



CAYMET's

Siddhant College of Engineering

Savitribai Phule Pune University, Pune

National Education Policy (NEP)-2020 Compliant Curriculum

First Year Engineering (2024 Pattern)

[Common to All UG Engineering Programs]

(With effect from Academic Year 2024-25)

NEP 2020 Compliant Curriculum Structure  
First Year Engineering (2024 Pattern)

Level 4.5														
Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)			Examination Scheme and Marks				Credits				
			Theory	Tutorial	Practical	CCE*	End-Sem	Term work	Practical	Oral	Theory	Tutorial	Practical	Total
<b>Semester I</b>														
BSC-101-BES	Basic Science Course	Engineering Mathematics- I	3	1	-	30	70	25	-	-	3	1	-	4
BSC 102 BES/ BSC-103-BES	Basic Science Course	Engineering Physics / Engineering Chemistry	3	-	2	30	70	25	-	-	3	-	1	4
ESC-101-ETC / ESC-102-ELE	Engineering Science Course	Basic Electronics Engineering / Basic Electrical Engineering	2	-	2	30	70	25	-	-	2	-	1	3
ESC-103-MEC/ ESC-104-CVL	Engineering Science Course	Engineering Graphics / Engineering Mechanics	2	-	2	30	70	25	-	-	2	-	1	3
ESC-105-COM	Engineering Science Course	Fundamentals of Programming Languages	2	-	2	30	70	25	-	-	2	-	1	3
VSE-101/ VSE-102	Vocational and Skill Enhancement Course	Manufacturing Practice Workshop/ Design Thinking and Idea Lab	-	-	2	-	-	25	-	-	-	-	1	1
AEC-101	Ability Enhancement Course	Professional Communication Skills	-	2	-	-	-	25	-	-	-	2	-	2
CCC-101	Co-Curricular Courses	Co-Curricular Course-I	-	-	4	-	-	25	-	-	-	-	2	2
<b>Total</b>			<b>12</b>	<b>03</b>	<b>14</b>	<b>150</b>	<b>350</b>	<b>200</b>	<b>-</b>	<b>-</b>	<b>12</b>	<b>03</b>	<b>07</b>	<b>22</b>

CCE\*: Comprehensive Continuous Evaluation

**NEP 2020 Compliant Curriculum Structure  
First Year Engineering (2024 Pattern)**

Level 4.5														
Course Code	Course Type	Course Name	Teaching Scheme (Hrs./week)			Examination Scheme and Marks					Credits			
			Theory	Tutorial	Practical	CCE*	End-Sem	Term work	Practical	Oral	Theory	Tutorial	Practical	Total
<b>Semester II</b>														
BSC-151-BES	Basic Science Course	Engineering Mathematics-II	3	1	-	30	70	25	-	-	3	1	-	4
BSC-103-BES/ BSC-102-BES	Basic Science Course	Engineering Chemistry/ Engineering Physics	3	-	2	30	70	25	-	-	3	-	1	4
ESC-102-ELE/ ESC-101-ETC	Engineering Science Course	Basic Electrical Engineering/ Basic Electronics Engineering	2	-	2	30	70	25	-	-	2	-	1	3
ESC-104-CVL/ ESC-103-MEC	Engineering Science Course	Engineering Mechanics/ Engineering Graphics	2	-	2	30	70	25	-	-	2	-	1	3
PCC-151-ITT	Program Core Course	Programming and Problem Solving	2	-	2	30	70	25	-	-	2	-	1	3
VSE-102/ VSE-101	Vocational and Skill Enhancement Course	Design Thinking and Idea Lab / Manufacturing Practice Workshop	-	-	2	-	-	25	-	-	-	-	1	1
IKS-151	Indian Knowledge System	Indian Knowledge System	-	2	-	-	-	25	-	-	-	2	-	2
CCC-151	Co-Curricular Courses	Co-Curricular Course-II	-	-	4	-	-	25	-	-	-	-	2	2
<b>Total</b>			<b>12</b>	<b>03</b>	<b>14</b>	<b>150</b>	<b>350</b>	<b>200</b>	<b>-</b>	<b>-</b>	<b>12</b>	<b>03</b>	<b>07</b>	<b>22</b>

**CCE\*: Comprehensive Continuous Evaluation**

## **COURSE OBJECTIVE & OUTCOMES**

### **SEM I**

#### **Course Code: BSC-101-BES Course Name: Engineering Mathematics-I**

##### **Course Objectives:**

To familiarize the students with concepts and techniques in Calculus, Fourier series and Linear Algebra.

The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

##### **Course Outcomes:**

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

**CO1:** Apply mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems. Determine the Fourier series representation and harmonic analysis of periodic functions in engineering applications.

**CO2:** Evaluate derivative functions of several variables that are essential in various engineering problems.

**CO3:** Apply the concept of Jacobian to find partial derivatives of implicit function and functional dependence. Use of partial derivatives in estimating errors & approximations and finding extreme values of the function.

**CO4:** Apply the essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, Linear dependence & Independence, finding linear and orthogonal transformations.

**CO5:** Determine Eigen values & Eigen vectors. Use it to diagonalize matrix and to reduce quadratic form to canonical form, applicable to engineering problems.

#### **Course Code: BSC-102-BES Course Name: Engineering Physics**

**Course Objectives:** The objective of the course is to impart the knowledge of fundamentals of physics through hands-on experiments and extend it to relevant engineering applications.

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

**CO1:** Develop the understanding of working principle of lasers, optical fibers and extend it to holography and fiber optic communication.

**CO2:** Deduce Schrödinger's wave equations and apply it to problems on the bound states by summarizing fundamentals of quantum physics.

**CO3:** Explain phenomena of interference in thin films, polarization, double refraction and connect to the Anti-Reflection Coating, LCD.

**CO4:** Develop understanding of Fermi level and Fermi energy in semiconductors on the basis of results of Fermi Dirac statistics and relate them with the working of semiconducting devices. Extend the understanding of Ultrasonic to thickness measurement, flaw detection.

**CO5:** Explain properties of nanoparticles and estimate engineering applications; Explain phenomenon of Superconductivity and estimate engineering applications.

**Course Code: BSC-103-BES Course Name: Engineering Chemistry**

**Course Objectives:** To acquire knowledge of water quality analysis technology and electro analytical techniques for chemical analysis. Learn about specialty polymers and nanomaterials. Study conventional and alternative fuels, and understand corrosion mechanisms and prevention methods.

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

**CO1:** Understand the practical approaches and techniques required to effectively monitor water quality.

**CO2:** Select appropriate electro analytical techniques for understanding the materials.

**CO3:** Demonstrate the structure and properties of advanced engineering materials for various technological applications.

**CO4:** Analyze different types of conventional and alternative fuels.

**CO5:** Explain causes of corrosion and methods for minimizing corrosion.

**Course Code: ESC-101-ETC Course Name: Basic Electronics Engineering**

**Course Objectives:**

1. To understand the working principles of PN junction diode and Special purpose diodes.
2. To study the operating principle and applications of Bipolar Junction Transistors & MOSFET.
3. To learn the concepts of various logic gates, digital circuits, Microprocessor & Controller.
4. To understand the concepts of Opamp, its applications and electronic Instruments.
5. To know the methods of measurement of physical parameters using sensors and transmission with the help of communication systems

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

**CO1:** Know about the working of P-N Junction diode and its application as rectifier & switch, basics of LED & Photodiode.

**CO2:** Understand the working of BJT & MOSFET, their characteristics & compare.

**CO3:** Learn logic gates & realization of the digital circuits.

**CO4:** Understand the functioning of Opamp and electronic instruments.

**CO5:** Select sensors based on their working principle for specific applications and its implementation with Communication system.

**Course Code: ESE-102-ELE Course Name: Basic Electrical Engineering**

**Course Objectives:** To impart the fundamental knowledge of electrical engineering to all the students of various disciplines and give comprehensive idea about AC and D C circuit analysis, working principles and applications of basic electric machines. The aim is also to familiarize students with different wiring components, wiring schemes and electricity bill

**Course Outcomes:** On completion of this course, learners will be able to:

**CO1:** Apply Kirchhoff's Laws, Superposition theorem and network simplification techniques for DC circuit analysis.

**CO2:** Analyze the magnetic circuit parameters, self-Inductance, mutual Inductance and Electromotive Forces (EMF's).

**CO3:** Calculate AC quantities using mathematical equations, waveforms and phasor diagrams.

**CO4:** Compute the voltage, current and power of the given 1-phase and 3-phase AC circuits

**CO5:** Understand the working principle of 1-Phase Transformer, Motors (DC, Induction) and their practical applications.

**Course Code: ESC-103-MEC Course Name: Engineering Graphics**

**Course Objectives:** This course aims to cultivate students' ability to conceptualize physical objects and effectively translate them onto paper for communication in engineering contexts. It focuses on enhancing manual drawing skills, honing drawing interpretation abilities, and fostering a practical understanding of object dimensions. Additionally, the course seeks to introduce students to essential drawing and design software tools for a well-rounded skill set.

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

**CO1:** Explain the fundamentals of Engineering Graphics and basic principles of geometric construction and apply the knowledge of Projections, Methods to prepare the drawings for points and lines.

**CO2:** Apply the types of Projections, Methods to prepare the drawings for planes.

**CO3:** Construct the various engineering curves and illustrate the application of various engineering curves and draw the development of the lateral surface of solid.

**CO4:** Apply the concept of orthographic projection of an object to draw several 2D views for visualizing the physical state of the object.

**CO5:** Apply the visualization skill to draw an isometric projection from given orthographic views.

**Course Code: ESC-104-CVL Course Name: Engineering Mechanics**

**Course Objectives:** The objectives of this course is to make students to learn basics of engineering Mechanics concepts and its application to the real-world problems, solve problems involving Forces, loads and Moments and know their applications in allied subjects

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

**CO1:** Understand basic concept of forces, moments and couples in two-dimension force system

**CO2:** Apply concept of free body diagram for static equilibrium in two-dimension force system

**CO3:** Analyze the practical example involving friction and application of two force members

**CO4:** Analyze rectilinear and curvilinear motion of particle

**CO5:** Apply Newton's second law, work energy and impulse momentum principles for particles

**Course Code: ESC-105-COM Course Name: Fundamentals of Programming Languages**

**Course Objectives:**

1. To understand the fundamental Concepts of C Programming
2. To acquire knowledge and Compare usage of Operators and Expressions in C Programming
3. To apply Control Flow structures in C Programming for Problem solving
4. To design a solution using Arrays, Character and String Arrays in C programming
5. To design a develop solution for simple computational problems using User Defined Functions and structures in C Programming

**Course Outcomes:** On completion of the course, students will be able to:

**CO1:** To Design algorithms for simple computational problems.

**CO2:** To Use mathematical, Logical Operators and Expressions.

**CO3:** To apply Control Flow structures for decision making.

**CO4:** To design a solution using Arrays, Character and String Arrays.

**CO5:** To Design and apply user defined functions and structures.

**Course Code: VSE-101 Course Name: Manufacturing Practice Workshop**

**Course Objectives:**

1. To acquire the basic knowledge of Machine Tools.
2. To inculcate the basics of various manufacturing processes.
3. To impart practical aspects of Machine Tools and Manufacturing processes used in industrial applications
4. To develop the skill through hands-on practices using hand tools, power tools, machine tools in manufacturing and assembly shop

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

**CO1:** Illustrate various sections of a typical workshop and different types of tools and machinery commonly found in a workshop 2-Understand

**CO2:** Explain the importance of workshop safety and apply general workshop safety rules and guidelines. 3-Apply

**CO3:** Demonstrate proficiency in various cutting techniques such as sawing, shearing, and laser cutting. 3-Apply

**CO4:** Plan and complete a simple sheet metal job from start to finish, incorporating shearing, bending, and joining operations. 3-Apply

**CO5:** Describe the applications, advantages and operation of advanced computerized machine tools in modern manufacturing. 2-Understand CO6 Apply 3D Printing Technology including setup, operation, and post-processing to print simple mechanical component. 3-Apply

**Course Code: VSE-102 Course Name: Design Thinking and Idea Lab**

**Course Objectives:**

- Understand the core principles of design thinking and its role in engineering.
- Apply the six hats of design thinking to analyze and solve complex problems.
- Develop creative and user-centered solutions to real-world challenges.
- Demonstrate effective communication and collaboration in multidisciplinary teams.
- Evaluate and analysis design concepts and prototypes.
- Develop a mindset for continuous innovation and improvement.

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

**CO1:** Identify and define problems from a user's perspective and articulate design criteria.

**CO2:** Apply empathy and observation to gain insights into user needs and behaviors.

**CO3:** Generate innovative ideas and solutions through brainstorming and ideation.

**CO4:** Prototype and test design solutions to refine and improve them

**CO5:** Present and communicate design ideas effectively using visual aids and storytelling

**CO6:** Collaborate with peers and industry professionals to address real-world design challenges

**Course Code: AEC-101 Course Name: Professional Communication Skills**

**Course Objectives:** To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error feedback.

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

**CO1:** Recognize, identify, and express advanced skills of Technical Communication in English through Language Laboratory.

**CO2:** Understand, categorize, differentiate, and infer listening, speaking, reading, and writing skills in societal and professional life.

**CO3:** Articulate and present the skills necessary to be a competent Interpersonal communicator.

**CO4:** Deconstruct, appraise, and critique communication behaviors.

**CO5:** Adapt, negotiate, and facilitate with multifarious socio-economical and professional arenas with effective communication and interpersonal skills.

**Course Code: CCC-101 Course Name Co-Curricular Course – I**

**Objectives:** Students are required to go through the list of following Co-curricular Courses and select any one of their interests. They will be allocated one course from the list. Experts from respective course will conduct classes on campus/Online through activities, discussions, presentations, and lecture methods. Students are required to submit hard copy of a report along with certificate on the activities performed related to topics of opted Co-curricular Course.

Evaluation will be done based on the report of activities submitted by student. Faculty members will be allotted for mentoring the activities related to Co-curricular Course topic. Faculty members will frame the list activities to be performed by students with the help of experts in respective course.

Selecting co-curricular courses that align with your interests and goals can significantly enrich your educational journey. Remember to maintain a balance and choose courses that you are genuinely excited about. This approach will help you gain the most from your co-curricular activities.

## SEM II

### **Course Code: BSC-151-BES Course Name: Engineering Mathematics – II**

**Course Objectives:** To familiarize the students with Advanced techniques of integration, Tracing of curve, Solid geometry, Multiple integrals and their applications, Mathematical modeling of physical systems using differential equations. The aim is to equip them with the concept and tools to understand advanced level mathematics and its applications, that would enhance thinking power, useful in their disciplines.

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

**CO1:** Apply advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions useful in evaluating multiple integrals and their applications.

**CO2:** Trace the curve for a given equation and measure arc length of various curves. Apply the concepts of solid geometry to solve problems on sphere, cone and cylinder in a comprehensive manner.

**CO3:** Evaluate multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

**CO4:** Apply the effective mathematical tools for solving first order ordinary differential equations such as Exact and Reducible to exact Linear and reducible to Linear.

**CO5:** Model physical systems using ordinary differential equations, solve and analyze the solutions apply to Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.

### **Course Code: PCC-151-ITT Course Name: Programming and Problem Solving**

**Course Objectives:** To understand problem solving aspects and to know python programming with learning data types, decision control statements, function, strings, file handling in Python. To learn features of object-oriented programming concepts using python.

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

**CO1:** Inculcate and apply various skills in problem solving.

**CO2:** Choose appropriate programming constructs and features to solve the problems in diversified domains.

**CO3:** Exhibit the programming skills for the problem-solving using functions and string manipulations.

**CO4:** Demonstrate File handling and dictionaries in Python.

**CO5:** Apply Object Oriented concepts in Python.

**Course Code: IKS-151 Course Name: Indian Knowledge System**

**Course Objectives:**

1. To introduce students to the foundational concepts of Indian knowledge systems and their significance.
2. To familiarize students with key dates in Indian history and the historical timeline.
3. To provide an overview of Indian philosophical systems and their relevance.
4. To explore significant scientific achievements in ancient India and analyze scientific texts and inventions.
5. To examine the role of engineering in ancient India and its contributions to metallurgy, materials science, and architectural techniques.

**Course Outcomes:** On completion of this course, learners will be able to:

**CO1:** Understand the significance and historical context of Indian knowledge systems.

**CO2:** Comprehend Indian philosophical concepts, scientific achievements, and their interplay.

**CO3:** Recognize the role of engineering in ancient India and its impact on architecture and materials.

**CO4:** Apply ancient Indian engineering principles in modern practices while considering cultural and environmental aspects.

**Course Code: CCC-151 Course Name: Co-Curricular Courses – II**

**Course Objectives:** Students are required to go through the list of following Co-curricular Courses and select any one of their interests. They will be allocated one course from the list. Experts from respective course will conduct classes on campus/Online through activities, discussions, presentations, and lecture methods.

Students are required to submit hard copy of a report along with certificate on the activities performed related to topics of opted Co-curricular Course. Evaluation will be done based on the report of activities submitted by student.

Faculty members will be allotted for mentoring the activities related to Co-curricular Course topic. Faculty members will frame the list activities to be performed by students with the help of experts in respective course.

Selecting co-curricular courses that align with your interests and goals can significantly enrich your educational journey. Remember to maintain a balance and choose courses that you are genuinely excited about. This approach will help you gain the most from your co-curricular activities.

### **Program Outcomes (POs)**

<b>PO1</b>	<b>Engineering knowledge</b>	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
<b>PO2</b>	<b>Problem analysis</b>	Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
<b>PO3</b>	<b>Design / Development of Solutions</b>	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
<b>PO4</b>	<b>Conduct Investigations of Complex Problems</b>	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5</b>	<b>Modern Tool Usage</b>	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modelling to complex Engineering activities with an understanding of the limitations.
<b>PO6</b>	<b>The Engineer and Society</b>	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
<b>PO7</b>	<b>Environment and Sustainability</b>	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8</b>	<b>Ethics</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
<b>PO9</b>	<b>Individual and Team Work</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>Communication Skills</b>	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports

		and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11</b>	<b>Project Management and Finance</b>	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
<b>PO12</b>	<b>Life-long Learning</b>	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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