

DEPARTMENT OF PRODUCTION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	INDUSTRIAL AUTOMATION AND MECHATRONICS		
Course Code	PR 629	No. of Credits	3
Course Code of Pre-requisite subject(s)	-	-	-
Session	January 2018	Section (if, applicable)	-
Name of Faculty	Dr.K.Panneerselvam	Department	Production Engineering
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Name of Course Coordinator(s) (if, applicable)	-		
E-mail	-	Telephone No.	-
Course Type	<input type="checkbox"/> Core course <input checked="" type="checkbox"/> Elective course		
Syllabus (approved in BoS)			
PR 629 INDUSTRIAL AUTOMATION AND MECHATRONICS			
L T P C 3 0 0 3			
<p>Need for Automation, Hydraulic & Pneumatic system Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics system – Selection criteria. Hydraulic system components selection and specification-characteristics – Linear actuator– construction. Reservoir capacity, heat dissipation, accumulators - standard circuit symbols, circuit (flow) analysis. Direction, flow and pressure control valves-operating-characteristics-electro hydraulic servo valves-types, characteristics and performance.</p> <p>Typical industrial hydraulic circuits-Design methodology – Ladder diagram-cascade, method-truth table-Karnaugh map method-sequencing circuits-combinational and logic circuit.</p> <p>Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram.</p> <p>Programmable logic control of Hydraulics and Pneumatics circuits, Sensors, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.</p> <p>Semi automats-automats-transfer lines - automatic assembly - transfer devices and feeders-classifications and applications-job orienting and picking devices- setting of automats and transfer lines.</p> <p>https://www.nitt.edu/home/academics/curriculum/M.Tech-PR-MT-2016.pdf</p>			

COURSE OBJECTIVES

1. Study and describe the fluid power (Hydraulic and Pneumatic) system, its components with symbols and circuits for industrial problems
2. Understand the concept and basics PLC with Fluid power control system for the industrial circuits.
3. Understand the concept and basics of Industrial automation for part picking, part orientation and transfer system

COURSE OUTCOMES (CO)

Course Outcomes

Aligned Programme Outcomes (PO)

COURSE OUTCOMES	Program Outcomes (PO)										
	1	2	3	4	5	6	7	8	9	10	11
CO1. Identify the fluid power system to meet industrial automation needs.	√	√	√	√	√	√	√	√	√		√
CO2. Apply Electrical control system and PLCs technology in fluid power system for providing solution to industrial automation.	√	√	√	√	√	√	√	√	√		√
CO3. Understand the concept and basics of Industrial automation.	√	√	√	√	√	√	√	√	√		√

PROGRAMME OUTCOMES (POs)

Sl. No	Attributes	Programme Outcomes (POs): On successful completion of the programme the students will be able to
1.	Scholarship of Knowledge	Acquire in depth knowledge in Manufacturing technology with an ability to define, evaluate, analysis and synthesize existing and new knowledge.
2.	Critical Thinking	Analyze problems critically; apply independent judgment for synthesizing information to make intellectual and/or creative advances for conducting research.
3.	Problem Solving	Conceptualize and solve Manufacturing engineering problems and evaluate optimal solutions considering economic and eco-friendly factors
4.	Research Skill	Develop scientific/ technological knowledge in Manufacturing engineering through literature survey and design of experiments.
5.	Usage of modern tools	Apply of IT tools such as CAD/CAE/CAM for modeling and simulation of complex Manufacturing processes.
6.	Collaborative and multi-disciplinary work	Perform collaborate multidisciplinary scientific Manufacturing engineering research through self-management and team work.
7.	Project Management and Finance	Demonstrate knowledge and understanding of Manufacturing engineering and management and apply the same to one's own work, as a member and leader in team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economic and financial factors.
8.	Communication	Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.
9.	Life-long Learning	Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.
10.	Ethical Practices and Social Responsibility	Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.
11.	Independent and Reflective Learning	Observe and examine critically the outcomes of one's actions and make corrective measures subsequently and learn from mistakes without depending on external feedback.

COURSE PLAN – PART II

COURSE OVERVIEW

This course is to teach the principles and application of hydraulic, pneumatic, electric controls system in such a way that the students can understand and use it in practical applications. This course gives (i) Overall view of principles and application of Mechanical, hydraulic, pneumatic, electric controls system, (ii) Study on Hydraulic system, Pneumatic system, ElectroPneumatic System and Electro hydraulic system, its components with symbols and Design of circuits for industrial problems, (iii) Introduction to PLC and integrating it with Fluid power (Hydraulic and Pneumatic) system for Industrial automation and (iv) Study on semiautomatic system for part picking, part orientation and transfer system to Industrial automation

COURSE TEACHING AND LEARNING ACTIVITIES

S.No	Week	Topic	Mode of Delivery
1.	Week-1 to Week-6	Need for Automation, Hydraulic & Pneumatic system Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics system – Selection criteria. Hydraulic system components selection and specification-characteristics – Linear actuator-construction. Reservoir capacity, heat dissipation, accumulators - standard circuit symbols, circuit (flow) analysis. Direction, flow and pressure control valves-operating-characteristics-electro hydraulic servo valves-types, characteristics and performance. Typical industrial hydraulic circuits-Design methodology – Ladder diagram-cascade, method-truth table-Karnaugh map method-sequencing circuits-combinational and logic circuit.	C&T/PPT
2.	Week-7	Assignment-1 and Cycle Test-1	
3.	Week-8 to Week -11	Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram. Programmable logic control of Hydraulics and Pneumatics circuits, Sensors, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.	C&T/PPT
4.	Week-12	Assignment-2 and Cycle Test-2	
5.	Week-13 to Week-15	Semi automats-automats-transfer lines - automatic assembly - transfer devices and feeders- classifications and applications-job orienting and picking devices- setting of automats and transfer lines.	C&T/PPT
6.	Week-16	Compensation Assessment	
7.	Week-17	End Semester Examination	

C & T : Chalk and Talk PPT : Power Point

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.no.	Mode of assessment for theory	Week/date	Duration	Wt. %
1	Assignment-1	Week-7		5
2	Cycle Test-1	Week-7	60 Minutes	20
3	Assignment-2	Week-12		5
4	Cycle Test-2	Week-12	60 Minutes	20
5	Compensation Assessment*	Week-16	60 Minutes	20
6	End Semester Examination	Week-17	120 Minutes	50

Important Note:

1. Attending all the assessments (Assessment – 1-4 and 6) are MANDATORY for every student.
2. If any student is not able to attend Cycle Test-1 or Cycle Test-2 due to genuine reason, student is permitted to attend the retest with 20% weightage (20 marks).
3. In any case, Compensation Assessment will not be considered as an improvement test.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Mention the ways in which the feedback about the course is assessed and indicate the attainment also:

- Feedback from the students during class committee meetings
- Anonymous feedback through questionnaire (Mid of the semester & End of the semester)

MODE OF CORRESPONDENCE (email/ phone etc.)

1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes schedule of assessment course material any other information regarding this course) will be done through their webmail only.
2. Queries (if required) may be emailed to me / contact me during 4.00 pm to 5.00 pm on Monday and Friday with prior intimation for any clarifications.

ATTENDANCE

Attendance will be taken by the course faculty in all the contact hours.

ACADEMIC HONESTY & PLAGIARISM

Copying in any form during assessments is considered as academic dishonesty and will attract suitable penalty.


ADDITIONAL COURSE INFORMATION

The faculty is available for consultation at times as per the intimation given by the faculty.
Queries may also be emailed to the Course Faculty directly at kps@nitt.edu

FOR APPROVAL


Course Faculty


CC Chairperson


HOD