M. TECH CURRICULUM - 2025

(AUTONOMOUS)
CREATING TECHNOLOGY
LEADERS OF TOMORROW
ESTD 2002

Semester I to IV

Discipline: Mechanical Engineering

Stream: Industrial Automation and Robotics (IAR)

Branch Code: PIA

Jyothi Engineering College (AUTONOMOUS)
Reaccredited with NAAC (Grade A) and
NBA Programmes* (*CE, CS, EC, EE, ME, MR)
Jyothi Hills, P. O. Vettikkattiri, Cheruthuruthy
Thrissur, Kerala, India, 679531
04884 259000 | info@jecc.ac.in | www.jecc.ac.in
A Centre of Excellence in Science and Technology by the Catholic Archdiocese of Trichur

VISION & MISSION OF THE INSTITUTE

VISION: Creating eminent and ethical leaders through quality professional education with emphasis on holistic excellence.

MISSION

- To emerge as an institution par excellence of global standards by imparting quality engineering and other professional programmes with state-of-the-art facilities.
- To equip the students with appropriate skills for a meaningful career in the global scenario.
- To inculcate ethical values among students and ignite their passion for holistic excellence through social initiatives.
- To participate in the development of society through technology incubation, entrepreneurship and industry interaction.

VISION & MISSION OF THE DEPARTMENT

VISION: To provide quality education of international standards in Mechanical Engineering and promote professionalism with ethical values, to work in a team and to face global challenges.

MISSION

- To provide an education that builds a solid foundation in Mechanical Engineering.
- To prepare graduates for employment, higher education and enable a lifelong growth in their profession.
- To develop good communication, leadership, and entrepreneurship skills to enable good knowledge transfer.
- To inculcate world class research program in Mechanical Engineering

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1 The graduates will demonstrate the skills to design, analyse, and implement systems to solve real-world problems through robotics and automation.

PEO2 Demonstrate technical competence in identifying, analysing, and designing innovative, sustainable, and cost-effective solutions for complex problems in industrial automation.

PEO3 Have successful professional career in industry, government, academia, and military as innovative engineers.

PEO4 Work successfully in collaborative and multidisciplinary environments upholding professional and ethical values.

PEO5 Be active members ready to serve society locally and internationally and take up entrepreneurship for the growth of the economy and to generate employment.

PROGRAMME SPECIFIC OUTCOMES

PSO1 Apply engineering skills to model, simulate, design, and implement automation solutions for improvement of industrial productivity.

PSO2 Design, develop and maintain robotics and automation systems for a variety of applications.

PSO3 Design indigenous and cost-effective systems to solve problems in industrial automation using advanced hardware and software tools.

PSO4 Apply domain knowledge of robotics and automation to provide solutions in interdisciplinary areas to meet current industrial challenges.

PSO5 Undertake higher education, research, and entrepreneurship in the field of automation and robotics.

PROGRAMME OUTCOMES

PO1 An ability to independently carry out research/investigation and development work in engineering and allied streams.

PO2 An ability to communicate effectively, write and present technical reports on complex engineering activities by interacting with the engineering fraternity and with society at large.

PO3 An ability to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4 An ability to apply stream knowledge to design or develop solutions for real-world problems by following the standards.

PO5 An ability to identify, select and apply appropriate techniques, resources and state-of-the-art tools to model, analyse and solve practical engineering problems.

PO6 An ability to engage in life-long learning for the design and development related to stream-related problems, taking into consideration sustainability, societal, ethical, and environmental aspects.

PO7 An ability to develop cognitive load management skills related to project management and finance, which focus on entrepreneurship and industry relevance.

SEMESTER I

SLOT	COURSE CODE	COURSE NAME	MARKS		L-T-P	HOURS	CREDIT
			CIA	ESE			
A	**25PIAT101**	COMPUTATIONAL METHODS FOR ENGINEERS	40	60	3-0-0	3	3
B	**25PIAT102**	ROBOTICS AND AUTOMATION	40	60	3-0-0	3	3
C	**25PIAT103**	CAD /CAM	40	60	3-0-0	3	3
D	**25PIAT11N**	PROGRAM ELECTIVE 1	40	60	3-0-0	3	3
E	**25PIAT12N**	PROGRAM ELECTIVE 2	40	60	3-0-0	3	3
S	**25PRGT100**	RESEARCH METHODOLOGY AND IPR	40	60	2-0-0	2	2
T	**25PIAL104**	ADVANCED MANUFACTURING LAB 1	100	--	0-0-2	2	1
Total			**340**	**360**		**19**	**18**

Teaching Assistance: 6 hours

PROGRAM ELECTIVE 1

PROGRAM ELECTIVE 1 (25PIAT11N)						
SLOT	**SL NO**	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**HOURS**	**CREDIT**
D	1	**25PIAT111**	COMPOSITE MATERIALS	3-0-0	3	3
	2	**25PIAT112**	FINITE ELEMENT ANALYSIS	3-0-0	3	3
	3	**25PIAT113**	DESIGN FOR MANUFACTURING	3-0-0	3	3

PROGRAM ELECTIVE 2

PROGRAM ELECTIVE 2 (25PIAT12N)						
SLOT	**SL NO**	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**HOURS**	**CREDIT**
E	1	**25PIAT121**	PRODUCTION AND OPERATIONS MANAGEMENT	3-0-0	3	3
	2	**25PIAT122**	SOFT COMPUTING TECHNIQUES	3-0-0	3	3
	3	**25PIAT123**	NANO MICRO MANUFACTURING	3-0-0	3	3

SEMESTER II

SLOT	COURSE CODE	COURSE NAME	MARKS		L-T-P	HOURS	CREDIT
			CIA	ESE			
A	**25PIAT201**	DESIGN OF EXPERIMENTS	40	60	3-0-0	3	3
B	**25PIAT202**	MODERN MANUFACTURING SYSTEMS	40	60	3-0-0	3	3
C	**25PIAT23N**	PROGRAM ELECTIVE 3	40	60	3-0-0	3	3
D	**25PIAT24N**	PROGRAM ELECTIVE 4	40	60	3-0-0	3	3
E	**25PIAT21N / 25PILE13N**	INDUSTRY/ INTERDISCIPLINARY ELECTIVE	40	60	3-0-0	3	3
S	**25PIAP203**	MINI PROJECT	100	--	0-0-4	4	2
T	**25PIAL204**	ADVANCED MANUFACTURING LAB 2	100	--	0-0-2	2	1
Total			**400**	**300**		**21**	**18**

Teaching Assistance: 6 hours

PROGRAM ELECTIVE 3

PROGRAM ELECTIVE 3 (25PIAT23N)						
SLOT	**SL NO**	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**HOURS**	**CREDIT**
C	1	**25PIAT231**	CELLULAR MANUFACTURING AND GROUP TECHNOLOGY	3-0-0	3	3
	2	**25PIAT232**	ENTERPRISE RESOURCE PLANNING	3-0-0	3	3
	3	**25PIAT233**	FLEXIBLE MANUFACTURING SYSTEMS	3-0-0	3	3

PROGRAM ELECTIVE 4

PROGRAM ELECTIVE 4 (25PIAT24N)						
SLOT	**SL NO**	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**HOURS**	**CREDIT**
D	1	**25PIAT241**	COMPUTER AIDED MEASUREMENTS	3-0-0	3	3
	2	**25PIAT242**	MODELING AND SIMULATION OF ENGINEERING SYSTEM	3-0-0	3	3
	3	**25PIAT243**	OPTIMIZATION TECHNIQUES	3-0-0	3	3

INTERDISCIPLINARY ELECTIVE

INTERDISCIPLINARY ELECTIVE (25PIAT21N)						
SLOT	**SL NO**	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**HOURS**	**CREDIT**
E	1	**25PIAT211**	INTERNET OF THINGS	3-0-0	3	3
	2	**25PIAT212**	DIGITAL PRODUCT DESIGN AND MANUFACTURING	3-0-0	3	3
	3	**25PIAT213**	RELIABILITY ENGINEERING	3-0-0	3	3
	4	**25PIAT214**	INDUSTRIAL SAFETY IN ENGINEERING	3-0-0	3	3

SEMESTER III

SLOT	COURSE CODE	COURSE NAME	MARKS		L-T-P	HOURS	CREDIT
			CIA	ESE			
TRACK 1							
A*	**25PIAXXXX**	MOOC	To be completed successfully		--	--	2
B	**25PAGT31N**	AUDIT COURSE	40	60	3-0-0	3	-
C	**25PIAI301**	INTERNSHIP	50	50	--	--	3
D	**25PIAP302**	DISSERTATION PHASE 1	100	--	0-0-17	17	11
TRACK 2							
A*	**25PIAXXXX**	MOOC	To be completed successfully		--	--	2
B	**25PAGT31N**	AUDIT COURSE	40	60	3-0-0	3	-
C	**25PIAI301**	INTERNSHIP	50	50	---	--	3
D	**25PIAP303**	RESEARCH PROJECT PHASE 1	100	--	0-0-17	17	11
Total			**190**	**110**		**20**	**16**

Teaching Assistance: 6 hours

*MOOC Course to be successfully completed before the commencement of fourth semester (starting from semester 1).

AUDIT COURSE						
SLOT	**SL NO**	**COURSE CODE**	**COURSE NAME**	**L-T-P**	**HOURS**	**CREDIT**
B	1	**25PAGT311**	ACADEMIC WRITING	3-0-0	3	-
	2	**25PAGT312**	ADVANCED ENGINEERING MATERIALS	3-0-0	3	-
	3	**25PAGT313**	FORENSIC ENGINEERING	3-0-0	3	-
	4	**25PAGT314**	DATA SCIENCE FOR ENGINEERS	3-0-0	3	-
	5	**25PAGT315**	DESIGN THINKING	3-0-0	3	-
	6	**25PAGT316**	FUNCTIONAL PROGRAMMING IN HASKELL	3-0-0	3	-
	7	**25PAGT317**	FRENCH LANGUAGE (A1 LEVEL)	3-0-0	3	-
	8	**25PAGT318**	GERMAN LANGUAGE (A1 LEVEL)	3-0-0	3	-
	9	**25PAGT319**	JAPANESE LANGUAGE (N5 LEVEL)	3-0-0	3	-
	10	**25PAGT320**	PRINCIPLES OF AUTOMATION	3-0-0	3	-
	11	**25PAGT321**	REUSE AND RECYCLE TECHNOLOGY	3-0-0	3	-
	12	**25PAGT322**	SYSTEM MODELING	3-0-0	3	-
	13	**25PAGT323**	EXPERT SYSTEMS	3-0-0	3	-

SEMESTER IV

SLOT	COURSE CODE	COURSE NAME	MARKS		L-T-P	HOURS	CREDIT
			CIA	ESE			
TRACK 1							
A	**25PIAP401**	Dissertation Phase II	100	100	0-0-24	24	16
TRACK 2							
A	**25PIAP402**	Research Project Phase II	100	100	0-0-24	24	16
Total			**100**	**100**		**24**	**16**

Teaching Assistance: 5 hours

ASSESSMENT PATTERN

(i) CORE COURSES

Evaluation shall only be based on application, analysis or design based questions (for both internal and end semester examinations).

Continuous Internal Evaluation: 40 marks

Micro project/Course based project:	20 marks
Course based task/Seminar/Quiz:	10 marks
Test paper, 1 no:	10 marks

The project shall be done individually. Group projects not permitted. Test paper shall include minimum 80% of the syllabus.

End Semester Examination: 60 marks

The end semester examination will be conducted by the University. There will be two parts; Part A and Part B. Part A contain 5 numerical questions (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students), with 1 question from each module, having 5 marks for each question. Students shall answer all questions. Part B contains 7 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student shall answer any five. Each question can carry 7 marks. Total duration of the examination will be 150 minutes.

(ii) ELECTIVE COURSES

Evaluation shall only be based on application, analysis or design based questions (for both internal and end semester examinations).

Continuous Internal Evaluation: 40 marks

Preparing a review article based on peer reviewed

Original publications (minimum 10 15 marks

Publications shall be referred):

Course based task/Seminar/Data 15 marks

Collection and interpretation:

Test paper, 1 no.: 10 marks

Test paper shall include minimum 80% of the syllabus.

End Semester Examination: 60 marks

The end semester examination will be conducted by the respective College. There will be two parts; Part A and Part B. Part A will contain 5 numerical/short answer questions with 1 question from each module, having 5 marks for each question (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students). Students should answer all questions. Part B will contain 7 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student should answer any five. Each question can carry 7 marks.

Note: The marks obtained for the ESE for an elective course shall not exceed 20% over the average ESE mark % for the core courses. ESE marks awarded to a student for each elective course shall be normalized accordingly. For example if the average end semester mark % for a core course is 40, then the maximum eligible mark % for an elective course is 40+20 = 60 %.

(iii) **RESEARCH METHODOLOGY & IPR/AUDIT COURSE**

Continuous Internal Evaluation: 40 marks

Course based task: 15 marks

Seminar/Quiz: 15 marks

Test paper, 1 no.: 10 marks

Test paper shall include minimum 80% of the syllabus.

End Semester Examination: 60 marks

The examination will be conducted by the respective College. The examination will be for 150 minutes and will contain 7 questions, with minimum one question from each module of which student should answer any five. Each question can carry 12 marks.

(iv) LABORATORY COURSES

The laboratory courses will be having only Continuous Internal Evaluation and carries 100 marks. Final assessment shall be done by two examiners; one examiner will be a senior faculty from the same department.

(v) INTERDISCIPLINARY ELECTIVE

Engineering students frequently aspire to work in areas and domains that are key topics in the industry. There are concerns by recruiters that skill sets of engineering students did not match with the Industry requirements, especially in the field of latest topics. In response to their desires, the University has incorporated Industry/Interdisciplinary electives in the curriculum. Interdisciplinary knowledge is critical for connecting students with current industry trends, where multitasking is the norm. Interdisciplinary knowledge aids in the bridge- building process between academic institutions and industry. It aids pupils in expanding their knowledge and innovating by allowing them to create something new. While core engineering courses provide students with a strong foundation, evolving technology necessitates new methods and approaches to progress, prosperity, and the inculcation of problem-solving techniques. Other courses' knowledge, on the other hand, can assist them to deal with any scenario more effectively. Interdisciplinary courses may be one approach to address such needs, as they can aid in the enhancement of engineering education and the integration of desirable specialized subjects into the current engineering education system. This will enable students to fulfill the current industry demands. Students with multidisciplinary knowledge and projects are more likely to be placed in top industries, according to the placement trend. The future of developing engineers will be influenced by their understanding of emerging technology and interdisciplinary

approaches such as bigdata, machine learning, and 3-D printing.

Continuous Internal Evaluation: 40 marks

Preparing a review article based on peer reviewed

Original publications (minimum 10 publications shall be referred):	15 marks
Course based task/Seminar/Data collection and interpretation:	15 marks
Test paper, 1 no:	10 marks

Test paper shall include minimum 80% of the syllabus.

End Semester Examination: 60 marks

The end semester examination will be conducted by the respective College. There will be two parts; Part A and Part B. Part A will contain 5 numerical/short answer questions with 1 question from each module, having 5 marks for each question (such questions shall be useful in the testing of knowledge, skills, comprehension, application, analysis, synthesis, evaluation and understanding of the students). Students should answer all questions. Part B will contain 7 questions (such questions shall be useful in the testing of overall achievement and maturity of the students in a course, through long answer questions relating to theoretical/practical knowledge, derivations, problem solving and quantitative evaluation), with minimum one question from each module of which student should answer any five. Each question can carry 7 marks.

(vi) MOOC COURSES

The MOOC course shall be considered only if it is conducted by the agencies namely AICTE/NPTEL/SWAYAM or NITTTR. The MOOC course should have a minimum duration of 8 weeks and the content of the syllabus shall be enough for at least 40 hours of teaching. The course should have a proctored/offline end semester examination. The students can do the MOOC according to their convenience, but shall complete it by third semester. The list of MOOC courses will be provided by the concerned BoS if at least 70% of the course content match with the area/stream of study. The course shall not be considered if its content has more than 50% of overlap

with a core/elective course in the concerned discipline or with an open elective.

MOOC Course to be successfully completed before the commencement of fourth semester (starting from semester 1). A credit of 2 will be awarded to all students whoever successfully completes the MOOC course as per the evaluation pattern of the respective agency conducting the MOOC.

(vii) **MINIPROJECT**

Total marks: 100, only CIA

Mini project can help to strengthen the understanding of student's fundamentals through application of theoretical concepts and to boost their skills and widen the horizon of their thinking. The ultimate aim of an engineering student is to resolve a problem by applying theoretical knowledge. Doing more projects increases problem-solving skills. The introduction of mini projects ensures preparedness of students to undertake dissertation. Students should identify a topic of interest in consultation with PG Programme Coordinator that should lead to their dissertation/research project. Demonstrate the novelty of the project through the results and outputs. The progress of the mini project is evaluated based on three reviews, two interim reviews and a final review. A report is required at the end of the semester.

Interim evaluation: 40 (20 marks for each review), final evaluation by a Committee (will be evaluating the level of completion and demonstration of functionality/specifications, clarity of presentation, oral examination, work knowledge and involvement): 35, Report (the committee will be evaluating for the technical content, adequacy of references, templates followed and permitted plagiarism level is not more than 25%): 15, Supervisor/Guide: 10

TEACHING ASSISTANCESHIP (TA)

All M Tech students irrespective of their category of admission shall undertake TA duties for a minimum duration as per the curriculum. Being a TA, the student will get an excellent opportunity to improve their expertise in the technical content of the course, enhance communication skills, obtain a hands-on experience in handling the experiments in the laboratory and improve peer interactions.

The possible TA responsibilities include the following: facilitate a discussion section or

tutorial for a theory/ course, facilitate to assist the students for a laboratory course, serve as a mentor for students, and act as the course web-master. TAs may be required to attend the instructor's lecture regularly. A TA shall not be employed as a substitute instructor, where the effect is to relieve the instructor of his or her teaching responsibilities (specifically prohibited by University Policy).

For the tutorial session:

(i) Meet the teacher and understand your responsibilities well in advance, attend the lectures of the course for which you are a tutor, work out the solutions for all the tutorial problems yourself, approach the teacher if you find any discrepancy or if you need help in solving the tutorial problems, use reference text books, be innovative and express everything in English only.

(ii) Try to lead the students to the correct solutions by providing appropriate hints rather than solving the entire problem yourself, encourage questions from the students, lead the group to a discussion based on their questions, plan to ask them some questions be friendly and open with the students, simultaneously being firm with them.

(iii) Keep track of the progress of each student in your group, give a periodic feedback to the student about his/her progress, issue warnings if the student is consistently under-performing, report to the faculty if you find that a particular student is consistently underperforming, pay special attention to slow-learners and be open to the feedback and comments from the students and faculty.

(iv) After the tutorial session you may be required to grade the tutorials/assignments/tests. Make sure that you work out the solutions to the questions yourself, and compare it with the answer key, think and work out possible alternate solutions to the same question, understand the marking scheme from the teacher. Consult the teacher if you are not partial to some student/students while grading. Follow basic ethics.

Handling a laboratory Session:

(i) Meet the faculty – in- charge a few days in advance of the actual lab class and get the details of the experiment, get clarifications from him/her regarding all aspects of the experiment and the expectations, prepare by reading about the theoretical background of the experiment, know the physical concepts involved in the experiment, go to the

laboratory and check out the condition of the equipment/instrumentation, perform the laboratory experiment at least once one or two days before the actual laboratory class, familiarize with safety/ security aspects of the experiment / equipment/laboratory, prepare an instruction sheet for the experiment in consultation with the faculty, and keep sufficient copies ready for distribution to students for their reference.

(ii) Verify condition of the equipment/set up about 30 minutes before the students arrive in the class and be ready with the hand outs, make brief introductory remarks about the experiment, its importance, its relevance to the theory they have studied in the class, ask the students suitable questions to know there level of preparation for the experiment, discuss how to interpret results, ask them comment on the results.

(iii) Correct/evaluate/grade the submitted reports after receiving suitable instructions from the faculty in charge, continue to interact with students if they have any clarifications regarding any aspect of the laboratory session, including of course grading, Carefully observe instrument and human safety in laboratory class, Preparing simple questions for short oral quizzing during explanation of experiments enables active participation of students, facilitate attention, provides feedback and formative assessment.