National Education Policy (NEP) Compliant Curriculum Structure

for

B. Tech. (Robotics & Artificial Intelligence)

(With effect from Academic Year 2024-25)

Department of Mechanical Engineering

COEP Technological University (COEP Tech)

A Unitary Public University of Government of Maharashtra

(Formerly College of Engineering Pune)

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Vision of the Department:

To be a leader amongst engineering institutions in India, offering value based world class education and constantly pursuing excellence

Mission of the Department:

M1: To offer state-of-the-art undergraduate, postgraduate and doctoral programmes

M2: To develop employable and skilled undergraduate to accept the global and societal challenges, while imparting quality education at postgraduate and research level.

M3: To Foster the passion of life-long learning in all facets of employability.

Program Educational Objectives (PEOs)

PEO1. ***Core Competence*****:** Fundamental and technical knowledge with skills in Robotics & Artificial Intelligence area to enable and empower to solve problems of the modern industrial world.

PEO2. ***Depth (Research culture)*****:** Imbibing a scientific perspective to make a decision of Robotic systems and Artificial Intelligence using Mathematical, Engineering, Computational & Simulation tools.

PEO3. ***Professionalism:*** Make acquaint with technical, managerial, and human skills and familiarize with professional issues like ethics and morality, Intellectual property Rights, Constitution of India and Environmental responsibility.

PEO4. ***Learning Environment:*** Motivation for entrepreneurship and inculcating a spirit of continuous lifelong learning for a successful professional career.

Program Outcomes

Program Outcomes of Engineering program as per norms (common to all UG/ PG Programme)

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, research literature, and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: The problems: • that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline. • that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions. • that require consideration of appropriate constraints/requirements not explicitly given in the problem statement. (like: cost, power requirement,

durability, product life, etc.). • which need to be defined (modeled) within appropriate mathematical frame work. • that often require use of modern computational concepts and tools.

PO5. Modern tool usage: 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.

PO6. The engineer and society: 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 practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with the 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.

PO11. Project management and finance: Demonstrate knowledge and understanding of the 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.

PO12. Life-long learning: 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 technological change.

Program Specific Objectives (PSOs)

PSO1 Design and Development: The ability to design and develop the products as per the need of the customers in the field of Mechanical and Allied Engineering Industries.

PSO2 Engineering Analysis and optimization: The ability to analyze and optimize the Mechanical systems/processes using various computational tools.

PSO3 Society: To strengthen Mechanical Engineering graduates who would value professional and ethical responsibilities while solving societal problems

List of Abbreviations

Abbreviation	Title
BS	Basic Science Course
ESC	Engineering Science Course
PCC	Programme Core Course (PCC)
PEC	Programme Elective Course (PEC)
OE/SE	Open/School Elective (OE/SE) other than particular program
MDM	Multidisciplinary Minor (MD M)
VSEC	Vocational and Skill Enhancement Course (VSEC)
HSMC	Humanities Social Science and Management
IKS	Indian Knowledge System (IKS)
VEC	Value Education Course (VEC)
RM	Research Methodology (RM)
--	Internship
--	Project
CEA	Community Engagement Activity (CEA)/Field Project
CCA	Co-curricular & Extracurricular Activities (CCA)

F.Y. B. Tech. Robotics & AI

[Level 4.5, UG Certificate] Semester -I

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	BSC	MRAIBSC101	Matrix Algebra, Calculus and Probability	2	1	0	1	3	30	20	50	--	--
02	BSC	MRAIBSC102	Engineering Physics	2	0	2	1	3	30	20	50	CIE: 100	
03	ESC	MRAIESC103	Basic Electrical & Electronics Engineering	2	0	2	1	3	30	20	50	CIE: 100	
04	ESC	MRAIESC104	Engineering Drawing and Graphics	1	0	4	1	3	CIE: 100			CIE: 100	
05	ESC	MRAIESC105	Engineering Mechanics	3	0	2	1	4	30	20	50	CIE: 100	
06	AEC-I	MRAIAEC106	Communication Skill	1	0	2	0	2	CIE: 100			CIE: 100	
07	CCA		Liberal Learning Course-I	0	0	2	2	1	--	--	--	CIE: 100	
08	VESC-I		Manufacturing Practices/ Fab Lab - I	0	0	2	1	1	--	--	--	CIE: 100	
			Total	**11**	**01**	**16**	**08**	**20**					

[Level 4.5, UG Certificate] Semester -II

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	BSC	MRAIBSC201	Engineering Chemistry	2	0	2#	1	3	30	20	50	CIE: 100	
02	BSC	MRAIBSC202	Ordinary Differential Equations and Multivariate Calculus	2	1	0	1	3	30	20	50	CIE: 100	
03	ESC	MRAIBSC203	Biology for Engineers	2	0	0	1	2	30	10	60	--	--
04	ESC	MRAIESC204	Systems in Mechanical Engineering	2	0	2	1	3	30	20	50	CIE: 100	
05	ESC	MRAIESC205	Programming for Problem Solving	1	0	2	2	2	CIE: 100			CIE: 100	
06	ESC	MRAIESC206	Design Thinking and Idea Lab	0	0	2	1	1	--	--	--	CIE: 100	
07	PCC	MRAIPCC207	Material Science	2	0	0	1	2	30	10	60	--	--
08	VSEC-II	MRAIVSEC208	Manufacturing Practices/ Fab Lab - II	0	0	2	0	1	--	--	--	CIE: 100	
09	IKS	MRAIIKS209	Indian Knowledge System	2	0	0	1	2	CIE: 100			--	--
10	CCA	MRAICCA210	Co-curricular/Office Automation/ Extracurricular Activity	0	0	2	0	1	--	--	--	CIE: 100	
11	CEA	MRAICEA211	Social Summer Internship-after Sem II-Exam in Sem III(60 Days)	0	0	0	0	0	--	--	--	--	--
			Total	**13**	**01**	**12**	**09**	**20**					

=> Combined Lab for Applied Chemistry and Material Science

Legends: **L**-Lecture, **T**-Tutorial, **P**-Practical, **S**-Self Study, **Cr**-Credits
ISE-In-Semester-Evaluation, **ESE**-End-Semester-Evaluation, **MSE**-Mid-Semester-Evaluation, **TA**-Teachers' Assessment, **CIE**-Continuous-Internal-Evaluation

For Exit after FY -- Additional Credits for Certificate (Any Four Skill Based Course)														
Sr. No.	**Course Type**	**Course Code**	**Course Name**	**L**	**T**	**P**	**S**	**Cr**	**Evaluation Scheme (Weightages in %)**					
									Theory			**Laboratory**		
									MSE	TA	ESE	ISE	ESE	
01	VSEC	MRAIVSEC2E1	Computer Aided Geometric Modelling	1	0	2	0	2	30	10	60	50	50	
02	VSEC	MRAIVSEC2E2	Additive Manufacturing	1	0	2	0	2	30	10	60	50	50	
03	VSEC	MRAIVSEC2E3	Metallurgical Lab Practice - I	1	0	2	0	2	30	10	60	50	50	
04	VSEC	MRAIVSEC2E4	Basics of CNC programming	1	0	2	0	2	30	10	60	50	50	
05	VSEC	MRAIVSEC2E5	Basics of Robotics & AI	1	0	2	0	2	30	10	60	50	50	
			Total	**18**	**01**	**22**	**9**	**30**						

*Summer internship (Industry / R&D / Academic Institute) after IV th semester during summer Vacation & Evaluation will be done in the starting of V th Semester