# Maharashtra State Board of Technical Education, Mumbai TEACHING PLAN (TP)

**D-1**

## Academic Year: 2020-21

**Date:** 16/06/2020

**Institute Name &Code:** Late Annasheb Polytechnic(NIT’S), Nashik (1479)

**Programme and Code**: Electronics & Telecommunication Engineering **Course Index:** 502 **Course Name**: Control System & PLC **Course Abbr-Code**: CSP -22531 **Semester**: Fifth **Scheme**: ‘I’ **Allocated Hrs:** 64 **Faculty**: Mrs.S.K.Khaire

# Class: TYEJ

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## Course Objectives:

* 1. Identify different types of control systems.
  2. Determine stability of control system.
  3. Test the performance of various types of controllers.
  4. Maintain various components of PLC based process control system.
  5. Maintain PLC based process control system.

## Course Outcomes (COs) and Unit Outcomes: Theory & Practical

By learning course Data Communication & Computer Network (DCC-22414), Second Year students will be able to:

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| **CO No.** | **UO No.** | **Course Outcomes (COs) / Unit Outcomes (UOs)** |
| **CO502.1** |  | **Basic control system.** |
|  | 1a | Explain with sketches the working principle of given type of control system |
| 1b | Compare the given control system based on the given parameters |
| 1c | Derive transfer functions of the given electrical circuits |
| 1d | Use block diagram reduction rules to determine, optimize transfer function of the given systems. |
| **CO502.2** |  | **Time domain stability analysis.** |
|  | 2a | Compare the parameters of given standard test input |
| 2b | Identify poles zero types & order for given transfer function |
| 2c | Sketch pole zero plot for given transfer function |
| 2d | Determine the output of the given order system for step input |
| 2e | Calculate response specification function for given transfer function |
|  | 2f | Calculate error constants for control system |
|  | 2g | Determine stability for the given control system using Routh’s stability criteria |
| **CO502.3** |  | **Process controller.** |
|  | 3a | Explain with sketch the given process control system |
| 3b | Describe with sketch the given control system action |
| 3c | Compare different electronics controllers on basis of given parameters |
| 3d | Sketch response of given controllers with respect to errors |
| **CO502.4** |  | **Fundamentals of PLC.** |
|  | 4a | Explain with sketch PLC based automation system |
| 4b | Describe with sketch the given PLC module |
| 4c | Identify different devices interfaced with PLC |
| 4d | Explain the steps for PLC installation |

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| **CO502.5** |  | **PLC hardware & programming.** |
|  | 5a | Identify & describe the given module of PLC |
| 5b | Describe the addressing of PLC |
| 5c | Use instruction set to perform the given operation |
| 5d | Develop ladder logic programs for the given applications |

* Teaching Plan:

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| **Unit No.**  **(Allotted Hrs.)** | **Unit**  **Objectives** | **Title/Topic Details and Course Outcome (CO)** | **Plan (From - To**  **& No. of**  **Lectures)** | **Actual Execution (From-To & No. of Lectures)** | **Teaching Method/ Media/ Tools** | **Remark** |
| **01.**  **(10)** | 1a | **1.1** Basics of control systems  **1.1.2** Basic block diagram & classification | 15/06/2020  to 17/06/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 1b | * 1. Open loop & Close loop control system details & their comparison      1. Linear & Nonlinear control systems, Time varying & Time in varying control system details | 18/06/2020  to 22/06/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 1c | * 1. Transfer Functions: RC , LC & RLC circuits – differential equations & transfer functions along with analysis   2. Block diagram reduction technique | 23/06/2020  to 25/06/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| **02.**  **(16)** | 2a | **2.1** Time Response : Transient & steady state response | 25/06/2020  to 26/06/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 2b | * 1. Concepts of standard state inputs & it’s types      1. Step, Ramp, Parabolic & impulse concept. | 29/06/2020  to 01/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 2b,2c | * 1. Analysis of first & second order control systems, poles & zero concept.      1. Order of systems & its equations with numerical | 01/07/2020  to 02/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 2d | * + 1. First order system for unit step input , concept of time constant     2. second order system for unit step input , concept of time constant , concept ,definition | 02/07/2020  to 03/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |

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|  | 2e,2f | **2.3.4** Time response specification – Tp , Ts & Tr details  Time response specification – TD & Mp with numerical | 06/07/2020  to 07/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 2e,2f | * 1. Steady state analysis for type 0, type 1 & type 2 system      1. Steady state errors & error constants with numerical | 08/07/2020  to 09/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 2f | * 1. Details of stable & astable systems ,      1. concept of relative stability   **2.6** Routh’s stability criteria & steps | 09/07/2020  to 13/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| **03.**  **(08)** | 3a | **3.1** Block diagram & functions of process control systems | 14/07/2020  to 15/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 3b | **3.2** control action   * + 1. Discontinuous mode of on- off controllers systems.     2. On -off controller equation & neutral zone concept.   Proportional controller in continuous mode | 16/07/2020  to 17/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 3b,3c, 3d | * 1. composite controllers      1. Integral & derivative controller with equations &Bit’s response      2. PI composite controllers with equations PD ,PID controllers with output equations | 20/07/2020  to 22/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| **04.**  **(12)** | 4a | **4.4** PLC  **4.1** PLC block diagram, classification, benefits & it’s need. | 23/07/2020  to 24/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 4b,4c | * 1. Description of PLC      1. Scanning cycle ,speed of execution      2. Power supply of PLC & its function of each block.      3. Different memories, their functions & organizations.      4. PLC input & output modules with their   functions | 24/07/2020  to 31/07/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |

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|  | 4d | * 1. PLC installation      1. PLC installation & review of PLC fundamentals | 03/08/2020  to 05/08/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| **05.**  **(18)** | 5a | * 1. Block diagram & specification of AC input module   2. Block diagram & specification of DC input module      1. Sinking & Sourcing concept in DC module | 06/08/2020  to 07/08/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 5b | * 1. Block diagram & specification of Analog input output module      1. Analog input PLC module diagram and specification      2. Analog output PLC module specification | 11/08/2020  to 18/08/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 5c | * 1. I/O addressing of PLC      1. Addressing of data files & different types of addressing | 19/08/2020  to 20/08/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 5c,5d | * 1. PLC instruction set      1. Relay instruction, timer instruction      2. PLC instruction set - counter instruction, data movement instruction      3. PLC instruction set -logical & comparison instruction | 21/08/2020  to 26/08/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
| 5d | **5.6** PLC programming - Ladder programming language | 27/08/2020  to 28/08/2020 |  | Videos & PPT  Online teaching on zoom, etc. |  |
|  |  | **Total** | 64 |  |  |  |

### Chapter wise CO Mapping:

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|  | **CO502.1** | **CO502.2** | **CO502.3** | **CO502.4** | **CO502.5** |
| **Chapter 1** |  |  |  |  |  |
| **Chapter 2** |  |  |  |  |  |
| **Chapter 3** |  |  |  |  |  |
| **Chapter 4** |  |  |  |  |  |
| **Chapter 5** |  |  |  |  |  |

* **Direct Assessment Criteria:**
  + **Rules for Theory Assessment:**

1. Weekly Test may be conducted in class. Student can’t access any study material during test.
2. An Open Book Test may be conducted in class. Student can access any material but no discussion with any one is allowed during test.
3. Total weightage of Theory Marks to the Course is 100. From 100 Marks 70 Marks are allotted to MSBTE TH Examination and 30 Marks are allotted to Theory Progressive Assessment (PA).
4. Under the theory PA; out of 30 Marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 test taken during the semester
5. MSBTE Theory Examination of 70 marks will be conducted by MSBTE at the end of semester. The schedule of MSBTE Examinations will be announced by MSBTE on the website [www.msbte.com](http://www.msbte.com/).

### Rules for Practical assessment:

* 1. Progressive Assessment (P.A.) of each experiment will be done out of 25 marks on the basis of Use of appropriate tool to solve the problem, Quality of output achieved, Answer to sample questions and Submit report in time
  2. Final term work of 50 marks is calculated based on Progressive Assessment for each experiment
  3. Term Work Marks = ((Total Marks Obtained in P.A.) / (25 x Total Number of Experiments)) \*25
  4. A comprehensive Final Practical End Semester examination (of 25 Marks) will be conducted by MSBTE at the end of semester. Examiner for this examination will be appointed by MSBTE. The schedule of MSBTE Practical Examination will be display on Notice board prior to examination

### References:

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| --- | --- | --- | --- |
| **Sr. No** | **Author** | **Title** | **Publisher** |
| 01 | Process Control Instrumentation Technology | Johnson C .D. | Prentice Hall , eighth edition , United States of America , 2014, ISBN:978-0131194571 |
| 02 | Introduction to Programmable Logic Controller | Dunning , Gary | Cenage Learning , United States of America ,2005 ISBN:9781401884260 |
| 03 | Control System Engineering | Nagrath , J.J, Gopal M | Anshan Publishers(2008 ) ISBN:9781848290037 |
| 04 | Modern Control Engineering | Ogata K. | PHI ,Fifth edition , NEW DELHI ,2010 ISBN:  978812034010 |
| 05 | Programmable Logic Controllers and Industrial Automation | Mitra , Madhuchhanda, Gupta , Samarjit Sen | Penram , first edition , Mumbai  , 2007, ISBN : 9788187972174 |
| 06 | Programmable Logic Controllers | Petruzella, F.D. | Tata Mc Graw Hill third Edition , 2010  ISBN : 9780071067386 |

* **Web References:**

1. [www.scilab.org](http://www.scilab.org/)
2. [www.openplc.fossee.in](http://www.openplc.fossee.in/)
3. [www.github.com/FOSSEE/open](http://www.github.com/FOSSEE/open) PLC [d.ww](http://www.youtube.com/plc)w.[youtube.com/plc](http://www.youtube.com/plc)

e. www.dream techpress.com/ebooks

f. [www.nptelvideos.com/control\_systems](http://www.nptelvideos.com/control_systems) g[.www.plcs.ne](http://www.plcs.net/)t [h.ww](http://www.ab.rockwellautomation.com/)w.[ab.rockwellautomation.com>](http://www.ab.rockwellautomation.com/)Allen -Bradley

### Mrs.S.K.Khaire Mrs.S.K.Khaire

**(Name & signature of staff) (Name & signature of HOD)**