| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 1 | 1 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Introduction to control system And it's transfer function |
| **LO Description** | Describe control systems and Laplace transform |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-01 | Open and closed loop control system and their merits and demerits , Block representation of simple systems, Differential equations representing a system definition of Laplace transform , Laplace transforms of some important functions (No derivation required ) | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 5 | 1 | Text Books, PPT, Handouts, chalk board, charts .Videos lectures- NPTEL& others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-01 | Mid Semester Theory Exam | **Student will be asked to (**and/or)<br>1. Compare open loop and closed loop control system.<br>2. Determine Laplace Transform some important function | 10 | | Question paper, Rating scale | Internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 1 | 2 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Introduction to control system And it's transfer function . |
| **LO Description** | Calculate the gain of a given control system. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-02 | Block diagram reduction technique, Signal flow graph of control systems, Mason's gain formula. | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 7 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-02 | End Semester Theory Exam | **Student will be asked to (**and/or)<br>1. Obtain the transfer function using Block Diagram reduction technique.<br>2. Obtain the transfer function using Mason's Gain formula. | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 1 | 3 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Introduction to control system And it's transfer function |
| **LO Description** | Modeling a control system and it's transfer function . |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-03 | Transfer function of electrical, mechanical and electromechanical system , pneumatic system, DC and AC Servo motor ,DC generator, Amplidyne generator, DC and AC taco generator, potentiometer error detector , synchro error detector | Interactive classroom lecture, PPT, demonstration, quiz, assignments . | 4 | 2 | Text Books, PPT, Handouts, chalk board, charts.Videos lectures-NPTEL& others . | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-03 | End Semester Theory Exam | **Student will be asked to**<br>1.determine the Transfer function of given Electrical system<br>2.determine the Transfer function of given mechanical system | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 1 | 4 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Introduction to control system And it's transfer function. |
| **LO Description** | Explain control system components and it's transfer function |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-04 | Determine the Transfer Functinon ac servo motor<br>Determine the Transfer function DC taco Generator<br>Determine the Transfer Functinon of given electrical network<br>Determine the Transfer function synchro error detector | Lab demonstration, hands on practice, lab assignments, Virtual Lab. | | 8 | Lab manual, charts, experimental trainer instruments/kit with measuring instruments, computer with relevant simulation software | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-04 | End Semester Practical Exam | **Student will be asked to (**and/or)<br>1. Determine the Transfer Functinon ac servo motor<br>2. Determine the Transfer function DC taco Generator | 10 | | Rubrics/Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 2 | 5 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Perform time domain analysis of given control system. |
| **LO Description** | Identify the type and order of given control system. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-05 | Time domain analysis- Type and order of a control system, typical test signals for time response analysis of a control system(Unit step, Unit ramp and unit impulse) | Interactive classroom lecture, PPT, demonstration, quiz, assignments | | 7 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures-NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-05 | Assignment | **Student will be asked to**<br>1. Find the time response of a given control system<br>2. find the type and order of given control system | 10 | | Question paper, Rating scale | internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 2 | 6 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Perform time domain analysis of given control system. |
| **LO Description** | To understand Response of first and second order control system. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-06 | Time response of first and second order control systems, steady state error- static and dynamic error coefficients, transient response specifications of second order control system. | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 7 | 3 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures-NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-06 | End Semester Theory Exam | **Student will be asked to** (and/or)<br>1. Determine the type and order of given Control system.<br>2. Derive the response of $1^{st}$ and $2^{nd}$ Order control system for different inputs | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 2 | 7 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Perform time domain analysis of given control system. |
| **LO Description** | Explain various controllers. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-07 | Basic ideas of proportional, derivative and integral controllers and electronic PID controllers | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-07 | End Semester Theory Exam | **Student will be asked to (**and/or)<br>1. Explain proportional control system<br>2. Explain PID control system | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 2 | 8 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Perform time domain analysis of given control system. |
| **LO Description** | Demonstrate the operation of given controllers. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-08 | Demonstrate the operation of PD controller.<br>Demonstrate the operation of PI controller.<br>Demonstrate the operation of PID controller. | Lab demonstration, hands on practice, lab assignments, Virtual Lab. | | 6 | Lab manual, charts, experimental trainer instruments/kit with measuring instruments, computer with relevant simulation software | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-08 | End semester Practical Exam | **Student will be asked to**<br>1. Setup and Demonstrate the operation of given Controller. | 10 | | Rubrics/Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 3 | 9 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Test the stability of a given control system. |
| **LO Description** | To determine stability Use Routh Hurwitz criterion |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-09 | Concept of stability, Routh Hurwitz criterion- different cases and conditions, numerical problems | Interactive classroom lecture, PPT, demonstration, quiz, assignments. | 8 | 2 | Text Books, PPT, Handouts, chalk board, charts.Videos lectures-NPTEL& others. | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-09 | End Semester Theory Exam | **Student will be asked to (and /or)**<br>1. Determine the stability of given control system equation using Routh hurwitz criteria.<br>2. Write the limitation of Routh Hurwitz criteria. | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 3 | 10 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Test the stability of a given control system. |
| **LO Description** | To determine stability Use root locus technique. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-10 | Root locus technique, basic theory and properties of root loci, procedure for construction of root loci. | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-10 | End Semester Theory Exam | **Student will be asked to (**and/or)<br>1. Draw root locus of given control system.<br>2. List the properties of Root loci. | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 3 | 11 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Test the stability of a given control system. |
| **LO Description** | Explain and compare different compensator. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-11 | Compensation techniques, lead compensator, lag compensator and lag lead compensator | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 6 | 2 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-11 | Mid Semester Theory Exam | **Student will be asked to**<br>1. Design a lead compensator<br>2. Design leg compensator | 10 | | Question paper, Rating scale | internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 3 | 12 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Test the stability of a given control system. |
| **LO Description** | Explain and compare different compensator. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-12 | Determine the response of lead circuit and lag circuit.<br>Determine the response of lag lead circuit.<br>Plot the root locus plot of a given control system using MATLAB/Scilab | Lab demonstration, hands on practice, lab assignments, Virtual Lab. | | 7 | Lab manual, charts, experimental trainer instruments/kit with measuring instruments, computer with relevant simulation software. | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-12 | End semester practical Exam | **Student will be asked to** (and/or)<br>1. Determine the response of given compensator.<br>2. Plot the root locus plot using MATLAB/Scilab. | 10 | | Rubrics/Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 4 | 13 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Perform frequency domain analysis of given control system |
| **LO Description** | Describe frequency response and use Bode plot |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-13 | Frequency domain analysis, frequency response, frequency domain specifications, Bode plot. | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 4 | 1 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-13 | End Semester Theory Exam | **Student will be asked to**<br>1. Draw the Bode plot of given Control system | 10 | | Question paper, Rating scale | External |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**


| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING | Branch Code | Course Code | CO Code | LO Code | Format No. 4 |
|---|---|---|---|---|---|---|

| OUTCOME | E | 0 | 4 | 4 | 0 | 1 | 4 | 14 | |
|---|---|---|---|---|---|---|---|---|---|

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Perform frequency domain analysis of given control system |
| **LO Description** | Use different tools to explain the stability of a given control system |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-14 | Nyquist stability criterion, relative stability, gain margin, phase margin | Interactive classroom lecture, PPT, demonstration, quiz, assignments | 2 | 3 | Text Books, PPT, Handouts, chalk board, charts. Videos lectures- NPTEL & others | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-14 | Assignment | **Student will be asked to**<br>1. Find the stability of given control system using Nyquist stability criterion.<br>2. Explain gain margin and phase margin. | 10 | | Question paper, Rating scale | internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**

| RGPV (Diploma Wing ) Bhopal | SCHEME FOR LEARNING OUTCOME | Branch Code | | | Course Code | | | CO Code | LO Code | Format No. **4** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | E | 0 | 4 | 4 | 0 | 1 | 4 | 15 | |

| | |
|---|---|
| **COURSE NAME** | **Electronics and Instrumentation** |
| **CO Description** | Perform frequency domain analysis of given control system |
| **LO Description** | Use MATLAB/Scilab software for drawing given plot. |

**SCHEME OF STUDY**

| S. No. | Learning Content | Method of teaching | Teach Hrs. | Pract. /Tut Hrs. | LRs Required | Remarks |
|---|---|---|---|---|---|---|
| LO-15 | Plot the Bode plot of a given control system using MATLAB/Scilab software<br>Plot the Nyquist plot of a given control system using MATLAB/Scilab software | Lab demonstration, hands on practice, lab assignments, Virtual Lab. | | 7 | Lab manual, charts, experimental trainer instruments/kit with measuring instruments, computer with relevant simulation software. | |

**SCHEME OF ASSESSMENT**

| S. No. | Method of Assessment | Description of Assessment | Maximum Marks | Passing Criteria | Resources Required | External / Internal |
|---|---|---|---|---|---|---|
| LO-15 | practical test in laboratory | **Student will be asked to**<br>1. Plot the Bode /Nyquist Plot of given control system using MATLAB/Scilab software. | 10 | | Rubrics/Rating scale | internal |

**ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)**