

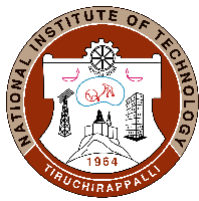
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF PRODUCTION ENGINEERING

| COURSE PLAN – PART I | | | | | | | | | | | |
|--|--|---|-------------------------------|---|---|---|---|---|---|---|---|
| Name of the programme and specialization | M.Tech. (Manufacturing Technology) | | | | | | | | | | |
| Course Title | MANUFACTURING AUTOMATION AND MECHATRONICS | | | | | | | | | | |
| Course Code | PR632 | No. of Credits | 3 | | | | | | | | |
| Course Code of Pre-requisite subject(s) | - | - | - | | | | | | | | |
| Session | January 2021 | Section (if, applicable) | - | | | | | | | | |
| Name of Faculty | Dr.K.PANNEERSELVAM | Department | Production Engineering | | | | | | | | |
| Email | kps@nitt.edu | Telephone No. | 04312503515 | | | | | | | | |
| 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) | | | | | | | | | | | |
| PR632 Manufacturing Automation and Mechatronics | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>L</th> <th>T</th> <th>P</th> <th>C</th> </tr> </thead> <tbody> <tr> <td align="center">3</td> <td align="center">0</td> <td align="center">0</td> <td align="center">3</td> </tr> </tbody> </table> | | | | L | T | P | C | 3 | 0 | 0 | 3 |
| 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> | | | | | | | | | | | |



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF PRODUCTION ENGINEERING

| 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) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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. | <table border="1"> <thead> <tr> <th rowspan="2">COURSE OUTCOMES</th> <th colspan="11">Program Outcomes (PO)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> </tr> </thead> <tbody> <tr> <td>CO1</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td>√</td> </tr> <tr> <td>CO2</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td>√</td> </tr> <tr> <td>CO3</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> <td>√</td> </tr> </tbody> </table> | COURSE OUTCOMES | Program Outcomes (PO) | | | | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | CO1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | CO2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | CO3 | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ |
| | COURSE OUTCOMES | | Program Outcomes (PO) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CO1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CO3 | √ | √ | √ | √ | √ | √ | √ | √ | √ | | √ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
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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 | | 15 |
| 2 | Cycle Test-1 | Week-7 | 60 Minutes | 20 |
| 3 | Assignment-2 | Week-12 | | 15 |
| 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 | 30 |

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.



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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 on Monday and Friday with prior intimation for any clarifications.

ATTENDANCE (A uniform attendance policy as specified below shall be followed)

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

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC HONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

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