding:** Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.

**C) Fitting and Plumbing:** Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation, Different types of pipes, joints, taps, fixtures and accessories used in plumbing, safety precautions.

**D) Sheet Metal Work:** Simple development and cutting, bending, Beading, Flanging, Lancing and shearing of sheet metal, Sheet metal machines - Bending Machine, Guillotine shear, Sheet metal joints, Fluxes and their use.

**E) Machine shop:** Lathe machine, types of lathes, major parts, cutting tool, turning operations, safety precautions

### List of Practical:

Pr. No.	Title
1	Wood sizing exercises in planning, marking, sawing, chiseling and grooving to make half lap joint, cross lap joint, and mortise tenon joint and cylindrical wooden parts.
2	A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3	A job on use of plumbing tools and preparation of plumbing line involving fixing of water tap and use of elbow, tee, union and coupling, etc.
4	Making a small parts using GI sheet involving development, marking, cutting, bending, brazing and soldering operations- i) Tray ii) Funnel and similar articles.
5	Exercise in Arc welding (MMAW) to make a square butt joint. Exercise in Resistance (Spot) welding to make a lap joint.
6	A job using power operated tools related to sheet metal work, Welding, Fitting, Plumbing, Carpentry and patternmaking.
7	A job on turning of a Mild Steel cylindrical job using center lathe

### Reference/Text Books:

- 1) K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi, 2010.
- 2) Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.

## First Year (Semester - I)

### Kautilya's Arthashastra

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
IKS108	Tutorial: 2 hrs./week	Continuous Assessment: 50 Marks	2	IKS

#### Course Objectives:

- 1) To introduce students to the foundational principles of statecraft, economics, and governance as enunciated by Kautilya.
- 2) To highlight the relevance of Arthashastra in contemporary public policy, corporate governance, strategic thinking, and ethics.
- 3) To encourage critical thinking and appreciation of Indian knowledge systems in modern contexts.

#### Course Outcome:

1. Explain the life of Kautilya and the historical significance, structure, and classification of Arthashastra.
2. Analyze the Saptanga Theory and evaluate its relevance to modern statecraft and administration.
3. Interpret Arthashastra's economic and administrative policies including taxation, trade, governance, and intelligence systems.
4. Apply ethical values, leadership qualities, and strategic thinking (Mandala theory, Shama-Dama-Bheda-Danda) in decision-making.
5. Relate Arthashastra's principles to modern management, corporate governance, HRM, and public policy.
6. Examine real-world case studies to connect Arthashastra's teachings with contemporary governance and business practices.

#### Course Contents:

##### Module 1: Introduction to Kautilya and Arthashastra

[4 Hours]

- Life and background of Chanakya (Kautilya/Vishnugupta)
- Historical context and significance of Arthashastra
- Structure and classification of Arthashastra (Books/Adhikaranas)

**Module 2: Elements of State (Saptanga Theory)****[4 Hours]**

- The seven pillars of a kingdom: Swami (King), Amatya (Minister), Janapada (Population), Durga (Fort), Kosa (Treasury), Danda (Army), Mitra (Alliances)
- Relevance in modern state administration

**Module 3: Economic and Administrative Policies****[6 Hours]**

- Revenue systems and taxation
- Trade, markets, and price control
- Governance and administrative structure
- Role of espionage and intelligence system

**Module 4: Ethics, Leadership and Strategic Thinking****[6 Hours]**

- Raj Dharma and moral values
- Leadership qualities and decision-making
- Diplomacy and conflict resolution (Mandala theory)
- Use of Shama (conciliation), Dama (gifts), Bheda (division), Danda (punishment)

**Module 5: Relevance in Modern Management and Governance****[5 Hours]**

- Application in corporate governance, HRM, strategic management
- Lessons for public policy, law, and administration
- Chanakya's management principles in startups and leadership

**Module 6: Case Studies and Discussions****[5 Hours]**

- Case-based analysis of Arthashastra principles in real-world scenarios
- Group discussion, assignments, and presentations

**Recommended Books and Resources:****Primary Texts**

- 1) Kautilya's Arthashastra – Translated by R. Shamasastry (English Translation).
- 2) The Arthashastra – Translated by L.N. Rangarajan, Penguin Classics.

**Supplementary Books**

- 1) Corporate Chanakya – Dr. Radhakrishnan Pillai
- 2) Chanakya in Daily Life – Dr. Radhakrishnan Pillai
- 3) Chanakya's 7 Secrets of Leadership – D. Sivanandhan & Dr. Radhakrishnan Pillai

- 4) Kautilya's Arthashastra: *The Way of Financial Management and Economic Governance* – B. K. Chaturvedi

### **Online Resources**

- 1) ePG Pathshala modules on Indian Political Thought
- 2) IGNOU Notes on Indian Political Thinkers
- 3) NPTEL Lecture Series (Humanities and Social Sciences)

## First Year (Semester - II)

### Engineering Mathematics -II

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
BSC201	Lecture: 3 hrs./week Tutorial : 1 hr./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)	4	BSC

#### Course Objectives:

1. To know and discuss the need and use of complex variables to find roots, to separate complex quantities, and to establish a relation between circular and hyperbolic functions.
2. To understand and solve first and higher-order differential equations and apply them as a mathematical modeling in electric and mechanical systems.
3. To determine Fourier series representation of periodic functions over different intervals.
4. To demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence & curl in various engineering streams.
5. To know and apply the principles of vector integration to transform line integral to surface integral, surface to volume integral & vice versa using Green's, Stoke's and Gauss divergence theorems.

#### Course Outcome:

CO1: Discuss the need and use of complex variables to find roots, separate complex quantities, and to establish relation between circular and hyperbolic functions.

CO2: Solve first and higher order differential equations and apply them as mathematical modeling in electric and mechanical systems.

CO3: Determine Fourier series representation of periodic functions over different intervals.

CO4: Demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence & curl in various engineering streams.

CO5: Apply the principles of vector integration to transform line integral to surface integral, surface to volume integral & vice versa using Green's, Stoke's and Gauss divergence theorems.

## **Course Content:**

### **Unit 1: Complex Number**

**[07 Hours]**

Definition and geometrical representation, De-Moivre's theorem (without proof), Roots of complex numbers by using De-Moivre's theorem, Circular functions of complex variable – definition, hyperbolic functions(only concept).Logarithm of Complex quantities.

### **Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications** **[07 Hours]**

Linear equations; Reducible to linear equations (Bernoulli's equation).Exact differential equations; Equations reducible to exact equations . Applications to RL/RC circuits and mechanical systems.

### **Unit 3: Linear Differential Equations with Constant Coefficients**

**[08 Hours]**

Introduction, Complementary function, particular integral. Rules for finding complementary functions and particular integrals; Method of variation of parameters.

### **Unit 4: FOURIER SERIES**

**[7 HOURS]**

Introduction, Euler's formulae. Conditions for Fourier series expansion - Dirichlet's conditions; Functions having points of discontinuity. Change of interval. Odd and even functions - expansions of odd and even periodic functions. Half-range series.

### **Unit 5: VECTOR DIFFERENTIAL CALCULUS**

**[7 HOURS]**

General rules of vector Differentiation; Scalar and vector fields: Gradient, divergence and curl; Solenoidal and irrotational vector fields; Vector identities, Green's lemma, Gauss' divergence theorem and Stokes' theorem (without proofs)

### **Tutorial on MATLAB or Scilab**

**[15 HOURS]**

**For Tutorial Purpose,** Practice examples on Unit 1 to Unit 5 on MATLAB or Scilab.

1. Mathematical Function,
2. Basic Plotting

### **Text Books**

- 1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
- 2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
- 3) A Course in Engineering Mathematics (Vol II) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
- 4) A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- 5) Higher Engineering Mathematics by H. K. Dasand, Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

### **Reference Books**

- 1) Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
- 2) A Text Book of Engineering Mathematics by Peter O'Neil, Thomson Asia Pvt. Ltd., Singapore.
- 3) Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

## First Year (Semester - II)

### Python Programming

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC202	Lecture: 1 hrs./week	Continuous Assessment: 50 Marks	1	ESC

#### Course Objectives:

1. To introduce students to the basics of Python programming language.
2. To develop understanding of Python syntax, data types, operators and control structures.
3. To enable students to design modular programs using functions, modules, OOP and exception handling.
4. To familiarize students with file handling operations for real-world problem solving.

#### Course Outcomes:

After completing this course, students will be able to:

1. Explain the fundamental concepts, features and applications of Python.
2. Demonstrate use of identifiers, reserved words, data types and operators in Python programs.
3. Apply decision-making and looping constructs to solve computational problems.
4. Design modular programs using functions, modules, OOPs and exception handling mechanisms.
5. Implement file input/output operations for data storage and processing.

#### Course Content

##### Unit 1 Introduction to Python

[3 Hours]

Python: Introduction, History, Features and Applications; Python IDEs; Variables, Reserved words, Indentation and Comments; Data Types: Numbers, Strings, List, Tuples, Dictionary and Set

##### Unit 2 Decision making and looping

[4 Hours]

Input output operations in python; Python basic operators: arithmetic, comparison, assignment, logical, membership and identity; Python decision making: if statements, if...else statements and nested if statements; Python loops: while loop, for loop and nested loops; Loop control statements: break statement, continue statement and pass statement

##### Unit 3 Python Function

[3 Hours]

Python function definition, defining the function; Calling a function, function argument - pass by value and pass by reference; Local and Global variables; Python Modules, import standard library module, from...import statement; Python packages; Built-in functions: mathematical, string and lists functions

#### **Unit 4 OOP and Exception Handling**

**[3 Hours]**

Introduction to OOP; Need of OOP; Object, Class, Data abstraction, data encapsulation, polymorphism and inheritance; Exception Handling meaning and uses; Exception handling using Try, except, else and finally; User-defined Exception

#### **Unit 5 FILE I/O**

**[2 Hours]**

Reading a Text File; Writing to a Text File; Creating a Text File; Checking If a File Exists; Renaming a File; Delete a File

#### **Suggested Textbooks**

- 1) Core Python Programming – R. Nageswara Rao, 3rd Edition – Released in 2021 by Dreamtech Press; ISBN-13: 978-9390457151
- 2) Visualization Analysis and Design – Tamara Munzner, 1st Edition – Published in 2014 by A K Peters / CRC Press (an imprint of Taylor & Francis)
- 3) Python Data Visualization Essentials Guide – Kalilur Rahman, 1st Edition – Published July 2021 by BPB Publications.
- 4) R Graphics Essentials – Alboukadel Kassambara, 1st Edition – Published November 14, 2017 by STHDA

**First Year (Semester –II)**  
**Python Programming Lab**

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC202L	Practical: 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	ESC

### Course Objectives

1. To introduce Python basics and programming concepts.
2. To develop problem-solving skills using decision-making, loops and functions.
3. To apply object-oriented programming and error handling in Python.
4. To build small applications using modules, packages and file handling.

### Course Outcomes

1. After completing this course, students will be able to:
2. Explain Python fundamentals and core programming constructs.
3. Solve problems using loops, conditions and modular programming.
4. Implement OOP features such as classes, inheritance and polymorphism.
5. Apply exception handling, file operations and built-in modules.
6. Develop simple Python applications for practical use.

### LIST OF PRACTICALS

**Minimum 12 practical's are to be performed based on contents from syllabus sample list:**

Sr. No.	Name of Experiments
1	Write a Python program to demonstrate use of different data types such as integer, float, string, list, tuple and dictionary. Perform at least two operations on each data type.
2	Write a Python program to create a list of numbers and check whether a given number is present in the list or not using membership operators.
3	Write a Python program to accept three numbers from the user and print the largest number using if, if else and nested if.
4	Write a Python program to create a menu driven calculator for addition, subtraction, multiplication, division and modulus using if elif else statements.
5	Write a Python program using loops to print multiplication table of a number and print all prime numbers between 1 to 100.
6	Write a Python program to check whether a number is an Armstrong number and also print all Armstrong numbers between 1 and 1000.
7	The following Python program calculates the factorial of a number and the nth Fibonacci number using both recursive and iterative approaches.

8	Write a Python program to define a class Student with attributes roll number, name and marks. Create objects and display their details using a method.
9	Write a Python program to demonstrate inheritance. Create a base class Shape and two derived classes Rectangle and Circle to compute area.
10	Write a Python program to calculate student result using functions. The program should accept marks in five subjects and return total marks, average and grade using pass by value and pass by reference.
11	Write a Python program to simulate an ATM machine. The program should verify pin with maximum three attempts and allow operations like balance inquiry, deposit and withdrawal.
12	Write a Python program to demonstrate use of built in modules. Use math module functions like sqrt, pow and sin. Use string functions like upper, lower and find. Use list functions like append, sort and pop.
13	Write a Python program to demonstrate exception handling. The program should handle division by zero and file not found errors using try except else and finally. Also include a user defined exception for invalid input such as negative age.
14	Write a Python program for file operations. Create a text file and write student details into it. Read and display the contents of the file. Append new data to the file. Rename and delete the file after checking if it exists.

## First Year (Semester - II)

### Engineering Physics

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
BSC103	Lecture: 2 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)	2	BSC

#### Course Objective:

- 1) To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
- 2) To understand and study the Physics principles behind the developments of engineering materials.

#### Course Outcomes:

- CO1. Explain the production of polarized light and analyze the principles, construction, and applications of lasers (Ruby and He-Ne) used in engineering and technology.
- CO2. Understand and differentiate various types of oscillatory motions, explain the production and applications of ultrasonic waves, and analyze dielectric properties and polarization mechanisms in materials.
- CO3. Apply the concepts of quantum mechanics such as matter waves and wave equations, understand the basic principles of quantum computing, and explain nuclear physics concepts including nuclear reactions and radiation detection.
- CO4. Analyze crystal structures using unit cell parameters and Miller indices, and apply the principles of electron optics to study the motion of charged particles and determine the  $e/m$  ratio of an electron
- CO5. Compare different magnetic materials, explain the electrical properties of semiconductors, analyze Hall effect and superconductivity, and describe their practical applications in modern technology.

#### Course Contents:

##### Unit 1- Engineering Optics

[6 Hours]

Interference of light in thin film, wedge shaped film, Newton's rings, polarization of light, methods for production of polarized light (Reflection, Refraction & Double refraction, Principle and structure of optical fiber, acceptance angle, acceptance cone, numerical aperture. Principle of laser, Einstein's coefficients, Types of laser – Ruby and He-Ne laser and their application.

##### Unit 2 – Oscillation, Ultrasonic and Dielectrics

[6 Hours]

Free oscillation, damped oscillation, Forced oscillation and Resonance, differential wave equation, Ultrasonic waves, production of ultra-sonics (Piezoelectric effect, Magnetostrictions effect) and its applications. Dielectric parameters (Dielectric constant,

Electric displacement, Polarization & Polarizability) Types of polarization, temperature and frequency dependences of dielectric materials.

**Unit 3- Quantum Mechanics and Nuclear Physics [6 Hours]**

De-broglie Hypothesis of Matter waves, Introduction and properties of matter waves, Wave function and physical significance of matter waves, Heisenberg's uncertainty principle, Schrodinger's time dependent and time independent wave equations, Introduction to Quantum computing (Difference between classical & quantum computing, bits, qubits), Introduction to mass defect, Q value of nuclear reaction, properties of alpha, beta, gamma rays, GM counter.

**Unit 4 – Crystal Structure and electron optics [6 Hours]**

Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices. Motion of charged particles in electric and magnetic field, measurement of  $e/m$  by Thomson method.

**Unit 5 – Magnetic Materials, Semiconductor & Superconductor [6 Hours]**

Magnetic materials (comparative study), BH curve, Types of Semiconductor, Band Theory of solids, Conductivity in Semiconductor, Hall Effect, Numerical. Superconductivity, properties of superconductor, Meissner effect, Types of superconductors, Application.

**Reference Books**

- 1) Engineering Physics- Hitendra K Malik, A. K. Singh-2010
- 2) Quantum Physics- Eyvind H. Wichman Vol.4-2008
- 3) Atomic and Nuclear Physics- N.Subrahmanyam, Brijlal, S. chand
- 4) Physics for Engineers -M. R. Srinivasen-2009
- 5) Engineering Physics- G. S. Raghavanshi-2010

**Text Books**

- 1) Engineering Physics-Dr. Amit T. Mane ,Dr.Vikas Patil(Nirali Prakashan)-2024
- 2) Engineering Physics- Dr. I. A. Shaikh, Suhas Pandit Shukla-2023
- 3) Fundamentals of Physics- Halliday and Resnik, Willey Eastern limited

## First Year (Semester -II)

### Engineering Physics Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
BSC103L	Practical- 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	BSC

#### Course Outcomes:

**CO1:** Demonstrate understanding of physical principles by performing experiments in optics, electronics, modern physics, and materials science.

**CO2:** Apply experimental techniques to measure physical quantities like wavelength, resistivity, band gap, specific rotation, and Hall coefficient with precision.

**CO3:** Use modern laboratory equipment such as lasers, optical fibers, GM counters, and semiconductor measurement systems safely and effectively.

#### LIST OF PRACTICALS

**Minimum 10 practical's are to be performed based on contents from syllabus Sample List of Practical's:**

Practical No.	Title
1	NEWTONS RINGS – Determination of Radius of Curvature of Plano Convex Lens/Wavelength of Light.
2	Wedge Shaped Film – Determination of Thickness of Thin Wire.
3	Half Shade Polarimeter – Determination of Specific Rotation of Optically Active Material.
4	Laser – Determination of Wavelength of He-Ne Laser.
5	Crystal Plane- Study of Planes with the Help of Models Related Miller
6	G. M. Counter - Determination of Operating Voltage of G. M. Tube
7	P-N Junction Diode VI Characteristics
8	Hall Effect – Determination of Hall Coefficient
9	Four Probe Method – Determination of Resistivity of Semiconductor.
10	Measurement Of Band Gap Energy of Semiconductor.
11	Demonstration of optical fiber and Determination of its numerical aperture.
12	Ultrasonic Interferometer Experiment.

## First Year (Semester - II)

### Electrical Technology

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
EEPCC204	Lecture: 1 hrs./week	Continuous Assessment: 50 Marks	1	PCC

#### Course Objective:

1. To provide knowledge of basic electrical components, circuits, and measuring instruments.
2. To develop understanding of the construction and operation of electrical machines and transformers.
3. To impart knowledge of batteries, illumination systems, and domestic electrical appliances.
4. To develop skills in using electronic test equipment and analyzing electrical waveforms.

#### Course Outcome:

- CO1. Understand basic electrical components, circuits, and measuring instruments.
- CO2. Explain the construction and working of electrical machines and transformers.
- CO3. Describe batteries, lighting systems, and domestic electrical appliances.
- CO4. Use CRO and electronic test equipment for waveform analysis and measurements.

#### Course Contents:

##### Unit-I: Basic Electrical Components and Measuring Instruments [3 Hours]

Types of resistors and resistor color coding, series and parallel circuits, measurement of resistance using multi-meter, ammeter, voltmeter, wattmeter and energy meter, moving coil and moving iron instruments, errors in measurements and calibration.

##### Unit-II: Construction of Electrical Machines [4 Hours]

Construction of D.C. motor and generator, construction of three point starter, single phase induction motor, squirrel cage and slip ring motors, construction of single phase and three phase transformer.

### **Unit–III: Batteries, Illumination and Domestic Appliances**

[4 Hours]

Construction of electric fan, common faults of fans lead acid battery construction, battery charging methods and chargers, care and maintenance of batteries, types of lamps and lighting systems, Fluorescent lamp, CFL, LED lamp, Mercury vapour and Sodium vapour lamps, Metal halide lamps, Illumination terms: lumen, lux and efficiency, energy efficient lighting systems.

### **Unit–IV: Electronic Test Equipment and Waveform Analysis**

[4 Hours]

Cathode Ray Oscilloscope (CRO): construction and working, time base and deflection system, measurement of amplitude, frequency and phase, sine, square and triangular waveforms.

#### **Text Book:**

- 1) D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
- 2) B. L. Theraja, “Electrical Technology – Part I and II”, S. Chand and Co. 2012.
- 3) D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
- 4) E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
- 5) Dr. S L Uppal, “Electrical Wiring Estimating and Costing” Khanna Publishers, 1987.

#### **Reference Book:**

- 1) V. K Mehta, Rohit Mehta, “Basic Electrical Engineering” S Chand, 2006.
- 2) Bipasa B Patra, Priyanka Gajare, Manish D. Mahale, Madhur Chauhan “Basic Electrical Engineering”, JEC Publication, 2023

#### **E-Books:**

1. <https://law.resource.org/pub/in/bis/S05/is.2032.25.1980.pdf>
2. <https://law.resource.org/pub/in/bis/S05/is.732.1989.pdf>

## First Year (Semester - II)

### Elements of Mechanical Engineering

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
MEPCC204	Lecture: 1 hrs./week	Continuous Assessment: 50 Marks	1	PCC

#### Course Objectives:

- 1) To impart knowledge of boilers, steam turbines, and steam engines with emphasis on efficiency and performance.
- 2) To develop understanding of internal combustion (I.C.) engines, their testing, performance parameters, and common troubleshooting methods.
- 3) To introduce working principles and classifications of air compressors, along with methods of energy saving and fault diagnosis.
- 4) To familiarize students with types of pumps, their working, power requirements, and basic maintenance practices.

#### Course Outcomes:

**CO1.** Explain the construction, working, efficiency, and regulations of boilers and turbines.

**CO2.** Analyze performance of I.C. engines using different power measurements and identify common faults with remedies.

**CO3.** Classify and describe reciprocating and rotary air compressors, calculate performance parameters, and suggest energy-saving methods.

**CO.4** Distinguish between different types of pumps, determine power requirements, and troubleshoot operational problems.

#### Course Contents:

##### Unit 1: Boilers, Steam turbines, Steam engine

[4 Hours]

Construction and working of critical and super critical boilers. Boiler efficiency, Boiler Act (for remedial measure). Classification of turbines, Impulse and reaction turbine, Power developed by turbine, Different power losses in turbine.

##### Unit 2: I.C. Engines

[4 Hours]

Classification of I.C. engines, Testing and performance of I. C. engines, Break power, Indicated power Frictional power, Fault finding and remedial action, Starting motor of I.C. engine.

##### Unit 3: Air Compressor

[3 Hours]

Introduction, Definition: Compression ratio, Compressor capacity, Free air Deliver, swept volume

Reciprocating and rotary air compressor, their working and Construction, Methods of energy saving in compressor, Fault finding and remedial action

**Unit 4: Pumps**

**[4 Hours]**

Classification of pumps, Type of pumps and their working, Power required to run the pump, Fault finding and remedial action

**Reference Books**

1. R.K. Rajput – *Thermal Engineering* – Laxmi Publications – 2016
2. P.K. Nag – *Power Plant Engineering* – McGraw Hill Education – 2017
3. V. Ganeshan – *Internal Combustion Engines* – McGraw Hill Education – 2017
4. R.S. Khurmi & J.K. Gupta – *A Textbook of Thermal Engineering* – S. Chand Publishing – 2015
5. S. Domkundwar & C.P. Kothandaraman – *A Course in Thermal Engineering* – Dhanpat Rai & Co. – 2016
6. Arora & Domkundwar – *A Course in Internal Combustion Engines* – Dhanpat Rai Publications – 2014
7. Dr. Jagdish Lal – *Hydraulic Machines* – Metropolitan Book Co. Pvt. Ltd. – 2010

## First Year (Semester - II)

### Electrical Technology Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
EEVSEC204L	Practical: 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	VSEC

#### Course Objectives

1. To develop practical knowledge of electrical components, measuring instruments, and electronic test equipment.
2. To provide hands-on experience in dismantling, assembling, testing, and fault finding of electrical machines and appliances.
3. To impart skills in battery charging, electrical wiring, cable jointing, and installation testing practices.
4. To develop competency in testing and maintenance of lighting systems, motors, generators, and electrical accessories.

#### Course Outcomes

1. Identify and measure electrical components and waveforms using standard measuring instruments and CRO.
2. Dismantle, assemble, test, and troubleshoot electrical machines, starters, fans, and variacs.
3. Perform residential wiring, cable jointing, crimping, and installation testing safely and effectively.
4. Test and evaluate batteries and various lighting systems, and prepare related observation and inventory records.

#### LIST OF PRACTICALS

Minimum 12 practicals' are to be performed based on contents from syllabus sample list:

Sr. No.	Name of Experiments
1	Measurement of resistance, inductance using colour code and identify different type of capacitor with their ratings.
2	To demonstrate the functionality of function generator and its use as a test and measurement equipment.
3	Measurement of amplitude and frequency of sine, triangular and square wave using CRO
4	Dismantle and study the construction of A.C. & D.C. voltmeter, ammeter & wattmeter.
5	Dismantle the D.C. motor three point starter.

6	Dismantle and fault finding of fan with observation of different parts.
7	Dismantle over haul and assemble a single phase induction motor. Take test and run it prepare an inventory list.
8	Dismantle over and assemble a three phase squirrel cage and phase wound motor.
9	Study battery charger and make charging of lead acid battery.
10	Find out fault of DC generator, repair and test it to run.
11	Erection of residential building wiring by CTs and conduit wiring system using main two points and test installation by test lamp method and a megger.
12	Overhaul a single/ three phase variac.
13	Identification of single core (SC), twin core (TC), three core (3C), four core (4C); copper and aluminium PVC, VIR & Weather proof (WP) wire.
14	Cutting copper and aluminium cable and crimping lug to them from 4 mm <sup>2</sup> to 25 mm <sup>2</sup> , cross section.
15	Connection and testing of fluorescent tube light, high pressure M.V. lamp, sodium vapour lamp, M.H. lamp, CFL and latest model lamp-measure inductance, Lux/lumens (intensity of illumination) in each case -prepare lux table.
16	Use crimping tools to lug sockets on L.T. & H.T. aluminium cable from 10 mm <sup>2</sup> to 50 mm <sup>2</sup> .

## First Year (Semester - II)

### Elements of Mechanical Engineering Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
MEVSEC204L	Practical: 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	VSEC

Skills to be developed:

#### Intellectual Skills:

- 1) Understand vapour process of steam boilers & different mountings & accessories
- 2) Analyze the performance of pumps & turbines

#### Motor Skills:

- 1) Use pressure & temp measuring device
- 2) Operate I C Engine & know the working of dynamometers

### LIST OF PRACTICALS

Practical No.	Title
1	Report on visit to sugar factory / steam power plant to observe boilers, steam turbines
2	Study of boiler mounting and accessories
3	Identify component of four stroke diesel engine
4	Study of centrifugal pump
5	Study of air compressor
6	Observe the reciprocating pump & identify its components
7	Observe the foundation of pumps & boilers

## First Year(Semester -II)

### Engineering Mechanics

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC205	Lecture:3hrs./week Tutorial:1hr./week	Continuous Assessment:20Marks Mid Semester Exam:20 Marks End Semester Exam:60Marks (Duration 03 hrs.)	4	ESC

#### Course Objectives:

1. To introduce fundamental principles of engineering mechanics including forces, moments, and equilibrium.
2. To develop the ability to analyze beams, trusses, centroids, and moments of inertia.
3. To understand kinematics and kinetics of particles and rigid bodies under various motion conditions.
4. To apply concepts of simple machines, friction, work, power, and energy in solving practical engineering problems.

#### Course Outcome:

CO1.Explain and apply basic principles of forces, laws of motion, and conditions of equilibrium.

CO2. Analyze different types of beams and trusses to determine reactions and internal forces.

CO3. Calculate centroid, moment of inertia, and solve problems related to kinematics and kinetics of particles and rigid bodies.

CO4.Evaluate the performance of simple machines and apply concepts of friction, work, power, energy, impulse, and momentum in engineering applications.

#### Course Contents:

##### Unit1:Introductionand Basic Principles

[9 Hours]

**Introduction:** Force, force systems, Resolution and composition of a forces, Resultant, couple, Moment, Principle of transmissibility, principle of superposition, free body diagram, Lami's theorem Varignon's theorem. Laws of Motion.

**Static equilibrium:** Analytical and graphical conditions of equilibrium ,Equilibrium of coplanar concurrent forces, coplanar non concurrent forces, parallel forces. Triangle law of forces, polygon law of forces.

**Unit2:Beams and Trusses****[9 Hours]**

**Beams:** Types of beam, loads and supports, beam reactions for simply supported beams, continuous beams (with 3 supports only) **Simple trusses:** Types of trusses, analysis of plane trusses by method of joints and method of sections.

**Unit3:Centroid and Moment of Inertia****[9 Hours]**

**Centroid:** Centroid of composite area, Centre of gravity, centre of mass, moment of inertia of planer sections, parallel axis theorem, perpendicular axis theorem.

**Unit4:Simple Machines and Friction****[8 Hours]**

**Kinematics of particle:** types of motion, laws of motion, rectilinear motion, constant and variable acceleration, study of motion diagrams, motion under gravity, concept of relative velocity,

**Friction:** Coulomb's laws, friction angles, wedge friction, sliding friction. Angle of friction, angle of repose, cone of friction.

**Unit5:Kinetics and Work,Power,Energy****[8 Hours]**

**Kinetics of particle:** D'Alembert's principle: applications in linear motion, kinetics of rigid bodies, applications in translation. Work done by a force, potential energy, kinetic energy of linear motion and rotation, work energy equation, conservation of energy, power.Collision of elastic bodies, Impulse momentum principle.

**Reference Books:-**

1. R.S. Khurmi& N. Khurmi – *Engineering Mechanics* – S. Chand Publishing – 2019
2. S. Timoshenko & D.H. Young – *Engineering Mechanics* – McGraw Hill Education – 2017 (Special Indian Edition)
3. F.P. Beer, E.R. Johnston, Jr., D.F. Mazurek& P.J. Cornwell – *Vector Mechanics for Engineers: Statics and Dynamics* – McGraw Hill Education – 2020 (11th Edition)
4. Irving H. Shames – *Engineering Mechanics: Statics and Dynamics* – Pearson Education – 2018
5. S.S. Bhavikatti – *Engineering Mechanics* – New Age International Publishers – 2019
6. K.L. Kumar – *Engineering Mechanics* – Tata McGraw Hill Education – 2016
7. Basudeb Bhattacharyya – *Engineering Mechanics: Statics and Dynamics* – Oxford University Press – 2016

**First Year (Semester -II)**  
**Engineering Mechanics Lab**

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC205L	Practical:2hrs./week	ContinuousAssessment:60Marks End Semester Exam: 40 Marks	1	ESC

**Course Objectives**

1. To understand basic principles of engineering mechanics through experiments.
2. To study forces, equilibrium, friction and centroid of bodies.
3. To analyze mechanical systems and simple machines practically.
4. To develop experimental and measurement skills.

**Course Outcomes**

1. Verify laws of forces and equilibrium.
2. Determine reactions, centroid and centre of gravity of bodies.
3. Evaluate friction, moment of inertia and pendulum characteristics.
4. Analyze performance of simple machines and mechanical systems.

**LIST OF PRACTICALS**

**Minimum 12 practicals' are to be performed based on contents from syllabus sample list:**

Practical No.	Title
1	To Verify the Polygon Law of Coplanar Forces.
2	To Study the Working Principle and Mechanical Advantage of a Bell Crank Lever.
3	To Determine the Support Reactions of a Beam under Parallel Forces.
4	To Determine Beam Reactions by Graphical Method for Parallel Force System
5	To Determine the Centroid of Geometrical Plane Figures.
6	To Determine the Coefficient of Friction on an Inclined Plane.
7	To Determine the Coefficient of Friction on a Horizontal Plane
8	To Determine the Centre of Gravity of Irregular Shaped Bodies
9	To Determine the Moment of Inertia of a Flywheel
10	To Study Simple Machines and Determine Their Mechanical Advantage, Velocity Ratio and Efficiency
11	To Study the Construction and Working of a Simple Screw Jack
12	To Determine the Time Period of a Simple / Compound Pendulum

## First Year (Semester - II)

### Basic Electrical and Electronics Engineering

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC106	Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)	3	ESC

#### Course Objectives:

- 1) To understand the fundamentals of DC and AC electrical circuits, including circuit laws, sources, and power calculations.
- 2) To study the principles of magnetic circuits, electromagnetic induction, and the construction and working of basic electrical machines like DC motors, BLDC motors, and transformers.
- 3) To explain the properties of semiconductors, working of diodes and the use of rectifiers, filters, and regulated power supplies.
- 4) To analyze the structure, operation, and applications of BJTs, FETs, and MOSFETs in various configurations, including amplifier and switching circuits.

#### Course Outcome:

**CO1:** Apply basic laws and analysis techniques to electrical DC and AC circuits.

**CO2:** Understand the principles of magnetic circuits and electrical machines.

**CO3:** Demonstrate understanding of semiconductor materials and diodes.

**CO4:** Understand and analyze the characteristics and applications of Bipolar Junction Transistors (BJT).

**CO5:** Understand and compare the operation of different types of FETs and MOSFETs.

#### Course Contents:

##### Unit 1: Electrical Circuits

[8 Hours]

DC Circuits: Circuit Components: Resistor, Inductor, Capacitor, Ohm's Law, Kirchhoff's Laws voltage and current sources -Independent and Dependent Sources, Nodal and Mesh analysis. (DC only) AC Circuits: Frequency, Average value, R.M.S. value, Form factor, Peak factor, Instantaneous power, real power, reactive power and apparent power, power factor.

##### Unit 2: Magnetic Circuits

[9 Hours]

Permanent magnets and Electromagnets, Faraday's Laws of Electromagnetic Induction, Dynamically induced EMF, Static induction, Self-induced and Mutually induced EMF, Torque produced on a current carrying coil in a magnetic field, Lenz Law, Fleming Rules. Motors: DC motor construction & working, EMF equation, Construction & Working of Brushless DC (BLDC) motor. Construction & Working of Transformer (Single Phase).

**Unit 3: Semiconductors and Diodes****[8 Hours]**

Intrinsic and Extrinsic semiconductor, Construction, Symbol, working principle of: P-N junction diode & Zener diode, Forward and reverse biasing and V-I characteristics of P-N junction diode & Zener diode, Types of Rectifiers- Circuit operation, Input- output waveforms. Filters, Regulated power supply.

**Unit 4: Bipolar Junction Transistor****[8 Hours]**

PNP, NPN Transistor Construction & Working. Transistor configurations: CB, CE, CC, Transistor characteristics (input, and output), DC load Line, Operating point, Types of biasing, Voltage divider bias. Transistor as switch, Transistor as amplifier.

**Unit 5: Field Effect Transistor & MOSFET****[9 Hours]**

Construction & Working of JFET (N channel and P- channel), Characteristics (Drain and Transfer characteristics), Construction & working of Enhancement and Depletion MOSFET, Construction and working of NMOS, PMOS, CMOS.

**Suggested Text/Reference Book**

- 1) Electrical Circuit Analysis & Magnetic Circuits Introductory Circuit Analysis, Robert L. Boylestad & Louis Nashelsky, Prentice Hall, 2016 (13th ed.).
- 2) V. N. Mittal and Arvind Mittal, Basic Electrical Engineering, McGraw-Hill Publication.
- 3) Vincent DeToro, Electrical engineering Fundamentals, PHI Publication, 2nd Edition, 2011.
- 4) Semiconductors, Diodes, Transistors, Rectifiers, Amplifiers, A Textbook of Electronic Devices & Circuits, J. B. Gupta, S.K. Kataria & Sons, 2010
- 5) Semiconductor Devices & Theory (Open-educational resource), Semiconductor Devices: Theory and Application, James M. Fiore, dissidents, 2018
- 6) General Electronics Reference (Analog/Digital, Transistors, Circuit Design), The Art of Electronics, Paul Horowitz & Winfield Hill, Cambridge University Press, 2015 (3rd ed.)
- 7) Solid-State Devices (FETs, BJTs, Semiconductor Physics), Solid-State Electronic Devices, Ben G. Streetman, Prentice Hall India, 2006 (6th ed.)

## First Year (Semester - II)

### Basic Electrical and Electronics Engineering Lab

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
ESC206L	Practical- 2 hrs./week	Continuous Assessment: 60 Marks End Semester Exam: 40 Marks	1	ESC

#### LIST OF PRACTICALS

Minimum 10 practical's are to be performed based on contents from syllabus Sample List of Practical's:

Practical No.	Title
1	Study of front panel of CRO and function generator.
2	Verification of Kirchhoff's Voltage and Current Laws in a DC circuit.
3	Measurement of RMS, Average, Form factor, and Peak factor using a sinusoidal waveform
4	Construction and Working Demonstration of DC Motor – identification of parts, winding, etc.
5	Demonstration of Brushless DC Motor Functionality.
6	Verify the transformation turn ratio.
7	V-I Characteristics of Zener Diode (Forward and Reverse Bias).
8	Observation of input/output waveforms of Half-Wave, Bridge Rectifier Circuits
9	Identification and Testing of NPN and PNP Transistors.
10	Input and Output Characteristics of a Transistor in CE Configuration.
11	Transistor as an Amplifier – small signal amplifier setup with output waveform.
12	Drain and Transfer Characteristics of JFET (N-channel/P-channel).

## First Year (Semester -II)

### Health and Wellness/Yoga

Course Code	Teaching Scheme	Examination Scheme	Credit	Course Category
CCA207	Practical- 2 hrs./week	Continuous Assessment : 50 Marks	1	CCA

### Health and Wellness

#### Course Objectives:

- 1) To address issues related to health, adjustment, and well-being.
- 2) To apply psychological insights for a more satisfying and meaningful life.

#### Course Outcomes:

By the end of the course, students will be able to:

**CO1.** Handle mental distress and psychological disorders.

**CO2.** Understand and improve mental health and well-being.

**CO3.** Explore theories and research on happiness to understand both positive and negative aspects of human behavior.

#### Course Contents:

##### Unit 1: Psychology of Happiness

- Definition and sources of happiness
- Role of socio-economic factors
- Importance of positive emotions

##### Unit 2: Can We Become Happier?

- Genetic set-point and hedonic adaptation
- Sustainable happiness model
- Role of intentional activities

##### Unit 3: Happiness Activities I

- Practicing gratitude and positive thinking
- Love, kindness, and avoiding negative comparisons

##### Unit 4: Happiness Activities II

- Identifying and using personal strengths
- Experiencing “flow” for sustained happiness

##### Unit 5: Is Happiness Sufficient?

- Concept of eudemonic well-being
- Theories of self-determination and motivation.

**Reference:**

- 1) W. Weiten, and M. A. Lloyd, Psychology Applied to Modern Life: Adjustment in the 21st Century, Wadsworth Publishing, 2007
- 2) R. Harington, Stress, Health and well-being: Thriving in the 21<sup>st</sup> century, Wadsworth Publishing, 2013.
- 3) I. Boniwell, Positive psychology in anutshell, McGraw-Hill Education, 2012.
- 4) S. Lyubomirsky, The how of happiness, Penguin Press, 2008.

# Yoga Education

## **Course Objectives:**

- Learn the core teachings of the Vedas and Upanishads
- Understand the Four Streams of Yoga
- Study the Six systems (Shaddarshanas) of Indian Philosophy
- Gain insight into the lives and messages of spiritual masters and explore Indian culture
- Learn the basics of Anatomy, Physiology, and their connection to Yoga and Health

## **Course Outcomes:**

After completing this course, students will be able to:

**CO1.** Understand the essential messages of the Vedas and Upanishads

**CO2.** Learn the principles of Bhakti, Raja, Karma, and Jnana Yoga

**CO3.** Gain knowledge of the Six classical schools of Indian philosophy

**CO4.** Appreciate the contributions of Indian spiritual masters and culture

**CO5.** Understand human physiology in relation to yoga and health

## **Course Contents:**

### **Unit I – Message of Vedas and Upanishads**

- Themes: Search for happiness and ultimate reality

### **Unit II – Streams of Yoga**

- **Bhakti Yoga** (devotion)
- **Raja Yoga** (meditation)
- **Antaranga & Bahiranga Yoga** (inner & outer disciplines)
- **Karma Yoga** (selfless action)
- **Jnana Yoga** (knowledge and wisdom)

### **Unit III – Shaddarshanas (Six Systems of Indian Philosophy)**

- Nyaya, Vaisheshika, Sankhya, Yoga, Purva Mimamsa, Uttara Mimamsa

### **Unit IV – Life and Teachings of Spiritual Masters**

Focus on:

- Sri Ramakrishna Paramahansa
- Maa Sharada Devi
- Swami Vivekananda
- Their influence on Indian culture

## **Unit V – Anatomy, Physiology, and Yoga**

- Yoga and Exercise Physiology
- Concept of health through **Pancha Kosha Vivek** (five sheaths)
- Yogic understanding of health and disease

### **Text Books:**

- 1) Rajayoga-Swami Vivekananda-Rama Krishna Ashrama Publications.
- 2) Hathayoga Pradipika of Swatmarama -Kaivalya dhama, Lonavala
- 3) The Science of Yoga-Taimini-Theosophical Publishing House, Adyar, Madras.
- 4) Yoga sutras of Patanjali - Hariharananda Aranya, University of Calcutta Press, Calcutta.

### **Reference Books:**

- 1) Patanjali Yoga Pradeepa Omananda Tirtha- Geeta Press, Gorakhpur.
- 2) Gherandasamhita- Bihar School of Yoga, Munger, Bihar.
- 3) Shivayogadipika - Sadashiva brahmendra, Ananda Ashrama granthavali, Choukhamba Press.
- 4) Yoga Darshan: Swami Niranjanananda-Sri Panchadashanam Paramahansa Alakh Bara, Deoghar.
- 5) Four chapters on Freedom (commentary on the Yoga sutras of Patanjali), Swami Satyananda (1983), Bihar School of Yoga, Munger.