Marathwada Mitramandal's Institute of Technology, Lohgaon, Pune - 411047

First Year Engineering: FE 2024 Pattern & Syllabus: Course Outcome Statements

Knowledge and Attitude Profile (WK)

Sr.	PO 1	Description	Statement
1	WK1:	**Scientific disciplinary insight**	A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences
2	WK2:	**Mathematical and analysis based modelling**	Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline
3	WK3:	**Engineering Fundamentals**	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
4	WK4:	**Engineering specialist knowledge**	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
5	WK5:	**Resource use and environment**	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
6	WK6:	**Engineering practice**	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
7	WK7:	**Engineering and society**	Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development
8	WK8:	**Evaluate emerging issues**	Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
9	WK9:	**Ethics, understanding and attitude**	Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

Program Outcomes (PO) Definitions - Common To All Branches and Years

Sr.	PO 1	Description	PO Statement
1	PO 1	Engineering Knowledge:	Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in **WK1** to **WK4** respectively to develop to the solution of complex engineering problems.
2	PO 2	Problem analysis	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. **(WK1 to WK4)**
3	PO 3	Design/Development of Solutions	Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. **(WK5)**
4	PO 4	Conduct investigations of complex problems	Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. **(WK8)**
5	PO 5	Engineering Tool Usage	Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. **(WK2 and WK6)**
6	PO 6	The Engineer and The World:	Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. **(WK1, WK5, and WK7)**
7	PO 7	Ethics:	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. **(WK9)**
8	PO 8	Individual and Collaborative Team work:	Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9	PO 9	Communication:	Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10	PO 10	Project Management and Finance	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11	PO 11	Life-Long Learning:	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. **(WK8)**

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Course Outcomes for First Year Engineering (FE 2024 Pattern and Syllabus)

Course Code:	BSC-101-BES
Course Name:	Engineering Mathematics-I
Course Objective:	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.
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 Objective:	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.
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 Objective:	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.
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 Objective:	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.
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 Objective:	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.
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 Objective:	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.
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 Objective:	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
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 Objective:	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
CO1	**Design** algorithms for simple computational problems.
CO2	**Use** mathematical, Logical Operators and Expressions
CO3	**Apply** Control Flow structures for decision making.
CO4	**Design** a solution using Arrays, Character and String Arrays.
CO5	**Design** and apply user defined functions and structures.

Course Code:	VSE-101
Course Name:	Manufacturing Practice Workshop
Course Objective:	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
CO1	**Illustrate** various sections of a typical workshop and different types of tools and machinery commonly found in a workshop
CO2	**Explain** the importance of workshop safety and apply general workshop safety rules and guidelines.
CO3	**Demonstrate** proficiency in various cutting techniques such as sawing, shearing, and laser cutting.
CO4	**Plan** and complete a simple sheet metal job from start to finish, incorporating shearing, bending, and joining operations.
CO5	**Describe** the applications, advantages and operation of advanced computerized machine tools in modern manufacturing.
CO6	**Apply** 3D Printing Technology including setup, operation, and post-processing to print simple mechanical component.

Course Code:	VSE-102
Course Name:	Design Thinking and Idea Lab
Course Objective:	• 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.
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 Objective:	To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error feedback
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
Course Objective:	Select any one course of their interests out of the list of Co-curricular Courses provided. Submit hard copy of a report along with certificate on the activities performed related to topics.
CO1	**Select** any one course of their interests out of the list of Co-curricular Courses provided.
CO2	**Perform** the activities related to the opted course.
CO3	Submit hard copy of the report

Course Code:	BSC-151-BES
Course Name:	Engineering Mathematics – II
Course Objective:	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.
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 Objective:	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
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 Objective:	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.
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 Objective:	Select any one course of their interests out of the list of Co-curricular Courses provided. Submit hard copy of a report along with certificate on the activities performed related to topics.
CO1	**Select** any one course of their interests out of the list of Co-curricular Courses provided.
CO2	**Perform** the activities related to the opted course.
CO3	Submit hard copy of the report