	Course Title: **MECHATRONICS LAB**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15ME57P**
	Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core (practice)**
CIE- 25 Marks			SEE- 50 Marks

Prerequisites: Mechatronics

Course Objectives:

1. To expose the students in Fluid power circuits, PLC based Fluid Power Control, Actuators, controllers and Virtual Instrumentation.

Course out comes

On successful completion of the course, the students will be able to attain CO:

	Course Outcome	**CL**	**Linked experiments**	**Linked PO**	**Teaching Hrs**
CO1	Understand the digital logic	*U/A*	1	2,3,4	**24**
CO2	Understand the concept of interfacing the various mechanical, electrical, electronics and computer systems	*U/A*	1,2,3,4,5,6,7	2,3,4	**15**
CO3	Know about the details of hydraulic and pneumatic Systems.	*U/A*	1,2,3,4,5,6,7	2,3,4	**30**
CO4	Design the circuits for hydraulic and pneumatic systems with PLC control	*U/A*	1,2,3,4,5,6,7	2,3,4	**15**
				Total sessions	**78**

Legend: R: remember U: Understand A: Application

Course –PO matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MECHATRONICS LAB	**0**	**1**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.
Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

LIST OF GRADED PRACTICAL EXERCISES

The practical/Graded exercises should be properly designed and implemented with an attempt to develop different types of learning out comes in affective domain and psychomotor domain, so that students are able to acquire the necessary skills. Following is the list of experiments to be carried out.

Exercise No.	Practical/Exercise	Apprx. Hrs. Required
PART A. PERFORMING EXPERIMENTS		
1	Design and Simulate the following digital circuits using MultiSim/any digital circuit simulator. Basic Logic Gates (i) Basic Logic Gates (ii) Demorgan's Theorem (iii) Combination Logic (iv) Encoders and Decoders (v) Flip-Flops	18
PART B. PERFORMING EXPERIMENTS (PLC)		

1	1. Draw the ladder rungs to represent
	   i. Two switches Normally Open and both have to be closed for the motor to operate.
	   ii. Either of the two Normally Open switches to be closed for the coil to be energised
		09

2.	Devise a timing circuit that will switch on for 20s and then switch it off.	06
3	Device a timing circuit that will switch on 10s and off 20s and so on	06
4	Device a circuit that can be used to start a motor and then to start a pump after delay of 50s. Then the motor is switched off 10s before the pump is switched off when the pump remains on for 50s.	09
5	Devise a circuit that can be used with the domestic washing machine to switch on a pump to pump water for 100s into the machine. Then switch on a heater for 50s to heat the water. The heater is switched off and another pump is switched on to empty the water for 100s.	09
6	Design and simulate of fluid power circuits to control (i)velocity (ii) direction of a single and double acting actuators	09
7	Design and Simulate a ladder diagram for car parking. (Hint: car is to be detected and enter the parking space to a particular location if space is available. If there is no space, a lamp should indicate that parking is full.)	09
	TOTAL	**78**

TEXT BOOKS AND REFERENCES

Sl.No.	Title of Books	Author	Publication
1.	Mechatronics	W.Bolton	Pearson education
2.	Mechatronics-Principles, Concepts and Applications	Nitaigour Premch and Mahalik	Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2006
3	Mechatronics	HMT	Tata McGraw Hill Publishers, New Delhi

4.	Programmable logic controllers	W.Bolton	Pearson education
5	Digital electronics	Flyod	-
6	Exploring PLC with applications	Pradeep Kumar Srivatsava	BPB publications

1. Each student should submit any one of the following type activity or any other similar activity related to the course and before take up get it approved from concerned Teacher and HOD.
2. *Each student should conduct different activity and no repeation should occur*

1	Visit to any of the nearest Electo-mechnaical based industries and the get report related to Mechanical operation performing using PLC and microcontroller.
2	Visit any of the nearest local service centre of automated Domestic washing machine get the information in the form report.(Make the Video when it is dismantled for presentation)
3	Visit the electrical and electronics laboratory and submit the report on construction and working of stepper motor when it is interfaced with any of the micro controller.

Course Delivery:

The course will be delivered through Demonstration and Shop practices

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	**CIE** (Continuous Internal Evaluation)	**IA** Tests	Students	Two Tests (Average of two tests to be computed)	**10**	Blue books	1,2,3,4
				Record Writing (Average marks of each exercise to be computed)	**10**	Record Book	1,2,3,4
				Activity	**05**	Report	1,2,3,4
				TOTAL	**25**		
	SEE (Semester End Examination)	End Exam		End of the course	**50**	Answer scripts at BTE	1,2,3,4
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, 4 Effectiveness of Delivery of instructions & Assessment Methods

Note: *CIE – Continuous Internal Evaluation   *SEE – Semester End Examination

Note:
1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.
3. Student suggested activities report for 5 marks
4. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods

MODEL OF RUBRICS FOR ASSESSING STUDENT ACTIVITY

	RUBRICS FOR ACTIVITY(5 Marks)					
Dimension	**Unsatisfactory** 1	**Developing** 2	**Satisfactory** 3	**Good** 4	**Exemplary** 5	**Student Score**
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	Ex: 4
Fulfil team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	5
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity

Note to IA verifier: **The following documents to be verified by CIE verifier at the end of semester**
5. Blue books (10 marks)
6. Student suggested activities report for 5 marks
7. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods

	SCHEME OF VALUATION		
Serial no	**Description**	**Marks**	
1	**Part A** **Writing**	5	**15**
	Execution	10	
2	**Part B** **Writing**	10	**25**
	Execution	15	
3	**Viva**		**10**
	TOTAL		**50**

SYSTEM REQUIREMENTS

1. Computers with latest configurations-cpu-3.0GHz-RAM-2Gb/hdd-250Gb/dedicated graphics card1Gb
2. UPS-minimum 7.5 KvA
3. LCD projector-2 Nos.

SOFTWARE REQUIREMENTS

1. **MultiSim– Latest version with 20 user Licences**
2. **PLC – trainer Kit-5 nos each (Siemens/Allen Bradley/Keyence/Fanuc)**

Directorate Of Technical Education   Karnataka State   15ME57P MECH