***Lesson Plan***

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| **CLASS** | | | | | | SE ECS, Semester IV | | | |
| **Academic Term** | | | | | | January – May 2021 | | | |
| **Subject** | | | | | | **Controls and Instrumentation (ECC 403)** | | | |
| ***Periods (Hours) per week*** | | | ***Lecture*** | | | | 3 | | |
| ***Practical*** | | | | ***--*** | | |
| ***Tutorial*** | | | | ***--*** | | |
| ***Evaluation System*** | | |  | | | | ***Hours*** | ***Marks*** | |
| Theory examination | | | | 3 | 80 | |
| Internal Assessment | | | | -- | 20 | |
| Practical Examination | | | | -- | -- | |
| Oral Examination | | | | -- | -- | |
| Term work | | | | -- | -- | |
| Total | | | | -- | 100 | |
|  | | | | | | | | | |
| ***Time Table*** | | | ***Day*** | | | | ***Time*** | | |
| Monday | | | | 9.00 to 10.00 am | | |
| Wednesday | | | | 9.00 to 10.00 am | | |
| Friday | | | | 9.00 to 10.00 am | | |
| ***Course Content and Lesson plan*** | | | | | | | | | |
| ***Module – 1 Control systems and Models*** | | | | | | | | | |
| **Week** | **Lecture No.** | **Date** | | | **Topic** | | | | **Remarks(If any)** |
| **Planned** | | **Actual** |
|  | 1 | 25 – 01 – 21 | |  | Discussion of syllabus and COs | | | |  |
| 2 | 27 – 01 – 21 | |  | Open loop control system, close loop control system, examples of open loop closed loop systems | | | |
| 3 | 29 – 01 – 21 | |  | Servomotors | | | |
| **Week** | **Lecture No.** | **Date** | | | **Topic** | | | | **Remarks(If any)** |
| **Planned** | | **Actual** |
|  | 4 | 01 – 02 – 21 | |  | Servomotors | | | |  |
| 5 | 03 – 02 – 21 | |  | Block reduction technique. | | | |
| 6 | 05 – 02 – 21 | |  | Block reduction technique. | | | |
|  | 7 | 08 – 02 – 21 | |  | Signal flow graph, Masons gain formula, problems based on SFG. | | | |  |
| 8 | 10 – 02 – 21 | |  | Signal flow graph, Masons gain formula, problems based on SFG. | | | | Assignment 1,  Quiz 1 |
| ***Module - 2 Time Response Analysis and Stability analysis*** | | | | | | | | | |
|  | 9 | 12 – 02 – 21 | |  | Type of a system, Steady state error analysis | | | |  |
|  | 10 | 15 – 02 – 21 | |  | Transient Analysis of second order system for step input. Time domain specifications of systems. | | | |  |
| 11 | 17 – 02 – 21 | |  | Transient Analysis of second order system for step input. Time domain specifications of systems. | | | |  |
| 12 | 19 – 02 – 21 | |  | Transient Analysis of second order system for step input. Time domain specifications of systems. | | | | Assignment 2  Quiz 2 |
|  | 13 | 01 – 03 – 21 | |  | Concept of stability, stability analysis using Routh’s stability criterion. | | | |  |
| 14 | 03 – 03 – 21 | |  | Root locus concept, Rules for constructing root locus. | | | |  |
| 15 | 05 – 03 – 21 | |  | Root locus analysis of control systems | | | | Assignment 3  Quiz 3 |
| ***Module – 3 Stability analysis in frequency domain*** | | | | | | | | | |
| **Week** | **Lecture No.** | **Date** | | | **Topics** | | | | **Remarks (If Any)** |
| **Planned** | | **Actual** |
|  | 16 | 22 – 03 – 21 | |  | Frequency domain specifications. Relationship between time and frequency domain specification of system. | | | |  |
| 17 | 24 – 03 – 21 | |  | Bode plots, gain margin phase margin, stability analysis based on Bode plot. | | | |  |
| 18 | 26 – 03 – 21 | |  | Stability analysis using bode plot. | | | |  |
|  | 19 | 31 – 03 – 21 | |  | Polar plot. | | | |  |
| 20 | 12– 04 – 21 | |  | Nyquist stability criterion, Nyquist plot. | | | | Assignment 4  Quiz 4 |
| 21 | 16 – 04 – 21 | |  | Advances in control systems | | | |  |
| ***Module –4 Sensors and Transducers*** | | | | | | | | | |
|  | 22 | 19 – 04 – 21 | |  | Sensors and Transducers | | | |  |
|  | 23 | 23 – 04 – 21 | |  | Displacement Transducers, Pressure Transducers | | | |  |
| 24 | 26 – 04 – 21 | |  | Temperature sensors | | | |  |
| ***Module – 5 Signal Conditioning*** | | | | | | | | | |
|  | 25 | 28 – 04 – 21 | |  | Instrumentation Systems, DAS, Data Logger | | | |  |
| 26 | 30 – 04 – 21 | |  | SCADA | | | |  |
| 27 | 03 – 05 – 21 | |  | Fibre Optic Instrumentation | | | | Assignment 5  Quiz 5 |
| ***Module –6 Communication Standards*** | | | | | | | | | |
|  | 28 | 05 – 05 – 21 | |  | Telemetry | | | |  |
|  | 29 | 07 – 05 – 21 | |  | Multiplexing, Instrument Interfacing | | | |  |
| 30 | 10 – 05 – 21 | |  | Communication Standards and Protocols | | | | Assignment No. 6 |
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|  | | | | | | | | | |

**Text Books:**

1. I. J. Nagrath, M. Gopal, Control Systems Engineering, New Age International, Fifth Edition, 2012.

2. B S Manke – Linear Control systems

3. D Patranabis – Principles of Industrial Automation

4. A K Sawhney – Electrical and Electronic Measurement and Instrumentation

5. H S Kalsi – Electronic Instrumentation

**Refence Books**

1. K. Ogata, Modern Control Engineering, Pearson Education India, Fifth Edition, 2015.
2. Norman S Nise – Control system Engineering
3. B C Kuo – Automatic Control systems
4. C S Rangan and G R sharma – Instrumentation Devices and Systems

**Internal Assessment: (IA):**

Two tests must be conducted which should cover at least 80% of the syllabus. The average marks of both the test will be considered as final IA marks.

**End Semester Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. The students need to solve total 4 questions.
3. Question No. 1 will be compulsory and based on entire syllabus.
4. Remaining question (Q.2 to Q.6) will be set from all the modules.

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| **Submitted By** | **Approved By** |
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| Prof. Narayanan Kallingal | i) Prof. Narayanan Kallingal Sign: |
|  |  |
| Sign: | ii) Prof. D V Bhoir Sign: |
|  |  |
|  | iii) Prof. Shilpa Patil Sign: |
|  | iv) Prof. Monica Khanore Sign: |
|  |  |
| **Date of Submission: 22 – 02 – 2021** | **Date of Approval:** |
|  | |
| **Remarks by PAC (if any)** | |
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